A consumer’s guide to
UNDERSTANDING
LAB RESULTS
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LABORATORY PANELS & EXPLANATIONS

**Why do you need a laboratory test?**

One of the most important steps that you can take to ensure optimal health is to monitor lab values to determine if there are trends that you could improve on. Over time, negative trends can end up leading to a chronic condition. If your goal is to age gracefully and feel good in the process, then learning about your chemistry can be satisfying and rewarding.

**+Introduction to Laboratory Testing**

- Reference Value Discussion
- Factors Affecting Results
- Complementary Recommendations

**+List of Life Time Fitness Laboratory Tests and Brief Explanations**

**+Introduction to Individual Panels**

*Reference Values (including normal range and optimal range where applicable)*

- Why Is This Lab Test Needed?
- What Does a Low Value Mean?

*What Are Steps You Can Take to Help Improve a Low Value?*

- Dietary and Lifestyle
- Supportive Supplements

*What Does a High Value Mean?*

*What Are Steps You Can Take to Help Improve a High Value?*

- Dietary and Lifestyle
- Supportive Supplements

DISCLAIMER: This information is for educational purposes only and is not intended to diagnose or treat an illness or disease. A doctor should always be consulted before taking any steps to alter laboratory values that when tested are out of range, either high or low. However, it is important for individuals to understand trends in their laboratory values and take steps to participate in the management of their health, such as using diet and lifestyle changes and professionally formulated dietary supplements.
INTRODUCTION TO LABORATORY TESTING

Laboratory tests are used in order to learn information about your body and your health. Laboratory tests, including urine, saliva and blood tests (depending on what is ordered), can provide information about your body’s unique chemistry, including low or high values and those that are in the “normal range” but still might be affecting your health.

Laboratory results generally assist your doctor in assessing your overall health and metabolic state. With self-testing through Life Time Fitness’s program, you can look at the numbers and recognize if you have a lab value that is trending low or trending high. This information can help you take action through self-motivating steps – by balancing nutrient levels and helping your body correct underlying metabolic imbalances. You do this with dietary changes, supplements where needed, and lifestyle changes like exercise and stress reduction – all specific for your needs based on your laboratory values. Then recheck labs in about 2 months. Remember, however, if your numbers are below the reference values, you generally should seek medical attention and have a doctor review your numbers and decide if further testing is needed. Some laboratory values may be altered by factors including pregnancy, foods eaten before a test or medications, but you should still seek medical advice to understand why your test is below or above the reference values.

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WHEN I REVIEW MY RESULTS, WHAT DO THE NUMBERS MEAN?

We use Reference Values including a “normal” range for all tests and an “optimal” range for some individual tests. Reference values help you and your health care provider determine if the results of your laboratory tests are of concern to your metabolism and health or not. Will these results place you at risk for a downward spiral into disease? The optimal range is closer to where the human body is thought to function its best.

The normal range reflects the results expected for 95% of the population, but it can’t always predict what’s right for you. If your particular panel comes back in the “normal” range, but your panel levels are on the low OR high side, generally there should be no cause for immediate medical concern. But if you test again in 12 weeks or so, and your numbers have gotten lower or higher, then a trend is set up and you may be at risk for developing health problems. The “optimal” range was developed by medical professionals to reflect testing levels that are associated with optimal health or minimal risk of related complications and diseases.

However, when you test on the “low” side of normal or the “high” side of normal and outside the “optimal” range, there may be steps you can take to help bring those numbers back into harmony and your health back into balance. Look at it this way: a normal range of vitamin D in the body is 10 - 55 ng/ml (nanograms per milliliter). If you purchase a Life Time Comprehensive Vitamin D Panel and your results come back with a level of 19, then you may be setting yourself up for imbalances in metabolism. Maybe you’re tired a lot more than usual, you get more colds than normal, you have food cravings or you just don’t feel well. Low-range vitamin D levels can also lead to insulin resistance, heart problems, depression, immune imbalances and more.

Now is a good time to take corrective steps with diet and lifestyle changes and dietary supplements to help return your laboratory values back to optimal. When you re-test in a couple months, you should see an improvement in how you feel and your numbers. If you still have a low trending vitamin D level, then you should consult your doctor.

What factors affect your lab test results?

Many factors can affect test results, including:

+ **Sex**: An example would be iron levels. Women that menstruate will show a lower iron level than men due to blood loss.
+ **Age**: Aging in general can alter many of the lab tests. Remember it’s the trends within a normal range that are important — unless you are out of the normal range.
+ **Race**: Different races can have a very different metabolism. For example, African Americans generally have a higher blood level of ferritin. Ferritin helps in the storage of iron in the body — the more ferritin, the more iron.
+ **Medical history**: Do you drink alcohol? Do you smoke? Are you on prescription medications? Do you have a history of health problems like liver, kidney or heart?
+ **General metabolic health**: Do you exercise? Do you eat good, nutrient-rich foods and avoid the fast
food establishment on the corner? Are you stressed all the time? Do you sleep well? Do you eat foods with sugar and high carbohydrates? Are your foods organic and free of pesticides and chemical additives?

**Sleep and stress levels:** Stress can lead to chronic inflammation in the body and this can impact many areas, including your brain chemistry, your mood, your hormones (like thyroid, stress hormone and sex hormones), your digestive and immune systems, your ability to regulate blood sugar — and the list goes on.

**Prescription and non-prescription use:** Various drugs can alter levels of most panels tested. We have included a list of these drugs in each panel where applicable.

**Dietary supplements:** Some dietary supplements can alter lab values.

**Not following testing requirements:** For example, if you are testing for a fasting blood glucose level and you eat breakfast before you test, then you’re going to have a higher glucose level in the blood than if you had fasted at least 8 hours prior to testing. Another example is with a saliva test. If you are testing for cortisol levels and you eat before your test, your saliva may be altered and the test may be altered. Follow the testing recommendations for each panel you purchase.

**Complementary Recommendations**

Recommendations for diet and lifestyle changes, and using dietary supplements are based on the invaluable clinical experience of our health care professional team. General dietary and lifestyle recommendations will be listed below, as we feel most members wanting to achieve a balanced metabolism can benefit from most of these practices. For specific tests, we have targeted diet/lifestyle recommendations along with dietary supplements that you can benefit from if your lab values are on the low side or high side of normal. You may not have to use all the dietary supplements related to a specific panel. Make sure to look at the recommendations, e.g., Sleep Solve 24/7 is listed under high cortisol levels, but you would only use this product if you have trouble falling or staying asleep.

**Note:** Remember, “out of range” values should be reviewed by a doctor.

**General Dietary and Lifestyle Recommendations:**

1. Take a quality multiple vitamin/mineral supplement daily to complement your diet. The Life Time Fitness Men’s Performance Daily Multivitamin AM/PM is recommended for adult males. The Life Time Fitness Women’s Performance Daily Multivitamin AM/PM is recommended for adult women.

2. As a starting point for most people, we recommend a diet in the following ratio: 40% carbohydrates, 30% protein and 30% fat (not saturated or animal fat) along with High-fiber.

3. High-fiber foods include fresh vegetables, fruits and beans. These foods should supply about 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar. Such foods also provide important benefits, such as antioxidant vitamins, minerals, and nutrients. Make sure to include green, orange, and yellow fruits and vegetables — such as peppers, broccoli, carrots, and spinach. The antioxidants and other nutrients in these foods can help to protect against inflammation and regulate immune function.¹

4. Increase low starch vegetable intake to 5–9 servings a day such as green beans, asparagus, avocados, broccoli, cabbage and sprouts.

5. Significantly limit refined sugar (sugar, candy, desserts) and refined carbohydrate (pastas, breads, baked goods, cereals, white rice) intake to decrease inflammation, improve insulin response and improve immunity and digestive function.

6. Eliminate high fructose corn syrup found in condiments like catsup, soft drinks, and fruit juices. Minimize high glycemic fruits like pineapple, dried fruits and bananas. Chronic high fructose corn syrup consumption is a known causative factor in developing Metabolic Syndrome, a risk for diabetes.² Chronic consumption of high-glycemic index foods may lead to high oxidative stress or rusting of your cells, which is a precursor to many health problems.³,⁴
7. Animal fat (saturated fat) can raise cholesterol levels and has been linked to heart problems. Saturated animal fats from animals exposed to growth hormones may also lead to health conditions such as hormonal imbalances and cancer. Choose lean meats from quality sources, skinless poultry, and nonfat or low-fat or nonfat dairy products. Red meat should always be organic and grass-fed. The majority of proteins can be from a variety of healthy sources — beans, fish, chicken, turkey, buffalo/bison, and seafood (if no allergy).

8. Trans-fats should be eliminated from the diet. Trans-fats are supplied by hydrogenated vegetable oils used in most processed foods in the supermarket and in many fast foods.

9. The consumption of cold-water fish (such as salmon or halibut), and walnuts, which contain omega-3 fatty acids on a regular basis is important as well. Substitute olive or canola oil for butter or stick margarine. Taking the Life Time Fitness Omega-3 Fish Oil supplement is recommended for most individuals on a daily basis. If you have a bleeding disorder or take anticoagulant medications, then check with your doctor before taking fish oil.

10. Try to limit inflammatory foods, such as processed meats, chemical preservatives, and food additives. Studies have found that nitrite or nitrate treated meats such as bacon, sausage, smoked foods, and lunch-meats increase the risk of cancer.5,6

11. Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.

12. Limit exposure to any pesticides or other toxins such as heavy metals (lead, mercury) that may be present in foods. Buy organic foods where possible.

13. Dietary portions should be moderate, especially with high-calorie foods.

14. Balance energy (calorie) intake with energy output to maintain a desirable weight. Exercise and other physical activity are essential. Thirty to 60 minute sessions of modest intensity exercise 3-4 times a week are recommended for most people. If you have a medical condition, then check with your doctor before beginning any exercise program.

15. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.

16. It is important to drink at least 6-8, eight-ounce glasses of filtered water daily. Reverse osmosis purification is preferred. However, there are some conditions where excess fluid should be decreased. Check individual laboratory panels for more information.

17. Decrease stress through increasing “down” time. Meditation, gardening, Tai’ chi, yoga and other forms of stress reduction can help in the balancing of your metabolism and improve performance. Elevation of the stress hormone cortisol can contribute to food cravings and blood sugar irregularities, sleep problems, belly fat and weight gain, inflammation, sex and thyroid hormone imbalances. Chronic stress has been linked to heart problems, type 2 diabetes and cancer.7,8

18. If alcohol is consumed, moderation is key. Moderate consumption of alcohol consists of one drink a day for women and two a day for men. A drink is defined as 12 ounces of beer, 4 ounces of wine, or 1.5 ounces of 80-proof spirits. Excess alcohol consumption leads to a variety of health problems, including increased risk of type 2 diabetes, hormonal imbalances and cancer.

19. Obtain at least 7–8 hours of quality sleep nightly. Losing sleep is linked with increased risk of illness, including immune and hormonal imbalances, heart disease, insulin resistance, increased belly fat, obesity, depression, even increased risk of bone fractures.9
LIFE TIME FITNESS LABORATORY TESTS

Life Time Fitness Laboratory Tests include:

+ Men’s Core Test
+ Women’s Core Test
+ Men’s Sex Hormone Test
+ Men’s Sex Hormone Premium
+ Women’s Sex Hormone Test
+ Women’s Sex Hormone Premium
+ Stress and Resilience
+ Comprehensive Vitamin D
+ Energy and Metabolism
+ Energy and Metabolism Premium
+ Cardio Metabolic Risk
+ Cardio Metabolic Risk Premium
+ Anabolic Amino Acid Profile
+ IgG Food Sensitivity
+ Men’s Longevity and Vitality
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality
+ Women’s Longevity and Vitality Premium

Men’s and Women’s Core Tests
Both the Men’s and Women’s Core laboratory tests contain panels that help determine your basic foundation of health, including the complete blood count (CBC) and the comprehensive metabolic panel (CMP). Your complete blood count (CBC) contains specific markers that help determine how well your blood is carrying oxygen and nutrients to your cells, if your blood clotting is appropriate and if your immune system is functioning as it should. Your comprehensive metabolic panel (CMP) examines your organs of detoxification (the liver, gallbladder, lungs and kidneys), blood sugar and insulin regulation, and electrolytes (minerals and trace elements). This is an essential test to look at core health status. A CBC (complete blood count) includes the following panels:

+ Hematocrit
+ Hemoglobin
+ MCV (mean corpuscular volume)
+ MCH (mean corpuscular hemoglobin)
+ MCHC (mean corpuscular hemoglobin concentration)
+ RDW (red cell distribution width)
+ WBC (white blood cell) — percentages and absolute differential counts
+ Platelet count
+ Red cell count

**A CMP (comprehensive metabolic panel) includes the following panels:**

+ ALT (alanine aminotransferase)
+ Albumin
+ Albumin:globulin (A:G) ratio
+ ALP (alkaline phosphatase)
+ AST (aspartate aminotransferase)
+ Bilirubin, total
+ BUN and BUN:creatinine ratio
+ Calcium
+ CO2 (carbon dioxide/bicarbonate)
+ Chloride
+ Creatinine
+ Globulin, total
+ Glucose (fasting and 2 hours after eating)
+ Potassium
+ Protein, total
+ Sodium

**Men’s Sex Hormone Test**

The Men’s Sex Hormone Test determines your basic male hormone trends. Sex hormones do more than raise or lower your libido, they play a major role in the complex hormonal relationships that contributes to maintaining as you are aging. Additionally, the relationship between sex hormones can play a major role in weight gain, cognitive function and mood. Most men do not realize that by the time that they are in their thirties, sex hormones may be dropping rapidly and taking a toll on how you feel both physically and emotionally. This test includes the following panels:

+ Testosterone, free and total
+ Estrone
+ PSA (prostate specific antigen)
+ SHBG (serum hormone binding globulin)

**Men’s Sex Hormone Premium**

The Men’s Sex Hormone Premium contains the same laboratory tests as the Men’s Sex Hormone Test, with the addition of assessing the stress hormone cortisol and associated markers. Elevated cortisol can contribute to food cravings and blood sugar irregularities, sleep problems, belly fat and weight gain, inflammation, sex and thyroid hormone imbalances. Chronic stress has been linked to heart problems, type 2 diabetes and cancer. Knowing how your body is responding to chronic stress is a critical feature of a complete health assessment. Most men do not realize that by the time that they are in their thirties, sex hormones may be dropping rapidly and taking a toll on how you feel both physically and emotionally. By adding cortisol and stress markers, a more thorough understanding of what may be causing low trends in testosterone is explored. This test includes the following panels:

+ Testosterone, free and total
+ Estrone
+ PSA (prostate specific antigen)
Women's Sex Hormone Profile
The Women’s Sex Hormone Test determines your basic female hormone balance. Sex hormones do more than raise or lower your libido, they play a major role in the aging process and overall good health. The relationship between these hormones is important because when out of balance it can lead to PMS, mood changes, mental focus issues as well as weight gain. If you are menstruating, your level of iron is also tested to determine if you have enough iron to carry oxygen and nutrients to your cells, low iron can lead to iron deficiency anemia. If you are exercising regularly your need for iron may go up as well. Sex hormones play a critical role in every aspect of women’s health and well being. This test includes the following panels:

+ Estrone
+ Estradiol
+ Progesterone
+ LH (luteinizing hormone)
+ FSH (follicle stimulating hormone)
+ SHBG (serum hormone binding globulin)
+ Iron (if menstruating)

Women's Sex Hormone Profile Premium
The Women’s Sex Hormone Premium contains the same laboratory markers as the Women’s Sex Hormone Test, with the addition of testing the level of your stress hormone cortisol, dehydroepiandosterone (DHEA, a compound that helps make hormones) and testosterone. In women, knowing your testosterone level is important for bone strength, development of lean muscle mass and strength and sex drive. Elevation of the stress hormone cortisol can contribute to food cravings and blood sugar irregularities; sleep problems, belly fat and weight gain, inflammation, sex and thyroid hormone imbalances. Chronic stress has been linked to heart conditions, type 2 diabetes and cancer. Knowing how your body is responding to chronic stress is a critical feature of a complete health assessment. This test includes the following panels:

+ Estrone
+ Estradiol
+ Progesterone
+ LH (luteinizing hormone)
+ FSH (follicle stimulating hormone)
+ SHBG (serum hormone binding globulin)
+ Iron (if menstruating)
+ Testosterone
+ Cortisol, blood
+ DHEA (dehydroepiandosterone), blood

Stress and Resilience Test
The Stress and Resilience Test helps determine the amount of stress your body is under by testing the stress hormone cortisol and dehydroepiandosterone (DHEA), a compound that helps make hormones. Elevation of the stress hormone cortisol can contribute to food cravings and blood sugar irregularities; sleep problems, belly fat and
weight gain, inflammation, sex and thyroid hormone imbalances. Chronic stress has been linked to heart conditions, type 2 diabetes, autoimmune disorders and cancer. Knowing how your body is responding to stress is a critical feature of a complete health assessment, and could be the most important obstacle to take on as it relates to future health outcome and feeling resilient and energized as you age. This test includes the following panels:

+ Cortisol 4 point salivary
+ DHEA-S (dehydroepiandosterone), saliva

**Comprehensive Vitamin D Test**

The Comprehensive Vitamin D Test measures your levels of vitamin D2 and D3. Vitamin D is a fat-soluble vitamin known as the “Sunshine vitamin”, and low levels of vitamin D is associated with an increased risk for nearly all major human health concerns, like bone health, heart function, blood sugar control, immune balance, breast and prostate health, mood (including depression), gastrointestinal health, and even cancer. This test includes the following panel:

+ Vitamin D2 and D3 (25-hydroxy vitamin D)

**Energy and Metabolism Test**

The Energy and Metabolism Test is used to evaluate your thyroid gland. Thyroid hormones regulate how each cell in your body converts calories from food or stored fat into energy, so imbalanced thyroid function can lead to a sluggish metabolism, and symptoms of fatigue, loss of concentration, weight gain, immune problems, mood swings, constipation, dry skin and brittle nails and sleep disturbance. When thyroid hormones are not at optimal levels, weight gain soon follows. Ferritin is also tested, which helps determine if you have enough iron being carried to the cells for energy. This test includes the following panels:

+ Free T4 (thyroxine)
+ Free T3 (triiodothyronine)
+ TSH (thyroid stimulating hormone)
+ TPO (thyroid peroxidase antibody)
+ Ferritin

**Energy and Metabolism Premium**

The Energy and Metabolism Premium contains the same laboratory panels in the Energy and Metabolism Test, with the addition of testing your blood sugar and insulin control, and your stress hormones cortisol and DHEA. This lab gives a comprehensive look at factors and relationships that could be influencing weight gain, mood, energy and stamina. If you are frustrated about your inability to maintain lean muscle or lack of consistent gains from exercise then consider this comprehensive lab value. This test includes the following panels:

+ Free T4 (thyroxine)
+ Free T3 (triiodothyronine)
+ TSH (thyroid stimulating hormone)
+ TPO (thyroid peroxidase antibody)
+ Ferritin
+ Glucose
+ Insulin
+ Cortisol, blood
+ DHEA (dehydroepiandosterone), blood
**Cardio Metabolic Risk Test**

The Cardio Metabolic Risk Test contains laboratory values that determine your heart and blood vessel health. It includes tests for blood sugar and insulin regulation, cholesterol and triglycerides, homocysteine (an indicator of heart health) and CRP-hs (a marker of inflammation). These tests should be considered by anyone in their twenties with family history of heart disease, and for all those older in order to get a baseline of cardiovascular wellness. Heart disease, known as the silent killer, taking many years to develop. This test proactively looks at the most accepted markers for cardiovascular fitness. This test includes the following panels:

+ Glucose  
+ Insulin  
+ LDL (low density lipoprotein)  
+ HDL (high density lipoprotein), total  
+ Cholesterol, total  
+ Triglycerides  
+ CRP-hs (c-reactive protein)  
+ Homocysteine

**Cardio Metabolic Risk Premium**

The Cardio Metabolic Risk Premium contains the same laboratory panels in the Cardio Metabolic Risk Test, with the addition of the stress hormone cortisol, vitamin D and the clotting factor fibrinogen. These three additional lab values create a more comprehensive picture of all the influences that are involved in your cardiovascular health. Stress can play a significant role in future cardiac risk. Fibrinogen measures how sticky red blood cells are. The Cardio Metabolic Risk Premium also substitutes a more advanced analysis of cholesterol and triglyceride balance. This test includes the following panels:

+ Glucose  
+ Insulin  
+ LDL (low density lipoprotein)  
+ HDL (high density lipoprotein), total  
+ Cholesterol, total  
+ Triglycerides  
+ CRP-hs (c-reactive protein)  
+ Homocysteine  
+ Cortisol, blood  
+ Vitamin D  
+ Fibrinogen  
+ VAP lipid panel

**Anabolic Amino Acid Profile**

The Anabolic Amino Acid Profile measures the level of amino acids in your body. Amino acids are the building blocks for your body’s proteins that make up the muscles, ligaments, tendons, organs, glands, nails, hair, body fluids, hormones and enzymes. Proteins are essential for the growth, repair and healing of bones, tissues and cells and are important in energy production, fluid regulation, brain health and your body’s use of nutrients. Poor recovery and lack of target gains from exercise can be attributed to low amino acid pools in the body.
Food Sensitivity Profile
The Food Sensitivity Profile helps to determine what foods your body is sensitive to and may be causing your digestive problems or excess inflammation. Food sensitivities have been linked to thyroid disorders, nerve problems, allergies and asthma and, most importantly, weight gain.

Men’s Longevity and Vitality
The Men’s Longevity and Vitality contains laboratory tests that measure major determinants in your metabolic performance, including thyroid health, your level of the stress hormone cortisol, blood sugar and insulin control, sex hormones, cholesterol and triglycerides along with vitamin D and CRP-hs, a marker of inflammation. These markers were selected because of their known role in the aging process. Values that are imbalanced have known associations with the development of chronic conditions and disorders. Get ahead of the aging curve and understand where you are going metabolically with this test. This test includes the following panels:

- FT3 (triiodothyronine)
- FT4 (thyroxine)
- TSH (thyroid stimulating hormone)
- TPO (thyroid peroxidase antibody)
- Cortisol, blood
- DHEA (dehydroepiandrosterone), blood
- Glucose
- Insulin
- Testosterone (free and total)
- SHBG (serum hormone binding globulin)
- Estrone
- IGF-1
- Vitamin D
- CRP-hs (c-reactive protein)
- Cholesterol, total
- LDL (low density lipoprotein)
- HDL (high density lipoprotein)
- Triglycerides

Men’s Longevity and Vitality Premium
The Men’s Longevity and Vitality Premium contains the same laboratory panels in the Men’s Longevity and Vitality test, with the addition of the complete blood count (CBC), a ferritin and homocysteine level and the comprehensive metabolic panel (CMP). The CBC (along with ferritin) contains markers that help determine if your blood is able to carry oxygen and nutrients to your cells, if your blood clotting is appropriate and if your immune system is competent. Your comprehensive metabolic panel (CMP) evaluates your organs of detoxification (the liver, gallbladder, lungs and kidneys), blood sugar and insulin control and electrolytes (minerals and trace elements). The Men’s Longevity and Vitality Premium also substitutes a more advanced analysis of cholesterol (particle size) and triglycerides, and checks homocysteine, all of which act as a more in depth indicator of heart health. This test includes the following panels:

- FT3 (triiodothyronine)
- FT4 (thyroxine)
- TSH (thyroid stimulating hormone)
- TPO (thyroid peroxidase antibody)
Women's Longevity and Vitality

The Women’s Longevity and Vitality contains laboratory tests that measure major determinants in your metabolic performance, including thyroid health, your level of the stress hormone cortisol, blood sugar and insulin control, sex hormones, cholesterol and triglycerides along with vitamin D and CRP-hs, a marker of inflammation. These markers were selected because of their known role in the aging process. Values that are imbalanced have known associations with the development of chronic conditions and disorders. Get ahead of the aging curve and understand where you are going metabolically with this test. This test includes the following panels:

+ FT3 (triiodothyronine)
+ FT4 (thyroxine)
+ TSH (thyroid stimulating hormone)
+ TPO (thyroid peroxidase antibody)
+ Cortisol, blood
+ DHEA (dehydroepiandosterone), blood
+ Glucose
+ Insulin
+ Estradiol
+ Progesterone
+ SHBG (serum hormone binding globulin)
+ Estrone
+ FSH/LH
+ IGF-1
+ Vitamin D
+ CRP-hs (c-reactive protein)
+ Cholesterol, total
+ LDL (low density lipoprotein)
+ HDL (high density lipoprotein)
+ Triglycerides
Women’s Longevity and Vitality Premium

The Women’s Longevity and Vitality Premium contains the same laboratory panels in the Women’s Longevity and Vitality test, with the addition of the complete blood count (CBC), a ferritin and homocysteine level and the comprehensive metabolic panel (CMP). The CBC (along with ferritin) contains markers that help determine how well your blood is able to carry oxygen and nutrients to your cells, if blood clotting is normal and if your immune system is competent. Your comprehensive metabolic panel (CMP) evaluates your organs of detoxification (the liver, gallbladder, lungs and kidneys), blood sugar and insulin control and electrolytes (minerals and trace elements). The Women’s Longevity and Vitality Premium also substitutes an advanced analysis of cholesterol (particle size) and triglycerides, and checks for homocysteine, all of which act as a more in depth indicator of heart health). This test includes the following panels:

+ FT3 (triiodothyronine)
+ FT4 (thyroxine)
+ TSH (thyroid stimulating hormone)
+ TPO (thyroid peroxidase antibody)
+ Cortisol, blood
+ DHEA (dehydroepiandosterone), blood
+ Glucose
+ Insulin
+ Estradiol
+ Progesterone
+ SHBG (serum hormone binding globulin)
+ Estrone
+ FSH/LH
+ IGF-1
+ Vitamin D
+ CRP-hs (c-reactive protein)
+ VAP lipid panel
+ Homocysteine
+ Ferritin
+ CMP
+ CBC
Amino acids make up 75% of the human body and are essential for most body function. Amino acids are the building blocks for your body’s proteins. Protein makes up the muscles, ligaments, tendons, organs, glands, nails, hair, body fluids, hormones and enzymes. Proteins are essential for the growth, repair and healing of bones, tissues and cells and are important in energy production, fluid regulation, neurotransmitter balance and the use of nutrients.

Essential amino acids are those that cannot be made by the body and must be obtained in the diet. These include isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine. Also, histidine is sometimes considered a “semi-essential” amino acid. Leucine, isoleucine, and valine are called branched-chain amino acid (BCAAs) due to their chemical structure. The combination of these three amino acids makes up approximately one-third of skeletal muscle in the human body. The nonessential amino acids include alanine, arginine, asparagines, aspartic acid, cysteine, glutamic acid, glycine, proline, serine taurine, and tyrosine. Other amino acids like carnosine and components of amino acids are important in metabolism and are tested in the Anabolic Amino Acid Panel.
AMINO ACID PANEL

Essential Amino Acids:

**Histidine**
+ Found in hemoglobin, the oxygen carrying molecule in the blood
+ Precursor in the body to form histamine, a compound of the immune system known for its role in stimulating the inflammatory and allergic responses of skin (the redness that occurs after a scrape on the skin) and mucous membranes (i.e. watery eyes and runny nose) and for its role in digestion (histamine stimulates acid secretion)
+ Decreases damage due to radiation and heavy metal exposure
+ Heavy metal toxicity, including lead, mercury or cadmium, can deplete histidine
+ Foods high in histidine include meats (lean beef, bison, turkey, chicken, pork, fish), soy protein, cheese, egg whites and white potatoes

**Isoleucine**
+ Necessary for hemoglobin formation
+ Helps balance blood sugar levels
+ Improves energy production
+ Aids in healing and repair of muscle tissue, skin and bones
+ Low levels can lead to hypoglycemia
+ Isoleucine rich foods include nuts (like almonds, cashews), chicken, chickpeas, lentils, fish, eggs, and lean meats. Soy protein also contains high amounts of isoleucine

**Leucine**
+ Works with isoleucine and valine in healing and repair of muscle tissue, skin and bones
+ Helps regulate blood sugar levels
+ Increases growth hormone production
+ Leucine rich food sources include legumes such as soybeans and animal products such as beef and fish. Also found in sweet potato, white potato, spinach, corn, green peas, asparagus, broccoli, swiss chard, mushrooms, tomato, avocado, wheat germ

**Lysine**
+ Helps with calcium absorption
+ Maintains nitrogen balance in the body
+ Helps form collagen, which makes up cartilage and connective tissue
+ Vitamin C helps improve lysine’s collagen formation
+ Improves immune function
+ Lowers triglyceride levels
+ Athletes, vegans who don’t eat beans, and burn patients may need increase lysine in the diet or lysine supplementation
+ Protein-rich foods contain lysine, including meats (chicken, bison, turkey, red meat, pork, fish), cheese (especially parmesan), nuts, eggs, soy protein, Brewer's yeast, beans and dairy. Also found in sweet potato, white potato, spinach, corn, green peas, asparagus, broccoli, swiss chard, mushrooms and tomato, avocado, wheat germ
+ If you have liver problems, use lysine under the care of a doctor

**Methionine**
+ Sulfur containing amino acid
+ Antioxidant
+ Helps break down fats
+ S-adenosyl methionine, a derivative of methionine, serves as a methyl donor which then converts methionine into the amino acids cystine and cysteine; this helps decrease the formation of homocysteine, a marker in the body for heart disease (see Life Time Fitness Homocysteine panel)
+ Proper levels are dependent on vitamin B12, folic acid, vitamin B6
+ Helps make creatine in the body which improves muscle function and growth
+ Foods containing high levels of methionine include sesame seeds, brazil nuts, meats (including fish), cereal grains; most fruits, vegetables and beans contain very little methionine

**Phenylalanine**
+ The body changes phenylalanine into tyrosine, another amino acid that’s needed to make proteins, brain chemicals including L-dopa, epinephrine, and norepinephrine, and thyroid hormones
+ Helps stabilize mood
+ A rare metabolic disorder called phenylketonuria (PKU) can occur in people who are missing an enzyme that breaks down phenylalanine. This can lead to an increased level of phenylalanine. In children, PKU can lead to irreversible mental retardation.
+ Symptoms of phenylalanine deficiency include confusion, lack of energy, decreased alertness, decreased memory, and diminished appetite
+ Those with PKU must eat a diet that avoids phenylalanine; also, tyrosine supplements are important in PKU to support neurotransmitter balance and proper brain growth and development
+ Ingestion of the artificial sweetener aspartame causes a rapid increase in brain levels of phenylalanine.
+ L-phenylalanine is found in foods that contain protein such as beef, poultry, fish, milk, eggs, dairy products, soy products, and some nuts and seeds. Also found in some vegetables including sweet potato, corn, green peas, white potato, spinach and swiss chard.

**Threonine**
+ Made from aspartic acid
+ Needed to make glycine and serine
+ Important in cardiovascular, liver, nervous system and immune function
+ Helps make connective tissue (collagen) and supports muscle function
+ Helps body digest fats
+ Foods high in threonine include cottage cheese, chicken, turkey, fish, red meat, lentils, mushroom, green leafy vegetables and sesame seeds
Tryptophan
+ Tryptophan is the metabolic precursor of the neurotransmitter serotonin, to the sleep hormone melatonin and to niacin
+ Tryptophan from the diet is converted into 5-HTP (5-hydroxytryptophan), which is converted into serotonin
+ Tryptophan can positively affect mood and well-being along with decreasing cravings and appetite
+ Foods high in tryptophan include chicken, turkey, tuna, soybeans, lean beef, halibut, salmon and lamb
+ Use tryptophan supplements under a doctors care if taking antidepressant medications

Valine
+ Valine is a branched-chain amino acid (BCAA)
+ Important in protein synthesis and energy metabolism, primarily in muscle tissue
+ Good source of energy
+ Helps with liver damage and gallbladder problems
+ Deficiency can lead to neurological problems
+ Foods high in valine include cottage cheese, fish, poultry, peanuts, sesame seeds, and lentils. Also found in white potato, sweet potato, broccoli, corn, green peas, spinach, swiss chard, avocado, chocolate.

Non-Essential Amino Acids:
Alanine
+ Manufactured in the body from pyruvate and branched chain amino acids (valine, leucine and isoleucine)
+ Plays major role in transferring nitrogen from tissues to the liver
+ Helps metabolize glucose for energy, especially during exercise
+ Improves immunity
+ Supports prostate health
+ Foods high in alanine include meats (red meat, fish, chicken, turkey, seafood), dairy, eggs, beans, nuts, seeds, soy protein, whey, brown rice and corn

Arginine
+ Made in the body from glutamine, glutamate, and proline
+ Key producer of nitric oxide (NO) which is important in blood vessel health, including erectile dysfunction
+ Important in heart health
+ Promotes tissue repair
+ Increases pituitary release of growth hormone
+ The best dietary sources of arginine are meat, nuts, eggs, milk and cheese. Also found in some vegetables, including green peas, asparagus, broccoli, swiss chard, corn, white potato, onion and spinach), avocado, chocolate.

Asparagine
+ Made from aspartic acid
+ Transports nitrogen in the body
+ Supports energy production
+ Supports nerve and brain tissue
+ Asparagine is most commonly found in poultry, dairy, eggs, fish, legumes, meat, nuts, seafood, seeds, soy, whey, whole grains, and beef
Aspartic Acid
+ Helps generate cellular energy
+ Helps balance neurochemistry
+ Helps liver rid the body of toxins like ammonia
+ Important in exercise and weight training
+ Found primarily in sugar cane and molasses; also found in meats and dairy

Carnosine
+ Made from histidine and β-alanine
+ Highly concentrated in muscle and brain tissue
+ Supports muscle recovery in exercise
+ Antioxidant
+ Helps regulate glycation, a process of sugar binding to a protein to form molecules that increase oxidative stress in the body
+ Supports detoxification of heavy metals
+ Found in meats, including beef, bison, chicken, turkey and pork

Citrulline
+ Made from ornithine and also glutamine in the intestines
+ Helps make arginine
+ Helps detoxify ammonia
+ Supports energy and immunity
+ Important in acid/base balance in body
+ Important in muscle recovery and strength
+ Found in watermelon rind

Cysteine and Cystine
+ Antioxidants; precursor to glutathione
+ Helps in detoxification
+ Cystine is made in the body from cysteine, which is formed from methionine
+ Proper levels are dependent on vitamin B12, folic acid, vitamin B6
+ Foods high in cysteine include chicken, turkey, yogurt, egg yolks, red peppers, garlic, onions, broccoli, Brussel sprouts, oats, wheat germ

Gamma-aminobutyric acid (GABA)
+ Helps regulate brain function in reducing effects of stress by increasing relaxation
+ Supports muscle tone
+ Made from glutamic acid
+ May increase levels of growth hormone (GH)
+ Found in fermented foods like soy
**Glutamic Acid**
+ Also called glutamate
+ Excitatory neurochemical in the brain; used as “fuel” in the brain
+ Converted to glutamine or GABA (gamma-aminobutyric acid)
+ Important in sugar and fat metabolism
+ A component of folate
+ Can lead to food sensitivity if sensitive to MSG (monosodium glutamate), a food flavor enhancer made from glutamic acid
+ Foods containing high levels of glutamic acid include meats, chicken, turkey, fish, eggs, dairy products (especially cheeses), soy sauce

**Glutamine**
+ The most prevalent amino acid in the bloodstream.
+ Source of energy for cells of the GI tract
+ Promotes protein synthesis and muscle growth
+ Alternative brain fuel
+ Blocks cortisol-induced protein breakdown
+ May be essential in GI disorders and tissue-wasting phenomena
+ L-glutamine can be found in beans, brewer’s yeast, brown rice bran, dairy products, eggs, fish, legumes, meat, nuts, seafood, seeds, soy, whey, whole grains, hydrolysis of gluten, beet root, or other proteins

**Glycine**
+ Helps create muscle tissue
+ Helps convert glucose to energy; regulates blood sugar levels
+ Important in neurochemical balance in the brain
+ Important in proper digestive tract function and immunity
+ High concentrations found in muscle, skin and connective tissue
+ High-protein foods, such as fish, meat, beans, milk, and cheese, are the best dietary sources of glycine
+ If you have liver or kidney problems, do not take glycine unless under a doctor’s care

**Ornithine**
+ Helps promote release of growth hormone (GH)
+ Increases metabolism and burns excess body fat (especially if combined with arginine and carnitine)
+ Helps improve insulin release and function
+ Supports immune function
+ Helps liver rid the body of toxins like ammonia
+ Important in exercise and weight training to build muscle
+ Promotes tissue healing and repair
+ Found in meats, dairy products, eggs

**Proline**
+ Made from glutamic acid
+ Helps in production of collagen; important for skin texture
+ Supports joints and connective tissue
+ Promotes tissue healing and repair
+ Vitamin C helps improve proline’s collagen formation
+ Important for muscle repair in prolonged or heavy exercise routines
+ Found in egg whites, wheat germ, fish, lean meats

**Serine**
+ Made from glycine
+ Important in the brain and nervous system
+ Helps make phospholipids, important in cell wall integrity
+ Supports immunity by helping make antibodies
+ Helps in metabolism of fats and fatty acids
+ Supports muscle formation; helps in absorption of creatine
+ Helps produce tryptophan, the amino acid that makes serotonin (the calming neurochemical); this helps decrease cravings
+ Foods high in serine include soy protein, dairy products, lean meats and nuts

**Taurine**
+ Made from methionine and cysteine
+ Concentrated in parts of the body that have high electrical activity such as the eye, brain, and heart
+ Found in bile and in lower intestines
+ Involved in heart protection, detoxification, eye protection, absorption of fats, and as a calming neurotransmitter in the brain
+ Important in muscle function
+ Low in vegetarians
+ Found in animal protein, including lean red meats, chicken, turkey, fish and in eggs and dairy products

**Tyrosine**
+ Made from phenylalanine
+ Important in making the neurochemicals dopamine, epinephrine and norepinephrine
+ Important in mood, stress response, mental function and craving
+ Helps make thyroid hormone
+ Important in metabolism
+ Aids in production of melanin (pigment that gives you hair and skin color)
+ May be depleted by oral contraceptives (birth control pills)
+ Found in dairy products, lean meats, fish, wheat
OTHER AMINO ACID VALUES REPORTED:

The Life Time Fitness Anabolic Amino Acid Profile also tests for precursors (compounds hormones are made from) and metabolites (compounds made during metabolism or chemical processes) of amino acids. These values include:

+ β-Alanine – involved in carnosine production; similar in chemical structure to taurine
+ α-Aminoacidipic acid – involved in lysine metabolism and probiotic microflora in intestines
+ β-Aminoisobutyric acid – made from the nucleic acid thymine
+ α-Amino-N-butryic acid – made from methionine involved in homocysteine regulation
+ Anserine – amino acid found in meats; marker for meat consumption
+ Cystathionine – made from homocysteine and serine in forming cysteine
+ Hydroxlyysine – made from lysine
+ 1-Methylhistidine – made from anserine and marker for meat consumption
+ 3-Methylhistidine – made from histidine and marker for meat consumption
+ Phosphoethanolamine – involved in methylation and formation of homocysteine
+ Phosphoserine – made from serine

Reference Values
Normal values, blood
(in micromoles per liter = µmol/L)

<table>
<thead>
<tr>
<th>Amino Acid</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>β-Alanine</td>
<td>0.0-14.0</td>
</tr>
<tr>
<td>Alanine (α-alanine)</td>
<td>210.0-670.0</td>
</tr>
<tr>
<td>α-Aminoacidipic acid</td>
<td>0.0-3.0</td>
</tr>
<tr>
<td>γ-Aminobutyric acid (GABA)</td>
<td>0.0-1.0</td>
</tr>
<tr>
<td>β-Aminoisobutyric acid</td>
<td>0.0-6.0</td>
</tr>
<tr>
<td>α-Amino-N-butryic acid</td>
<td>5.0-39.0</td>
</tr>
<tr>
<td>Anserine</td>
<td>0.0-10.0</td>
</tr>
<tr>
<td>Arginine</td>
<td>28.0-159.0</td>
</tr>
<tr>
<td>Asparagine</td>
<td>30.0-97.0</td>
</tr>
<tr>
<td>Aspartic acid</td>
<td>0.0-19.0</td>
</tr>
<tr>
<td>Carnosine</td>
<td>0.0-12.0</td>
</tr>
<tr>
<td>Citrulline</td>
<td>7.0-65.0</td>
</tr>
<tr>
<td>Cystathionine</td>
<td>0.0-3.0</td>
</tr>
</tbody>
</table>
### Why are Amino Acid levels needed?

Determining amino acid levels identify if you have an ample supply of amino acids in the body. Amino acids are used by every body system, and declining amounts can create imbalances in metabolism, including digestive and heart problems, an increase in oxidative stress, enzyme deficiencies, poor detoxification, immune deficiencies, hormone and neurochemical imbalances, and muscle, bone, and connective tissue problems. Amino acid imbalances can also indicate nutrient deficiencies, as various vitamins and minerals are used in amino acid metabolism.

**Do not eat or drink anything but water for at least 8 hours before your test.**

### What Life Time Fitness Lab Test Reports Amino Acid levels?

+ Anabolic Amino Acid Profile

### What do Amino Acid values mean?

Since amino acids affect your metabolism in many ways, this section will be organized into body systems that discusses the effects of low or high amino acid level trends, and how you can return your levels back within optimal range through diet and lifestyle changes, and by taking targeted nutritional supplements.

<table>
<thead>
<tr>
<th>Amino Acid</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cystine</td>
<td>3.0-56.0</td>
</tr>
<tr>
<td>Glutamic acid</td>
<td>20.0-220.0</td>
</tr>
<tr>
<td>Glutamine</td>
<td>350.0-700.0</td>
</tr>
<tr>
<td>Glycine</td>
<td>120.0-460.0</td>
</tr>
<tr>
<td>Histidine</td>
<td>48.0-125.0</td>
</tr>
<tr>
<td>Homocystine</td>
<td>0.0-2.0</td>
</tr>
<tr>
<td>Hydroxlysine</td>
<td>0.0-1.0</td>
</tr>
<tr>
<td>Hydroxyproline</td>
<td>0.0-40.0</td>
</tr>
<tr>
<td>Isoleucine</td>
<td>39.0-121.0</td>
</tr>
<tr>
<td>Leucine</td>
<td>61.0-200.0</td>
</tr>
<tr>
<td>Lysine</td>
<td>110.0-290.0</td>
</tr>
<tr>
<td>Methionine</td>
<td>14.0-47.0</td>
</tr>
<tr>
<td>1-Methylhistidine</td>
<td>0.0-32.0</td>
</tr>
<tr>
<td>3-Methylhistidine</td>
<td>0.0-14.0</td>
</tr>
<tr>
<td>Ornithine</td>
<td>30.0-136.0</td>
</tr>
<tr>
<td>Phenylalanine</td>
<td>36.0-99.0</td>
</tr>
<tr>
<td>Phosphoethanolamine</td>
<td>0.0-18.0</td>
</tr>
<tr>
<td>Phosphoserine</td>
<td>3.0-21.0</td>
</tr>
<tr>
<td>Proline</td>
<td>98.0-440.0</td>
</tr>
<tr>
<td>Sarcosine</td>
<td>0.0-16.0</td>
</tr>
<tr>
<td>Serine</td>
<td>69.0-270.0</td>
</tr>
<tr>
<td>Taurine</td>
<td>34.0-145.0</td>
</tr>
<tr>
<td>Threonine</td>
<td>76.0-261.0</td>
</tr>
<tr>
<td>Tryptophan</td>
<td>21.0-940.0</td>
</tr>
<tr>
<td>Tyrosine</td>
<td>32.0-122.0</td>
</tr>
<tr>
<td>Valine</td>
<td>115.0-340.0</td>
</tr>
</tbody>
</table>
Most of us eat enough protein in our diet so that a decline in essential amino acids is usually not a problem. However, vegetarians, body builders, those on strict protein diets, or individuals with malnutrition can have amino acid deficiencies.

Some drugs, like anti-ulcer medications, can lead to low acid in the stomach and low protein absorption that can result in lower amino acid levels. Proton pump inhibitors and H2 blockers are the 2nd largest category of drugs being prescribed in the U.S., and many of these drugs are easily available over-the-counter (OTC). Lower protein can have a significant impact on everything from immune function and blood sugar regulation to maintaining lean muscle mass. These drugs include:

+ Cimetidine (Tagamet)
+ Ranitidine (Zantac)
+ Nizatidine (Axid)
+ Famotidine (Pepcid)
+ Omeprazole (Prilosec)
+ Lansoprazole (Prevacid)
+ Rebeprazole (Aciphex)
+ Pantoprazole (Protonix)
+ Esomeprazole (Nexium, the “purple” pill)

Some of the effects of a diet generally deficient in amino acids include: reduced energy levels, sleeping disorders, joint and muscle aches/pains, digestive problems, hair loss and skin ailments, anxiety, mood swings, increased stress, insulin resistance and blood sugar problems, heart problems and general poor health. Other possible symptoms of amino acid deficiencies include obesity, malnutrition, and buildup of toxins in the bloodstream like ammonia.

**Cardiovascular Health**

<table>
<thead>
<tr>
<th>Amino Acid Trends</th>
<th>Potential Cardiovascular Health Condition(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Increased homocysteine</td>
<td>+ Increased risk of heart disease</td>
</tr>
<tr>
<td>+ Decreased cystathionine</td>
<td>+ Increased risk of developing Metabolic Syndrome, including</td>
</tr>
<tr>
<td>+ Decreased taurine</td>
<td>high blood pressure, weight gain, cholesterol imbalances,</td>
</tr>
<tr>
<td>+ Increased or decreased</td>
<td>insulin resistance and blood sugar regulation problems,</td>
</tr>
<tr>
<td>methionine and cysteine</td>
<td>leading to type 2 diabetes, heart attack and stroke</td>
</tr>
</tbody>
</table>

**Diet and Lifestyle Changes**

**General Dietary and Lifestyle Recommendations**

+ Some studies report that increasing the intake of B vitamins and folate improve homocysteine levels.\(^{11}\)
+ Increase vitamin B12 containing foods. Vitamin B12 is produced by microbial synthesis in the digestive tract of animals. Therefore, animal protein products are the source of this nutrient. Organ meats are the best source of vitamin B12, followed by clams, oysters, beef, eggs, milk, chicken, and cheese. If you are eating meat, buy organic and all natural meat. Do not buy processed meats, packaged meats, deli meats unless the meat does not have chemical additives. Choose lean meats from quality sources, skinless poultry, and nonfat or low-fat or nonfat dairy products. Red meat should always be organic grass-fed when eaten and free of hormones and antibiotics. Get the rest of protein from a variety of sources like beans, fish, chicken, turkey, buffalo/bison, and seafood.
+ Increase vitamin B6 (pyridoxine) containing foods. The best sources of pyridoxine are brewer’s yeast, wheat
germ, organ meats (especially liver), peanuts, legumes, potatoes, and bananas.
+ Increase folic acid containing foods. Folic acid occurs in a wide variety of foods, including dark green leafy vegetables, brewer’s yeast, liver, and eggs. Other good sources are beets, broccoli, Brussels sprouts, asparagus, orange juice, cabbage, cauliflower, cantaloupe, kidney and lima beans, wheat germ, and whole grain cereals and breads. Limit your breads though, as high carbohydrate diets can lead to insulin resistance, hormonal imbalances and weight gain.
+ The best sources of vitamin B2 are liver, milk, and dairy products. Moderate sources include meats, dark green vegetables, eggs, avocados, oysters, mushrooms, and fish (especially salmon and tuna).
+ Magnesium levels may be decreased in individuals with high homocysteine levels. Magnesium from nuts and seeds to help control blood pressure and reduce blood vessel spasm.
+ The probiotic “friendly” intestinal bacteria also synthesize B vitamins and folic acid.
+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day.
+ Avoid heating the oil, but it’s great on salads and sprayed on foods.
+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), lead to chronic oxidative stress and inflammation. Modifying the diet can help decrease inflammation, physical and mental stress, all helping to balance metabolism.
+ The diet should limit inflammatory foods, such as processed meats, chemical preservatives, and food additives. Studies have found that nitrite or nitrate treated meats such as bacon, sausage, smoked foods, and lunch meats increase the risk of cancer. High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketchup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such as imbalances in the probiotic flora in your intestines.
+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible.
+ High-fiber foods, including fresh vegetables and beans, should be a large part of the diet. These foods should supply the 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar. Such foods also provide important benefits, such as antioxidant vitamins, minerals, and phytochemicals. Make sure to include green, orange, and yellow fruits and vegetables — such as broccoli, carrots, cantaloupe, and citrus fruits. The antioxidants and other nutrients in these foods may help protect against inflammatory chemistry including lowering homocysteine levels and also help regulate immune function.
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.
+ Get adequate rest — about 7–8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of oxidative stress and homocysteine levels than those that get regular sleep.
+ Exercise and other physical activity are essential in managing stress and maintaining a healthy weight. At least 30 minutes of exercise daily, 5 days a week is recommended. Elevations in homocysteine levels are associated with a high BMI (>30).
+ Decrease caffeine intake (coffee, tea); increases in homocysteine levels are reported with caffeine containing products.
+ Quit smoking or tobacco use. Tobacco use is reported to increase inflammation.
+ Moderate alcohol intake, especially from red wine, also lowers cardiovascular disease risk — but don’t drink to excess because that can have very negative effects on your metabolism.
Other Life Time Fitness Lab Tests recommended if cardiovascular health is an issue include:
+ Men’s or Women’s Core Heath
  Cardio Metabolic Risk or Cardio Metabolic Risk Premium
  Energy and Metabolism Premium

**Supplements If Cardiovascular Health Is Impaired**

<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage and Usage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Time Fitness FastFuel Complete</td>
<td>4 scoops (approx. 65gm) in the morning as part of a healthy beverage</td>
<td>+ Contains whey protein concentrate &amp; isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend. + Helps support digestive function, + Whey is high in cysteine and branched-chain amino acids (leucine, isoleucine, and valine). + If gas or bloating occurs, change to L-glutamine, 1–4 capsules (500mg – 2 grams) daily in divided doses.</td>
</tr>
<tr>
<td>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.</td>
</tr>
<tr>
<td>Life Time Fitness Omega-3 Fish Oil</td>
<td>1-2 capsules, 2 times daily</td>
<td>+ Helps decrease inflammation and the consequences it has on your metabolism, + Helps support heart and blood vessel health, + Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction,</td>
</tr>
<tr>
<td>Methyl-Guard</td>
<td>1 capsule 2 times daily</td>
<td>+ Helps regulate homocysteine levels + Supplies vitamin B12, Vitamin B6 and folate along with trimethylglycine (betaine)</td>
</tr>
<tr>
<td>Multi-Probiotic 4000</td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health + Supports vitamin B and K metabolism + Helps improve absorption of nutrients from foods + Helps decrease inflammation</td>
</tr>
</tbody>
</table>
**Perfusia SR**

2 capsules 2 times daily; each cap contains 1,000mg time release L-arginine

+ Perfusia SR® contains sustained-release L-arginine, an amino acid which helps support vascular health by improving nitric oxide production and use.35

+ Individuals with a known herpes infection should not take L-arginine without also taking lysine (500–1,000mg daily), as L-arginine alone has been noted to cause herpes eruptions in susceptible individuals.

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**Detoxification Processes**

**Amino Acid Trends**

| Increased glutamine together with one of the following: arginine, citrulline, ornithine | Decreased detoxification of ammonia by the liver + Can lead to confusion, dehydration, fatigue, joint aches/pains |
| Increased or decreased methionine, cysteine, cystathionine + Increased β-Alanine (leading to taurine deficiency) + Decreased glycine, glutamine, glutamic acid or aspartic acid | General decreased detoxification by the liver + Toxins may build up and can lead to fatigue, confusion, joint aches/pains, increased sweating, itching and dark urine + Heavy metals and other environmental toxins like pesticides and plastics can disrupt hormonal balance and lead to inefficient metabolism36 |

**Dietary and Lifestyle Changes**

**General Dietary and Lifestyle Recommendations**

+ Limit fatty foods, such as meats, processed foods, fried foods, fast foods and dairy. Opt for salads with grilled, lean meats like chicken and fish.
+ Make sure to use “organic” meats and vegetables where possible to limit the potential for chemicals additives and toxins.
+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli, brussel sprouts), garlic, onions.
+ Nonalcoholic fatty liver disease (NAFLD) is a common condition associated with obesity and metabolic syndrome.37 Inappropriate dietary fat intake, excessive intake of soft drinks (due to high fructose corn syrup and sugar), insulin resistance caused by eating too much refined sugar and carbs and increased oxidative stress due to a poor diet combine to increase free fatty acid delivery to the liver. Losing weight will help improved liver function tests.
+ Do not microwave food in plastic containers or covered in plastic.
+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates.
+ Decrease alcohol consumption.
+ Lose weight. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.
Have a doctor or pharmacist review your prescription and non-prescription medications along with any dietary supplements you take for the possibility of liver toxicity. Make sure if you are taking OTC pain relievers that have acetaminophen (Tylenol) in them, you stop these medicines immediately until you talk to your doctor or pharmacist.

Drink at least 2 liters of water daily to help improve detoxification through the urine.

Stop smoking — cigarette smoke contains many toxins, including the heavy metal cadmium.

Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.

Saunas are beneficial for decreasing toxins in the body as is an increase in exercise. Get outside and walk or garden. Sweating is your body’s method of detoxification.

Other Life Time Fitness Lab Tests recommended if detoxification is an issue include:
- Men’s or Women’s Core Health
- Energy and Metabolism

### Supplements If Detoxification Is Impaired

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage/Usage</th>
<th>Additional Benefits</th>
</tr>
</thead>
</table>
| Alpha lipoic acid                    | 500mg 2 times daily                                                         | + Antioxidant[^18]  
  + Helps improve energy production and regulate blood glucose levels[^19]  
  + Builds glutathione pools in the liver  
  + Helps in heavy metal detoxification |
| Life Time Fitness FastFuel Complete  | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage        | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
  + Whey is high in amino acids including cysteine and branched-chain amino acids (leucine, isoleucine, and valine).  
  + Helps support digestive function[^40,41]  
  + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
<table>
<thead>
<tr>
<th><strong>Life Time Fitness LeanSource™ Weight Loss</strong></th>
<th>4 capliques daily, 2 with breakfast and 2 with dinner</th>
<th>+ LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat—all promoting and sustaining weight loss. + LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements42, 43</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Use if BMI 25 or &gt;</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</strong></td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism and detoxification.44</td>
</tr>
<tr>
<td><strong>Life Time Fitness Peak Performance Whey Protein Isolate</strong></td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>+ Easily digestible, high-quality protein source.45 + Whey is high in amino acids including cysteine and branched-chain amino acids (leucine, isoleucine, and valine). + Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).46 + Provides 22gm protein per 2 scoops (30gm)</td>
</tr>
<tr>
<td>*If amino acids are low</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Multi-Probiotic 4000</strong></td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health47 + Supports vitamin B and K metabolism48 + Helps improve absorption of nutrients from foods + Improves liver enzymes.49</td>
</tr>
<tr>
<td><strong>N-acetyl cysteine (NAC)</strong></td>
<td>500 - 750mg, 1-2 times daily</td>
<td>+ Liver and antioxidant support + Improves glutathione (antioxidant) stores in the liver.50</td>
</tr>
<tr>
<td><strong>T.A.P.S</strong></td>
<td>1 capsule, 2 times daily</td>
<td>+ Contains liver-supportive herbs, including milk thistle, picrorhiza, artichoke and curcumin + Helps improve liver detoxification processes and provides antioxidant support for the liver.51</td>
</tr>
</tbody>
</table>
### Ultra-D Tox

| 1-2 capsules 2 times daily; use for 2-3 weeks | + Contains significant amounts of + detoxifying herbs, minerals, and probiotics, as well as vitamin C. + Helps support digestive function and detoxification processes + Helps clear the body of environmental toxins. |

### Digestive Problems

#### Amino Acid Trends

| + Increased anserine, carnosine, 1-Methylhistidine, and 3-Methylhistidine + Decreased essential amino acids including leucine, isoleucine, valine, lysine + Decreased arginine, glutamine, tryptophan, cystine/cysteine, glutamate, taurine | + Impaired protein digestion • Can lead to nutrient imbalances, amino acid deficiencies, decreased energy and muscle strength, weight loss • Can lead to immune imbalances and susceptibility to infections like colds and flu |
| + Decreased taurine | + Impaired fat digestion • Can lead to increased oxidative stress, neurological problems, inflammation, nutrient deficiencies |
| + Decreased threonine and essential amino acids | + Impaired nutrient absorption • Can lead to metabolic imbalances including hormonal, insulin and blood sugar imbalances, heart problems, immune imbalances, cancer |
| + Decreased leucine, isoleucine, valine + Decreased non-essential amino acids | + Impaired microflora (probiotics) in intestines • Can lead to chronic gut inflammation • Fatigue, lack of concentration, bloating, diarrhea, constipation and gas are common • Can lead to metabolic imbalances including nutrient deficiencies, hormonal, insulin and blood sugar imbalances, heart problems, cancer • Can lead to immune imbalances and susceptibility to infections like colds and flu |

#### Potential Digestive Health Condition(s)

### Dietary and Lifestyle Changes

#### General Dietary and Lifestyle Recommendations

+ Increase your intake of lean, high-quality proteins in the diet, including fish, turkey, bison and ostrich. It is best to use organic, free-range meats that are raised without chemical additives, hormones and antibiotics. Use a digestive enzyme to help in breaking down protein and foods for use in the body.
Increase your protein by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with unsweetened almond milk or quality water.

Nonalcoholic fatty liver disease (NAFLD) is a common condition associated with obesity and metabolic syndrome. Inappropriate dietary fat intake, excessive intake of soft drinks (due to high fructose corn syrup), insulin resistance caused by eating too much refined sugar and carbohydrates and increased oxidative stress due to a poor diet combine to increase fat in the liver. Losing weight will help improved liver function tests.

Increase calcium-containing foods, including green, leafy vegetables and organic milk/cheese

Avoid overeating, as this creates stress on the digestive tract.

Eat meals at regular times each day. It’s best not to eat after 7 pm.

Remember to chew your food. Saliva begins the process of digestion — it tells your stomach that food is coming. Chewing your food thoroughly, rather than bolting it, is the first step in healthy digestion.

Lower the use of antacids like Tums and ulcer medicines like Tagamet, Zantac, Pepcid and Prevacid.

Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli), garlic, onions.

Exercise routinely, at least 30 minutes daily 3-4 times a week; exercise can help improve digestion of food.

Other recommended Life Time Fitness Lab Tests if digestive health is an issue include:

- Men’s or Women’s Core Health
- IgG Food Sensitivity Panel

### Supplements If Digestion Is Impaired

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Aller DMG                   | 1 tablet, 2-3 times daily; use for 2-3 weeks                           | + Contains antioxidant nutrients, including quercetin, vitamin C, grape seed extract and polyphenols.  
+ Also contains DMG (dimethylglycine) which supports immune function |
| Cat’s claw MAX V            | 1 capsule 2 times daily; use for 2 weeks                               | + Used to support immune and digestive health                             
+ Antiinflammatory           |
| Life Time Fitness Creatine  | 10gm daily in divided doses for 1 week, then 5gm daily                | + Promotes protein synthesis and enhances muscle mass                     
+ Important in exercise and fitness performance |

Better health & performance start here.
<table>
<thead>
<tr>
<th>Product Name</th>
<th>Usage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Life Time Fitness FastFuel Complete</strong></td>
<td>4 scoops (approx. 65gm) in the morning as part of a healthy beverage</td>
<td>+ Contains whey protein concentrate &amp; isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend. + Whey is high in amino acids including cysteine and branched-chain amino acids (leucine, isoleucine, and valine). + Helps support digestive function. + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses.</td>
</tr>
<tr>
<td><strong>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</strong></td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.</td>
</tr>
<tr>
<td><strong>Life Time Fitness Peak Performance Whey Protein Isolate</strong></td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>+ Easily digestible, high-quality protein source. + Whey is high in amino acids including cysteine and branched-chain amino acids (leucine, isoleucine, and valine). + Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH). + Provides 22gm protein per 2 scoops (30gm).</td>
</tr>
<tr>
<td><strong>Multi-Probiotic 4000</strong></td>
<td>1 capsule, 1–3 times daily</td>
<td>+ Supports gastrointestinal health. + Supports vitamin B and K metabolism. + Helps improve absorption of nutrients from foods.</td>
</tr>
<tr>
<td><strong>Vegetarian Enzyme</strong></td>
<td>1–2 tablets, 3 times daily 30 minutes before meals</td>
<td>+ Vegetarian Enzyme™ contains a mixture of vegetable-source enzymes which help digest starches, proteins, fats, and cellulose. Vegetarian Enzyme™ is used after eating a meal to help support healthy digestion.</td>
</tr>
</tbody>
</table>
**Life Time Fitness LeanSource™**

**Weight Loss**

*Use if BMI 25 or >

4 capliques daily, 2 with breakfast and 2 with dinner

+ LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat — all promoting and sustaining weight loss.

+ LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements\(^{67,68}\)

### Hormonal Imbalances

#### Amino Acid Trends

<table>
<thead>
<tr>
<th>+ Decreased alanine</th>
<th>+ Adrenal insufficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Decreased essential amino acids</td>
<td>- Chronic stress and excess cortisol (the stress hormone) release can lead to adrenal “burnout”</td>
</tr>
<tr>
<td>+ Increased ornithine</td>
<td>- Chronic fatigue, blood sugar regulation problems, allergies, asthma, weight gain, sleep disorders, mood and memory changes, heart, immune and digestive problems, hormonal imbalances(^{69})</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>+ Increased alanine</th>
<th>+ Adrenal hyperactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Decreased arginine, tryptophan, tyrosine</td>
<td>- Impacted by chronic stress</td>
</tr>
<tr>
<td></td>
<td>- Can lead to imbalances in metabolism, including blood sugar and insulin problems, food cravings, heart, mood changes, immune and digestive problems, hormonal imbalances and loss of key nutrients like chromium, magnesium and calcium and zinc(^{70})</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>+ Decreased phenylalanine</th>
<th>+ Insulin resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Increased serine, alanine, glycine</td>
<td>- Can lead to metabolic imbalances including weight gain, chronic inflammation, type 2 diabetes, hormonal imbalances, heart problems, loss of key nutrients like chromium, magnesium and vitamin D, neurological imbalances and cancer(^{71})</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>+ Increased phosphoserine, decreased ornithine</th>
<th>+ Parathyroid imbalance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Can lead to nutrient imbalances including vitamin D and calcium, bone loss, mood swings, sleep disorders, hormonal imbalances, heart problems</td>
</tr>
</tbody>
</table>
+ Decreased tyrosine, phenylalanine
+ Thyroid hormone imbalances
  - Can lead to decreased energy, skin and nail problems, weight gain, insulin resistance, inflammation, oxidative stress, hormonal imbalances, sleep and immune problems, heart problems
  - Nutrients found low in thyroid imbalances include iodine, chromium, selenium and zinc

**Dietary and Lifestyle Changes**

**General Dietary and Lifestyle Recommendations**

+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which initiates the inflammatory signaling pathways. Modifying the diet can help decrease physical and mental stress, helping balance metabolism.
+ Avoid common food allergens, including gluten, dairy, soy.
+ Eat meals at regular times each day. It's best not to eat after 7 pm.
+ Remember to chew your food. Saliva begins the process of digestion — it tells your stomach that food is coming. Chewing your food thoroughly, rather than bolting it, is the first step in healthy digestion.
+ Your protein requirements increase when you’re under ongoing stress — especially physical stress and illness. And even if you don’t feel ill, your body probably still needs some extra proteins to heal the hidden damage metabolic imbalances have done to your intestines and other especially vulnerable areas of your body. You may want to consider adding a protein drink to your diet if your amino acids are low.
+ There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries in a blender with unsweetened almond milk or quality water.
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.
+ Studies report imbalances in thyroid and stress hormone levels when you are overweight or obese. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.
+ Avoid overeating, as this creates too much demand on your body and your digestive tract.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance hormone levels.
+ Do not microwave food in plastic containers or covered in plastic.
+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates.
+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours, suggesting that chronic insomnia is a disorder of sustained excitation of the body’s stress response system.
+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.
Other recommended Life Time Fitness Lab Tests if digestive health is an issue include:

- Men’s or Women’s Core Health
- Energy and Metabolism Premium
- IgG Food sensitivity panel

## Supplements to Support Hormonal Imbalances

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Use Criteria</th>
<th>Dosage Details</th>
<th>Additional Information</th>
</tr>
</thead>
</table>
| Cal/Mag 1001                      | *Use if calcium levels are low or trending low   | 1 tablet, 2 times daily | + Bone support  
+ Contains highly absorbable calcium, magnesium, vitamin D3, vitamin C, boron and glutamic acid.  
+ A meta analysis of 29 randomized trials showed that supplementation with calcium and vitamin D3 reduces risk of bone fractures by 24% and significantly reduces loss of bone mass.⁷⁸ |
| 5-HTP Plus                        | *Use if cravings are present                      | 1-2 capsules daily, between meals | + 5-HTP Plus™ contains natural L-5-hydroxytryptophan (5-HP), together with pyridoxal-5-phosphate and 50 mg of a proprietary blend of the neurotransmitters L-tyrosine and L-glutamine.  
+ Helps improve serotonin levels, decrease food cravings⁷⁹ |
| Adrenomend                        | *Use if high levels or cortisol are present       | 2-4 capsules, daily with food | + Used in chronic stress  
+ Contains a proprietary adaptogenic herb blend that helps decrease the effects of chronic stress on the body⁸⁰ |
| Cortex                            | *Use if low cortisol levels are present           | 1 capsule, 2 times daily | + Contains herbs and nutrients to help balance the adrenal glands and the levels of cortisol, the stress hormone  
+ Contains adrenal gland extract  
+ If you have a heart condition or high blood pressure, speak to a healthcare professional before using Cortrex⁸¹ |
| Dual-Source Chromium as chromium polynicotinate and chromium picolinate | 1 capsules (300mcg chromium) daily | + Improves insulin regulation and glucose tolerance⁸²  
+ Helps support serotonin levels⁸³ |
<p>| Glukokine                         | *If blood sugar and fasting insulin are high      | 1 tablet 2 times daily | + Glukokine® contains bitter melon extract (10% Charantin), chromium (250mcg/tab) and the antioxidant glutathione, blended together to support healthy blood sugar levels through improved glucose metabolism⁸⁴ |</p>
<table>
<thead>
<tr>
<th>Product</th>
<th>Usage</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **Life Time Fitness FastFuel Complete**      | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Whey is high in amino acids including cysteine and branched-chain amino acids (leucine, isoleucine, and valine).  
+ Helps support digestive function[^85][^86]  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Life Time Fitness LeanSource™ Weight Loss** | 4 caplique daily, 2 with breakfast and 2 with dinner                   | + LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat — all promoting and sustaining weight loss.  
+ LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements[^87][^88] |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.[^89] |
| **Life Time Fitness Peak Performance Whey Protein Isolate** | 2 scoops in favorite beverage, mix and drink daily                    | + Easily digestible, high-quality protein source  
+ Whey is high in amino acids including cysteine and branched-chain amino acids (leucine, isoleucine, and valine).  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).[^91]  
+ Provides 22gm protein per 2 scoops (30gm) |
| **L-theanine**                               | 100-200mg, 1-2 times daily                                           | + Antioxidant; nutrient support  
+ Isolated from green tea  
+ Helps decrease stress and improve neurochemical balance[^92][^93] |
<table>
<thead>
<tr>
<th>Product</th>
<th>Usage Instructions</th>
<th>Dosing Details</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Multi-Probiotic 4000 | 1 capsule, 1-3 times daily          | + Supports gastrointestinal health  
+ Supports vitamin B and K metabolism  
+ Helps improve absorption of nutrients from foods |
| Relora Plex      | 2 capsules, 1-2 times daily         | + Relora® is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (*Magnolia officinalis*) and Phellodendron bark (*Phellodendron amurense*),  
+ Relora Plex also contains B-vitamins, which help in stress and nervous system balance  
+ Useful in stress and decreasing cortisol levels  
+ Relora can increase salivary DHEA and decreases salivary morning cortisol levels  
+ Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals. |
| Sleep Solve 24/7 | 1-2 capsules at bedtime             | + Improves sleep/wake cycles  
+ Melatonin decreases with increased cortisol levels |
| Thyro Mend       | 1 capsule, 2 times daily with food  | + Thyro-Mend™ is a proprietary combination of iodine from seaweeds and synergistic herbs that support thyroid function.  
+ Thyro-Mend™ helps maintain proper iodine levels necessary for an increase in thyroid hormone production. |
| Tyrosine         | 500-1000mg daily                    | + Amino acid  
+ Supports thyroid hormone metabolism  
+ Dairy products, meats, fish, wheat, oats contain tyrosine. |
**Vitamin D 1000**

*Use if vitamin D levels are low or trending low

1-5 capsules (1,000 – 5,000 IU) daily, depending on vitamin D3 lab value

If lab value 30 ng/mL or less, then take 5,000 IU daily; if 30-40 ng/mL, then take 1,000 IU daily both in addition to your multivit; retest in a month

+ Bone support
+ Treatment of vitamin D deficiency improves bone mineral density

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**Musculoskeletal Problems**

**Amino Acid Trends**

| + Increased homocysteine with low cystathionine |
| + Increased or decreased cysteine or taurine |
| + Decreased methionin, lysine |
| + Decreased leucine, isoleucine, valine |
| + Increased hydroxyproline and proline |
| + Increased anserine, carnosine, 1 and 3-methylhistidine |

**Potential Musculoskeletal Condition(s)**

+ Collagen or muscle/skeletal problems

---

**Dietary and Lifestyle Changes**

**General Dietary and Lifestyle Recommendations**

+ Increase your intake of lean, high-quality proteins in the diet, including fish, turkey, bison and ostrich. It is best to use organic, free-range meats that are raised without chemical additives, hormones and antibiotics. Use a digestive enzyme to help in breaking down protein and foods for use in the body.
+ Increase your protein by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with almond milk or quality water.
+ Nonalcoholic fatty liver disease (NAFLD) is a common condition associated with obesity and metabolic syndrome. Inappropriate dietary fat intake, excessive intake of soft drinks (due to high fructose corn syrup), insulin resistance caused by eating too much refined sugar and carbohydrates and increased oxidative stress due to a poor diet combine to increase fat in the liver. Losing weight will help improved liver function tests.
+ Increase calcium-containing foods, including green, leafy vegetables and organic milk/cheese
+ Decrease phosphorus-containing food, like soft drinks, many snack foods, processed foods like processed cheeses and meats and fish sticks. Watch labels for sodium monophosphate and other names. Other foods high in phosphorus include beefalo, veal, clams, dairy products, bran cereal and almonds.
+ Soft drinks, even artificially sweetened ones, contain high levels of phosphoric acid. Phosphoric acid in the drinks can also deplete calcium from the body, leading to bone loss.
+ Lower the use of antacids like Tums and ulcer medicines like Tagamet, Zantac, Pepcid and Prevacid.
+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli), garlic, onions.
+ Other recommended Life Time Fitness Lab Tests if musculoskeletal health is an issue include:
  • Men’s or Women’s Core Health
  • Men’s or Women’s Sex Hormone Premium
  • Energy and Metabolism

### Supplements to Support Musculoskeletal Health

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage/Description</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **Cal/Mag 1001**                  | 1 tablet, 2 times daily                                                            | + Bone support  
+ Contains highly absorbable calcium, magnesium, vitamin D3, vitamin C, boron and glutamic acid.  
+ A meta analysis of 29 randomized trials showed that supplementation with calcium and vitamin D3 reduces risk of bone fractures by 24% and significantly reduces loss of bone mass<sup>104</sup> |
| **Life Time Fitness Creatine**    | 10gm daily in divided doses for 1 week, then 5gm daily                             | + Promotes protein synthesis and enhances muscle mass and muscle function  
+ Important in exercise and fitness performance<sup>105</sup>                                                                 |
| **Life Time Fitness FastFuel Complete** | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage                     | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Whey is high in amino acids including cysteine and branched-chain amino acids (leucine, isoleucine, and valine).  
+ Helps support digestive function<sup>106,107</sup>  
+ If gas or bloating occurs, change to l-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage</th>
<th>Benefits</th>
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</thead>
<tbody>
<tr>
<td><strong>Life Time Fitness Joint Maintenance Formula</strong></td>
<td>2-4 capsules, daily with food</td>
<td>Contains glucosamine and chondroitin sulfate with the protective ability of calcium, MSM (methylsulfonylmethane) and hyaluronic acid, along with the anti-inflammatory properties of bromelain, for nutritional support of healthy bones, joints and connective tissue.</td>
</tr>
<tr>
<td><strong>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</strong></td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.</td>
</tr>
<tr>
<td><strong>Life Time Fitness Peak Performance Whey Protein Isolate</strong></td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>Easily digestible, high-quality protein source. Whey is high in amino acids including cysteine and branched-chain amino acids (leucine, isoleucine, and valine). Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).</td>
</tr>
<tr>
<td><strong>Multi-Probiotic 4000</strong></td>
<td>1 capsule, 1-3 times daily</td>
<td>Provides 22gm protein per 2 scoops (30gm) Supports gastrointestinal health Supports vitamin B and K metabolism Helps improve absorption of nutrients from foods Improves liver enzymes</td>
</tr>
</tbody>
</table>

**Neurological Balance**

**Amino Acid Trends**

<table>
<thead>
<tr>
<th>Amino Acid Trends</th>
<th>Potential Neurological Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Low tryptophan, taurine, phenylalanine, tyrosine + Increased homocysteine with increased or decreased methionine and low cystathionine</td>
<td>+ Neurological disorders, including anxiety, sleep disorders, moodiness, depression, food and other cravings. + Can lead to inflammation, weight gain, insulin resistance, blood sugar regulation problems and heart conditions including cholesterol imbalances and increased blood pressure.</td>
</tr>
<tr>
<td>+ Low glycine, GABA, tryptophan, tyrosine</td>
<td>+ Can lead to sleep disorders • Fewer than 6 hours sleep a night can induce inflammation, insulin resistance, heart problems, immune problems, digestive problems, neurochemical and hormonal imbalances.</td>
</tr>
</tbody>
</table>
Dietary and Lifestyle Changes
General Dietary and Lifestyle Recommendations

+ Control insulin and blood sugar levels through dietary changes. Over-consumption of simple carbohydrates like refined sugars and grains, causes unfriendly flora to grow in the GI tract. These foods also raise blood glucose and insulin levels that can result in neurochemical imbalances.\textsuperscript{114}

+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which can imbalance neurochemistry and immunity.\textsuperscript{115,116} Modifying the diet can help decrease physical and mental stress, helping balance metabolism.

+ Avoid common food allergens, including wheat, dairy, soy.

+ When you eat foods, try to buy organic when possible. The use of chemical additives, hormones, pesticides and antibiotics in our food supply can lead to imbalances in neurochemistry and the immune system. Foods that you should avoid include processed meats, frozen dinners, preserved meats like hot dogs or bacon, fast foods, artificial ingredients and sweeteners, anything with MSG or monosodium glutamate.

+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy. These foods can imbalance neurochemistry.

+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. Fatty acid balance can improve neurological health.\textsuperscript{117}

+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day. Avoid heating the oil, but it’s great on salads and sprayed on foods.

+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.

+ Lose weight. If you are overweight or obese based on your BMI (body mass index, >25), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.

+ The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods should be eliminated. These contaminants can imbalance neurochemistry.\textsuperscript{118} Buy organic foods where possible.

+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.

+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.\textsuperscript{119}

+ Do not microwave food in plastic containers or covered in plastic.

+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain chemical ingredients like phthalates.

+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult.

+ Exercise and other physical activity are essential in managing stress and maintaining neurochemical balance. At least 30 minutes of exercise daily, 5 days a week is recommended.

+ Decrease stress — take a walk, garden, do Yoga or Tai Chi. Stress can imbalance neurochemistry.

+ Stop smoking.
+ Drink in moderation.
+ Other recommended Life Time Fitness Lab Tests if neurological health is an issue include:
  • Men or Women's Core Health
  • Energy and Metabolism Premium

### Supplements to Support Neurological and Neurochemical Balance

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5-HTP Plus</strong></td>
<td>1-2 capsules daily, between meals</td>
<td>+ 5-HTP Plus™ contains natural L-5-hydroxytryptophan (5-HTP), together with pyridoxal-5-phosphate and 50 mg of a proprietary blend of the neurotransmitters L-tyrosine and L-glutamine. + Helps improve serotonin levels, decrease food cravings&lt;sup&gt;122&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Dual-Source Chromium as chromium polynicotinate and chromium picolinate</strong></td>
<td>1 capsule (300mcg chromium) daily</td>
<td>+ Improves insulin regulation and glucose tolerance&lt;sup&gt;123&lt;/sup&gt; + Helps support serotonin levels&lt;sup&gt;124&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Life Time Fitness LeanSource™ Weight Loss</strong></td>
<td>4 caplques daily, 2 with breakfast and 2 with dinner</td>
<td>+ LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat — all promoting and sustaining weight loss. + LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements&lt;sup&gt;125, 126&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</strong></td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for blood sugar regulation and proper metabolism.&lt;sup&gt;127&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Life Time Fitness Omega-3 Fish Oil</strong></td>
<td>1-2 capsules, 2 times daily</td>
<td>+ Helps decrease inflammation and the consequences it has on your metabolism.&lt;sup&gt;128&lt;/sup&gt; + Helps support heart and blood vessel health.&lt;sup&gt;129, 130&lt;/sup&gt; + Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction&lt;sup&gt;131&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
| **Life Time Fitness Peak Performance Whey Protein Isolate** | 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source<sup>132</sup>  
+ Whey is high in amino acids including cysteine and branched-chain amino acids (leucine, isoleucine, and valine).  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).  
+ Provides 22gm protein per 2 scoops (30gm). |
|--------------------------------------------------------|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| **L-theanine**                                          | 100mg, 1-2 times daily                           | + Antioxidant; nutrient support  
+ Isolated from green tea  
+ Helps decrease stress and improve neurochemical balance<sup>134,135</sup> |
| **Multi-Probiotic 4000**                               | 1 capsule, 1-3 times daily                       | + Supports gastrointestinal health<sup>136</sup>  
+ Supports vitamin B and K metabolism<sup>137</sup>  
+ Helps improve absorption of nutrients from foods |
| **Relora Plex**                                         | 2 capsules, 1-2 times daily                      | + Relora<sup>®</sup> is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (*Magnolia officinalis*) and Phellodendron bark (*Phelodendron amurense*).  
+ Relora Plex also contains B-vitamins, which help in stress and nervous system balance  
+ Useful in stress and decreasing cortisol levels<sup>138</sup> Relora can increase salivary DHEA and decreases salivary morning cortisol levels<sup>139</sup>  
+ Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals. |
| **Sleep Solve 24/7**                                   | 1-2 capsules at bedtime                          | + Improves sleep/wake cycles  
+ Melatonin decreases with increased cortisol levels<sup>140</sup> |
| Tyrosine | Use if cravings and/or mood swings are present | 500-1000mg daily | + Amino acid  
+ Supports thyroid hormone and neurochemical metabolism  
+ Dairy products, meats, fish, wheat, oats contain tyrosine. |

### Nutrient Imbalances

**Amino Acid Trends**

| + Increased phosphoserine compared to serine  
+ Increased citrulline  
+ Increased aspartic acid | + Low or trending low magnesium  
• Can lead to muscle and joint aches/pains, sleep problems, increased inflammation, leg cramps, insulin resistance and blood sugar imbalances, heart problems $^{142,143}$ |

| + Increased phenylalanine, unless increased tyrosine and tryptophan are present  
+ Decreased histidine | + Low or trending low iron  
• Iron deficiency anemia is the classic condition where red blood cells contain less hemoglobin and consequently carry less oxygen. Symptoms of iron deficiency include: anemia, weakness, fatigue, skin pallor, headache, hair loss, labored breathing after exertion, spooning of fingernails, brittle nails, and greater susceptibility to infections $^{144}$ |

| + Increased arginine, compared to ornithine  
+ Increased alanine, $\alpha$-aminoacidic acid, tyrosine, leucine, isoleucine, valine  
+ Decreased histidine  
+ Decreased threonine | + Low or trending low manganese  
• Can decrease enzyme function  
• Can lead to muscle problems $^{145}$ like decreased coordination, fatigue, sprains and joint/connective tissue problems  
• Important in thyroid and fatty acid balance |

| + Increased anserine, carnosine  
+ Increased phosphoethanolamine with increased phosphoserine  
+ Increased leucine, isoleucine, valine | + Low or trending low zinc  
• Can impair immunity and wound healing $^{146}$  
• May lead to thyroid or blood sugar imbalances $^{147}$ |

| + Increased taurine with normal — alanine  
+ Increased cysteine with normal lysine and ornithine | + Low or trending low molybdenum  
• Can lead to decreased enzyme function in the body $^{148}$  
• Can decrease liver detoxification processes $^{149}$ |
| + Increased cystathionine, homocysteine, serine, tyrosine, α-aminoacidic acid, α-alanine, alanine, threonine, ornithine, glycine, aspartic acid, β-aminoisobutyric acid, leucine, isoleucine, valine | + Low or trending low vitamin B6 (pyridoxal-5-phosphate)  
• Can lead to elevated homocysteine levels and heart problems  
• Can lead to niacin deficiency  
• Can lead to neurotransmitter and neurological imbalances |
| + Decreased cysteine compared to cystathionine  
+ Decreased taurine compared to cysteine | + Decreased cysteine compared to cystathionine  
+ Decreased taurine compared to cysteine |
| + Increased homocysteine, sarcosine, glycine, serine, 1-methylhistidine, 3-methylhistidine, methionine, cystathionine or histidine | + Low or trending low folic acid  
• Can lead to anemia (inability of red blood cells to carry sufficient oxygen for tissues), elevated homocysteine levels and heart problems  
• Can lead to neurotransmitter and neurological imbalances  
• Folic acid deficiency in pregnancy can lead to birth defects, including neural tube defects |
| + Decreased glycine  
+ Increased β-alanine  
+ Decreased threonine | + Decreased glycine  
+ Increased β-alanine  
+ Decreased threonine |
| + Decreased glycine  
+ Increased β-alanine  
+ Decreased threonine | + Decreased glycine  
+ Increased β-alanine  
+ Decreased threonine  
+ Low or trending low fat soluble vitamins, including vitamins A, E, D, K  
• Can lead to immune imbalances, increased oxidative stress, bone disorders, heart problems, bleeding disorders, eye problems |

**Dietary and Lifestyle Changes**

**General Dietary and Lifestyle Recommendations**

+ Increase nuts and seeds along with green leafy vegetables for magnesium support.
+ If B-vitamins are an issue, then increase vitamin B12 containing foods. Vitamin B12 is produced by microbial synthesis in the digestive tract of animals. Therefore, animal protein products are the source of this nutrient. Organ meats are the best source of vitamin B12, followed by clams, oysters, beef, eggs, milk, chicken, and cheese. If you are eating meat, buy organic and all natural meat. Do not buy processed meats, packaged meats, deli meats unless the meat does not have chemical additives. Choose lean meats from quality sources, skinless poultry, and nonfat or low-fat or nonfat dairy products. Red meat should always be organic grass-fed when eaten and free of hormones and antibiotics. Get the rest of protein from a variety of sources like beans, fish, chicken, turkey, buffalo/bison, and seafood.
+ If folic acid is an issue, then increase folic acid containing foods. Folic acid occurs in a wide variety of foods, including dark green leafy vegetables, brewer’s yeast, liver, and eggs. Other good sources are beets, broccoli, Brussels sprouts, asparagus, orange juice, cabbage, cauliflower, cantaloupe, kidney and lima beans, wheat germ, and whole grain cereals and breads. Limit your breads though, as high carbohydrate diets can lead to insulin resistance, hormonal imbalances and weight gain.
+ If B vitamins are an issue, then increase vitamin B6 (pyridoxine) containing foods. The best sources of pyridoxine are brewer’s yeast, wheat germ, organ meats (especially liver), peanuts, legumes, potatoes, and bananas.

+ If iron levels are an issue, increase your consumption of animal proteins, including meats and seafood. Liver is by far the richest iron-containing food. Other good sources of iron-rich foods include organ meats, fish, and poultry. Dried beans and vegetables are the best plant sources, followed by dried fruits, nuts, and whole grain breads and cereals. Fortification of cereals, flours, and bread with iron has contributed significantly to daily dietary iron consumption. (See Iron Panel, Low for more details)

+ If calcium levels are an issue, increase calcium-containing foods, including green, leafy vegetables and organic milk/cheese. Soft drinks, even artificially sweetened ones, contain high levels of phosphoric acid. Phosphoric acid in the drinks can deplete calcium from the body, leading to bone loss.\(^{159}\)

+ If vitamin A levels are an issue, improve vegetable intake, especially those high in vitamin A, including:
  - sweet potatoes
  - carrots
  - beet
  - broccoli
  - spinach
  - winter squash
  - kale
  - peas
  - red peppers
  - tomato juice
  - apricots

+ If vitamin D levels are an issue, get out in the sun! Sunlight, specifically UV-B rays, stimulate the production of vitamin D. The current suggested exposure of hands, face and arms is 10-20 minutes, three times a week. However, this provides only 200-400 IU of vitamin D each time or an average of 100-200 IU per day during the summer months. Supplementing vitamin D3 along with safe sun exposure is best.

+ Because the body needs 30-60 minutes to absorb vitamin D from made from the sun, it is best to delay showering or bathing for one hour after exposure. Use cholesterol-containing skin oils and wear appropriate sun protection if you are fair skinned.

+ Vegetarian and vegan diets generally are poor sources of vitamin D. So are low-fat foods and diets.\(^{160}\) Decrease caffeine intake. Caffeine has been reported to negatively affect vitamin D and bone formation.\(^{161}\) Caffeine is included in tea, coffee and chocolate.

### Supplements to Support Nutrient Deficiencies

<table>
<thead>
<tr>
<th><strong>Time Release Iron</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Use if iron levels are low</em></td>
</tr>
<tr>
<td>2 tablets daily with meals</td>
</tr>
<tr>
<td>+ Specially designed to provide 54 mg of carbonyl iron (Ferronyl®) per serving for a 6-to 8-hour period.</td>
</tr>
<tr>
<td>+ Use with caution in men</td>
</tr>
</tbody>
</table>

Better health & performance start here.
### Cal/Mag 1001

*Use if calcium and/or magnesium levels are low or trending low

| 1 tablet, 2 times daily | For calcium and magnesium support  
+ Contains highly absorbable calcium, magnesium, vitamin D3, vitamin C, boron and glutamic acid.  
+ A meta analysis of 29 randomized trials showed that supplementation with calcium and vitamin D3 reduces risk of bone fractures by 24% and significantly reduces loss of bone mass.\(^{162}\) |

### Life Time Fitness FastFuel Complete

4 scoops (approx. 65gm) in the morning as part of a healthy beverage

| + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Whey is high in amino acids including cysteine and branched-chain amino acids (leucine, isoleucine, and valine).  
+ Helps support digestive function\(^{163,164}\)  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |

### Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM

3 capsules in the morning after breakfast and 3 capsules with dinner.

| + The Life Time Fitness Men's and Women's Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for blood sugar regulation and proper metabolism.\(^{165}\) |

### Multi-Probiotic 4000

1 capsule, 1-3 times daily

| + Supports gastrointestinal health\(^{166}\)  
+ Supports vitamin B and K metabolism\(^{167}\)  
+ Helps improve absorption of nutrients from foods |

### Oxidative Stress

#### Amino Acid Trends

- Decreased cysteine, taurine, methionine

#### Potential Nutrient Imbalances

- Decreased glutathione production\(^{168}\)
- Increased oxidative stress
- Leads to chronic health problems like inflammation, hormonal imbalances, blood sugar problems and insulin resistance, type 2 diabetes, sleep disorders, heart problems, accelerated aging and cancer\(^{169,170}\)
Dietary and Lifestyle Changes

General Dietary and Lifestyle Recommendations

+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which initiates the inflammatory signaling pathways.\textsuperscript{171,172} Modifying the diet can help decrease physical and mental stress, helping balance metabolism.

+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli, brussel sprouts), garlic, onions.
+ Avoid common food allergens, including wheat, dairy, soy.
+ Increase your protein by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with unsweetened almond milk or quality water.

+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy. These foods can imbalance immunity and increase oxidative stress.

+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body.\textsuperscript{173}

+ The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods should be eliminated. These contaminants can increase oxidative stress on the body.\textsuperscript{174} Use organic foods where possible to avoid contaminants, including meats.

+ No alcohol until levels return to the normal range.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and increase oxidative stress.\textsuperscript{175}
+ Do not microwave food in plastic containers or covered in plastic.

+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates.
+ Have a doctor or pharmacist review your prescription and non-prescription medications along with any dietary supplements you take for the possibility of liver toxicity. Make sure if you are taking OTC pain relievers that have acetaminophen (Tylenol) in them, you stop these medicines immediately until you talk to your doctor or pharmacist.

+ Exercise routinely, at least 30 minutes daily 3-4 times a week; exercise can help improve digestion of food.
+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult.
+ Saunas are beneficial for decreasing toxins in the body as is an increase in exercise. Get outside and walk or garden. Sweating is your body’s method of detoxification.

+ Other recommended Life Time Fitness Lab Tests if oxidative stress is an issue include:
  - Men’s or Women’s Core Health
  - Energy and Metabolism Premium
  - Cardio Metabolic Risk Premium
  - IgG Food Sensitivity Panel
| **Alpha lipoic acid** | 500mg 2 times daily | + Antioxidant<sup>176</sup>  
+ Helps improve energy production, regulate blood glucose levels and aids in detoxification<sup>177</sup> |
|------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------|
| **Aller DMG**          | 1 tablet, 2-3 times daily | + Contains antioxidant nutrients, including quercetin, vitamin C, grape seed extract and polyphenols.  
+ Also contains DMG (dimethylglycine) which supports immune function<sup>178</sup> |
| **Kyolic Reserve**     | 1 capsule (600mg), 1-3 times daily | + Aged garlic is an antioxidant and helps improve the antioxidant glutathione levels in the liver and detoxification of the liver<sup>179</sup>  
+ Aged garlic also helps with immunity, protects against heart disease and may decrease the risk for certain cancers<sup>180</sup>  
+ Aged garlic has been reported not to interact with blood-thinning medicines, such as aspirin or warfarin (Coumadin).<sup>181</sup>  
However, if you take blood-thinning medications, you should be under the supervision of a doctor before taking any supplement. |
| **Life Time Fitness FastFuel Complete** | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Whey is high in amino acids including cysteine and branched-chain amino acids (leucine, isoleucine, and valine).  
+ Helps support digestive function<sup>182,183</sup>  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
<table>
<thead>
<tr>
<th>Product</th>
<th>Use</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Life Time Fitness LeanSource™ Weight Loss</strong></td>
<td>* Use if BMI 25 or &gt;</td>
<td>+ LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat — all promoting and sustaining weight loss. + LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements. ¹⁸⁴,¹⁸⁵</td>
</tr>
<tr>
<td><strong>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</strong></td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for blood sugar regulation and proper metabolism. ¹⁸⁶</td>
</tr>
<tr>
<td><strong>Life Time Fitness Omega-3 Fish Oil</strong></td>
<td>1-2 capsules, 2 times daily</td>
<td>+ Helps decrease inflammation and the consequences it has on your metabolism. ¹⁸⁷ + Helps support heart and blood vessel health. ¹⁸⁸,¹⁸⁹ + Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction. ¹⁹⁰</td>
</tr>
<tr>
<td><strong>Life Time Fitness Peak Performance Whey Protein Isolate</strong></td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>+ Easily digestible, high-quality protein source ¹⁹¹ + Whey is high in amino acids including cysteine and branched-chain amino acids (leucine, isoleucine, and valine). + Whey protein also is an antioxidant by helping to raise the levels of glutathione (GSH). ¹⁹² + Provides 22gm protein per 2 scoops (30gm)</td>
</tr>
<tr>
<td><strong>Methyl-Guard</strong></td>
<td>1 capsule 2 times daily</td>
<td>+ Helps regulate homocysteine levels + Supplies vitamin B12, Vitamin B6 and folate along with trimethylglycine (betaine) ¹⁹³</td>
</tr>
</tbody>
</table>
| **Multi-Probiotic 4000** | 1 capsule, 1-3 times daily | + Supports gastrointestinal health and decreases inflammation\(^{194}\)  
+ Supports vitamin B and K metabolism\(^{195}\)  
+ Helps improve absorption of nutrients from foods |
|------------------------|----------------------------|---------------------------------------------------------------------------------|
| **N-acetyl cysteine (NAC)** | 500 - 750mg 1-2 times daily | + Liver support  
+ Improves glutathione (antioxidant) stores in the liver\(^{196}\) |
ALBUMIN

Albumin is a protein made in the liver from dietary protein. Albumin makes up about 60% of total blood plasma proteins. Its functions include helping maintain fluid volume and fluid balance in the body and as an antioxidant. Many substances bind to albumin for transport in the blood, including amino acids, bilirubin, calcium, cortisol, free fatty acids, magnesium, prescription and non-prescription drugs, and the thyroid hormone thyroxin.

Pages 54-58
ALBUMIN

Reference Values
Albumin blood values
(Measured in grams per deciliter = gm/dL)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Normal range (3-60yrs)</td>
<td>3.5 - 5.5 g/dL</td>
</tr>
<tr>
<td>Normal range (60-70yrs)</td>
<td>3.6 – 4.8 g/dL</td>
</tr>
<tr>
<td>Optimal level</td>
<td>4.0 - 4.5 g/dL</td>
</tr>
</tbody>
</table>

Why is an Albumin level needed?
An albumin level is tested routinely as part of your comprehensive metabolic panel (CMP). Individuals with liver and/or kidney problems are at highest risk for developing albumin levels that are consistently out of range. In addition, individuals with gastrointestinal disorders who do not absorb nutrients properly or who have chronic diarrhea can develop abnormal albumin levels.

What Life Time Fitness Lab Tests Report the Albumin value?
+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

What does a low albumin value mean?
Albumin levels that are low may indicate that you have liver and/or kidney imbalances, stomach or intestinal problems, you’ve been drinking too much water or you may need extra protein in your diet.

What are steps you can take for a low albumin value?
*Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations
+ Increase your intake of lean, high-quality proteins in the diet, including fish, turkey, bison, grass-fed beef and ostrich. It is best to use organic, free-range meats that are raised without chemical additives, hormones and antibiotics.
+ Increase your protein by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with rice milk or quality water.
+ It is important to limit your carbohydrate intake. Excess carbohydrate intake is associated with non alcoholic fatty liver disease (NAFLD). Increase quality proteins and fresh vegetables.
Nonalcoholic fatty liver disease (NAFLD) is a common condition associated with obesity and metabolic syndrome. Inappropriate dietary fat intake, excessive intake of soft drinks (due to high fructose corn syrup), insulin resistance caused by eating too much refined sugar and carbohydrates and increased oxidative stress due to a poor diet combine to increase fat in the liver. Losing weight will help improve liver function tests. Increase calcium-containing foods, including green, leafy vegetables and organic milk/cheese. Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli), garlic, onions.

### Supportive Supplements

<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage/Directions</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Time Fitness Creatine</td>
<td>10gm daily in divided doses for 1 week, then 5gm daily</td>
<td>+ Promotes protein synthesis and enhances muscle mass. + Important in exercise and fitness performance.</td>
</tr>
<tr>
<td>Life Time Fitness FastFuel Complete</td>
<td>4 scoops (approx. 65gm) in the morning as part of a healthy beverage</td>
<td>+ Contains whey protein concentrate &amp; isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend. + Helps support digestive function. If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses.</td>
</tr>
<tr>
<td>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.</td>
</tr>
<tr>
<td>Life Time Fitness Peak Performance Whey Protein Isolate</td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>+ Easily digestible, high-quality protein source. + Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH). + Provides 22gm protein per 2 scoops (30gm)</td>
</tr>
<tr>
<td>N-acetyl cysteine (NAC)</td>
<td>500 - 750mg, 1-2 times daily</td>
<td>+ Liver support + Improves glutathione (antioxidant) stores in the liver</td>
</tr>
</tbody>
</table>
**T.A.P.S**

| 1 capsule, 2 times daily | + Contains liver-supportive herbs, including milk thistle, picrorhiza, artichoke and curcumin + Helps improve liver detoxification processes and provides antioxidant support for the liver. |

---

**What does a high albumin value mean?**

Albumin levels in the higher range may indicate that you have gastrointestinal imbalances, liver/kidney imbalances, dehydration, or a possible vitamin A deficiency.

**What are steps you can take for a high albumin value?**

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Increase water intake – stay hydrated; a minimum of 2 liters of filtered water daily is recommended
+ It is important to limit your carbohydrate intake. Excess carbohydrate intake is associated with NAFLD.
+ Increase quality proteins and fresh vegetables.
+ Nonalcoholic fatty liver disease (NAFLD) is a common condition associated with obesity and metabolic syndrome. Inappropriate dietary fat intake, excessive intake of soft drinks (due to high fructose corn syrup), insulin resistance caused by eating too much refined sugar and carbohydrates and increased oxidative stress due to a poor diet combine to increase fat in the liver. Losing weight will help improved liver function tests.
+ Decrease protein intake, including eggs, meats, fish, shellfish, beans;
+ Improve vegetable intake, especially those high in vitamin A, including:
  - sweet potatoes
  - carrots
  - beets
  - broccoli
  - spinach
  - winter squash
  - kale
  - peas
  - red peppers
  - tomato juice
  - apricots
+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli), garlic, onions
+ Limit alcohol intake.
## Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage Description</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-glutamine</td>
<td>1-4 capsules (500mg-2 grams) daily in divided doses</td>
<td>+ Supports digestive tract tissue and immune function</td>
</tr>
<tr>
<td>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.</td>
</tr>
<tr>
<td>N-acetyl cysteine (NAC)</td>
<td>500 - 750mg, 1-2 times daily</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>+ Improves glutathione (antioxidant) stores in the liver</td>
</tr>
<tr>
<td>T.A.P.S</td>
<td>1 capsule, 2 times daily</td>
<td>+ Contains liver-supportive herbs, including milk thistle, picrorhiza, artichoke and curcumin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Helps improve liver detoxification processes and provides antioxidant support for the liver</td>
</tr>
<tr>
<td>Ultra-D Tox</td>
<td>1-2 capsules 2 times daily; use for 2-3 weeks</td>
<td>+ Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Helps support digestive function and detoxification processes</td>
</tr>
</tbody>
</table>
The Albumin/Globulin ratio, also called the A/G ratio, is a test to determine albumin and globulin levels, both proteins found in the blood.

Pages 59-62
ALBUMIN/GLOBULIN (A/G) RATIO

Reference Values
Albumin blood values
(Measured in grams per deciliter = gm/dL)

| Normal A/G ratio: | 1.1 – 2.4 |

Why is an Albumin/Globulin ratio level needed?
The Albumin/Globulin (A/G) ratio is tested routinely as part of your comprehensive metabolic panel (CMP). The A/G ratio is a way of determining whether albumin or globulin is out of the normal range, instead of checking each separately. Typically, the body will have a little more albumin than globulins and the A/G ratio will be just over 1.0.

What Life Time Fitness Lab Tests report the Albumin/Globulin ratio?
+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

What does a lowered A/G ratio mean?
An overproduction of globulins or an underproduction of albumin will result in a low A/G ratio, which may indicate liver imbalances and chronic inflammatory conditions such as autoimmunity.

What are steps you can take for a lowered A/G ratio?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations
+ Increase water intake – stay hydrated; a minimum of 2 liters of filtered water daily is recommended
+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.
+ It is important to limit your carbohydrate intake. Excess carbohydrate intake is associated with NAFLD. Increase quality proteins and fresh vegetables.
+ Limit alcohol intake.
Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha lipoic acid</td>
<td>500mg 2 times daily</td>
<td>+ Antioxidant(^{214})</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Helps improve energy production and regulate blood glucose levels(^{215})</td>
</tr>
<tr>
<td>L-glutamine</td>
<td>1-4 capsules (500mg-2 grams) daily in divided doses</td>
<td>+ Supports digestive tract tissue and immune function(^{216})</td>
</tr>
<tr>
<td>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.(^{217})</td>
</tr>
<tr>
<td>N-acetyl cysteine (NAC)</td>
<td>500 - 750mg, 1-2 times daily</td>
<td>+ Liver support</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Improves glutathione (antioxidant) stores in the liver(^{218})</td>
</tr>
<tr>
<td>T.A.P.S</td>
<td>1 capsule, 2 times daily</td>
<td>+ Contains liver-supportive herbs, including milk thistle, picorrhiza, artichoke and curcumin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Helps improve liver detoxification processes and provides antioxidant support for the liver(^{219})</td>
</tr>
</tbody>
</table>

What does an elevated A/G ratio mean?

A high A/G ratio may mean that there is too little production of immunoglobulins, and immune imbalances may be present.

What are steps you can take for an elevated A/G ratio?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

- Cut out refined sugars and carbohydrates to decrease inflammation and improve insulin function. Insulin resistance can lower your immunity.
- Avoid common food allergens, including wheat, dairy, soy.
- When you eat foods, try to buy organic when possible. The use of chemical additives, hormones, pesticides and antibiotics in our food supply can lead to imbalances in the immune system. Foods that you should avoid include processed meats, frozen dinners, preserved meats like hot dogs or bacon, fast foods, artificial ingredients and sweeteners, anything with MSG or monosodium glutamate.
- Drink at least 8 glasses of filtered water daily to improve detoxification and hydration.
### Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dose/Usage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual-Source Chromium as</td>
<td>1 capsule (300mcg chromium) daily</td>
<td>+ Improves insulin regulation and glucose tolerance(^{221}) + Helps support serotonin levels(^{222})</td>
</tr>
<tr>
<td>polynicotinate and chromium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>picolinate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life Time Fitness FastFuel</td>
<td>4 scoops (approx. 65gm) in the morning as part of a healthy beverage</td>
<td>+ Contains whey protein concentrate &amp; isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend. + Helps support digestive function(^{223,224}) + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses.</td>
</tr>
<tr>
<td>Complete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life Time Fitness Men’s or</td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.(^{225})</td>
</tr>
<tr>
<td>Women’s Performance Daily</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multivitamin AM/PM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life Time Fitness Peak Performance Whey Protein Isolate</td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>+ Easily digestible, high-quality protein source(^{226}) + Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH)(^{227}) + Provides 22gm protein per 2 scoops (30gm)</td>
</tr>
<tr>
<td>Moducare</td>
<td>1-3 capsules, 2-3 times daily</td>
<td>+ If immune imbalance is present + A mixture of plant sterols/sterolins + Helps support immunity by balancing immune components(^{228}) + Also helps control inflammation</td>
</tr>
<tr>
<td>Multi-Probiotic 4000</td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health(^{229}) + Supports vitamin B and K metabolism(^{230}) + Helps improve absorption of nutrients from foods</td>
</tr>
<tr>
<td>T.A.P.S</td>
<td>1 capsule, 2 times daily</td>
<td>+ Contains liver-supportive herbs, including milk thistle, picrorhiza, artichoke and curcumin + Helps improve liver detoxification processes and provides antioxidant support for the liver(^{231})</td>
</tr>
</tbody>
</table>

(For more information on Albumin and Globulins, refer to individual listings)
Alkaline Phosphatase (ALP)

Alkaline phosphatase (ALP) is an enzyme found in all body tissues, but is found most predominantly in the liver and bone. ALP is produced in the cells of the bone and liver with some activity in the kidney, intestine, and placenta. Blood levels increase when bones are growing; thus children have higher levels than adults do. High levels of ALP can be seen in imbalances of the bone and minerals and/or the liver. Elevated ALP is also present in pregnancy. ALP can be increased if you take prescription and non-prescription medicines on a chronic basis, including aspirin and oral contraceptives.

ALP levels should always be measured after fasting because enzyme levels increase as much as 30 U/L after food ingestion. Due to the release of intestinal enzymes, individuals with blood group O and B can have increased ALP levels after eating a fatty meal.
ALKALINE PHOSPHATASE

Reference Values

ALP blood values
(Measured in international units per liter = IU/L)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>ALP Range (IU/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female 15-20 yrs</td>
<td>45 - 400</td>
</tr>
<tr>
<td>Female 20-60 yrs</td>
<td>25-150</td>
</tr>
<tr>
<td>Female 60-100 yrs</td>
<td>25 - 165</td>
</tr>
<tr>
<td>Male 15-20 yrs</td>
<td>45 - 400</td>
</tr>
<tr>
<td>Male 20-60 yrs</td>
<td>25-150</td>
</tr>
<tr>
<td>Male 60-100 yrs</td>
<td>25 - 160</td>
</tr>
</tbody>
</table>

Why is an ALP level needed?

The alkaline phosphatase (ALP) level is tested routinely as part of your comprehensive metabolic panel (CMP). The primary importance of measuring ALP is to check the possibility of bone, mineral or liver imbalances.

What Life Time Fitness Lab Tests report the ALP value?

+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

What does a low ALP value mean?

Low ALP levels may indicate vitamin/mineral imbalances such as too much vitamin D, or too little phosphorus, magnesium, vitamin C, vitamin B6 and zinc. Low ALP levels may also indicate malnutrition and protein deficiency. Medications that can decrease ALP levels include:

+ Corticosteroids
+ Synthetic estrogen
+ Trifluoperazine (Stelazine)
+ Hyperalimentation
+ Ethambutol (Myambutol)
+ Antiretroviral drug
+ Thiazide Diuretics
  • Hydrochlorothiazide (HCTZ, HydroDiuril)
  • Methclothiazide (Enduron)
  • Indapamide (Lozol)
  • Metolazone (Zaroxolyn)
+ Potassium Sparing Diuretics
  • Triamterene (Diurenium)
  • Triamterene and HCTZ (Dyazide, Maxide)
+ ACE Inhibitors (Angiotensin-Converting Enzyme Inhibitors)
  • Captopril (Capoten)
  • Enalapril (Vasotec)
  • Lisinopril (Zestril, Prinivil)
  • Ramipril (Altace)
+ Clofibrate (Atromid S)
+ Azathioprine (Imuran)
+ Oral contraceptives
+ H2 Blockers
  • Cimetidine (Tagamet)
  • Ranitidine (Zantac)
  • Famotidine (Pepcid)
  • Nizatidine (Axid)

What are steps you can take for an elevated A/G ratio?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations
+ Increase your intake of lean, high-quality proteins in the diet, including fish, turkey, bison and ostrich. It is best to use organic, free-range meats that are raised without chemical additives, hormones and antibiotics.
+ Increase vitamin C, magnesium and zinc containing foods, including fresh fruits and green, leafy vegetables. Buy organic if possible.
+ If vitamin D levels are elevated, decrease intake of vitamin D containing foods such as milk and other dairy products.

Supportive Supplements

| Life Time Fitness FastFuel Complete | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.
+ Helps support digestive function\(^{232,233}\)
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
<p>| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.(^{234}) |</p>
<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage Details</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **Life Time Fitness Peak**                   | 2 scoops in favorite beverage, mix and drink daily                     | + Easily digestible, high-quality protein source  \(^\text{235}\)  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).  \(^\text{236}\)  
+ Provides 22gm protein per 2 scoops (30gm)                                                      |
| **Multi-Probiotic 4000**                     | 1 capsule, 1-3 times daily                                           | + Supports gastrointestinal health  \(^\text{237}\)  
+ Supports vitamin B and K metabolism  \(^\text{238}\)  
+ Helps improve absorption of nutrients from foods  
+ Improves liver enzymes.  \(^\text{239}\)                                                                 |
| **N-acetyl cysteine (NAC)**                  | 500 - 750mg, 1-2 times daily                                          | + Liver support  
+ Improves glutathione (antioxidant) stores in the liver  \(^\text{240}\)                                                                 |
| **T.A.P.S**                                  | 1 capsule, 2 times daily                                              | + Contains liver-supportive herbs, including milk thistle, picrorhiza, artichoke and curcumin  
+ Helps improve liver detoxification processes and provides antioxidant support for the liver.  \(^\text{241}\)  |

**What does a high ALP value mean?**

High ALP values may be due to liver and gallbladder problems. A high ALP may also indicate bone and mineral imbalances, such as osteoporosis. Medications that can increase ALP include:

- Allopurinol (Zyloprim)
- Antibiotics, including erythromycin and other causing antibiotic allergies
- Anti-inflammatory medicines, including ibuprofen (Advil)
- Birth control pills
- Oral hypoglycemic medications, such as metformin (Glucophage) and chlorpropamide (Diabenese)
- Chlorpromazine (Thorazine) and other phenothiazines
- Corticosteroids, such as cortisone (Prednisone)
- Methyltestosterone
- Methyl dopa (Aldomet)
- Narcotic pain medicines, including Lortab, Vicodin, Percocet
- Propranolol (Inderal)
- Tricyclic antidepressants, including amitriptyline (Elavil)
Certain prescription drugs can also make your bones more brittle by depleting calcium and vitamin D. These drugs include:

- Bisphosphonates (including Fosamax, Actonel, Boniva)
- Certain Cholesterol-lowering drugs (including Questran and Colestid)
- Digoxin (Lanoxin)
- Potassium sparing diuretics (Dyazide/Maxide)
- Loop diuretics (Lasix)
- Corticosteroids
- Anticonvulsants
- Tetracycline antibiotics
- Magnesium and aluminum antacids
- Ulcer drugs including H2 blockers (Tagamet, Zantac, Pepcid) and Proton pump inhibitors (Nexium, Prilosec, Aciphex)

**What are steps you can take for a high ALP level?**

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

- Increase phytoestrogens in foods, including flax seed, sesame seeds, pomegranate and soy. Phytoestrogens help support bone health.\(^{242}\)
- Nonalcoholic fatty liver disease (NAFLD) is a common condition associated with obesity and metabolic syndrome.\(^{243}\) Inappropriate dietary fat intake, excessive intake of soft drinks (due to high fructose corn syrup), insulin resistance caused by eating too much refined sugar and carbohydrates and increased oxidative stress due to a poor diet combine to increase fat in the liver. Losing weight will help improved liver function tests.
- Limit fatty foods, such as meats, processed foods, fried foods, fast foods and dairy. Opt for salads with grilled, lean meats like chicken and fish.
- It is important to limit your carbohydrate intake. Excess carbohydrate intake is associated with NAFLD.\(^{244}\) Increase quality proteins and fresh vegetables.
- Increase calcium-containing foods, such as green leafy vegetables and dairy products if you can tolerate dairy. If vitamin D levels are low, increase intake of vitamin D containing foods such as milk and other dairy products.
- Soft drinks, even artificially sweetened ones, contain high levels of phosphoric acid. Phosphoric acid in the drinks can deplete calcium from the body, leading to bone loss.\(^{245}\)
- Decrease caffeine intake. Caffeine has been reported to negatively affect vitamin D and bone formation.\(^{246}\)
- Exercise appropriately, 30 minutes daily at least 3 times a week. Physical activity and fitness may help reduce risk of osteoporosis and fracture and fall-related injuries in men and women.\(^{247,248,249}\) Studies have also reported that bone mineral density in postmenopausal women can be maintained or increased with therapeutic exercise.\(^{250}\)
- In a study in elderly men and women, higher dietary protein intake was associated with a lower rate of age-related bone loss.\(^{251}\) However, an acidic diet, which includes one high in meats, may decrease bone density. Fruit and vegetable intake was positively associated with bone density in a 1999 study in men and women.\(^{252}\)
### Supportive Supplements

<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **Cal/Mag 1001**                             | 1 tablet, 2 times daily                            | + Bone support  
  + Contains highly absorbable calcium, magnesium, vitamin D3, vitamin C, boron and glutamic acid.  
  + A meta analysis of 29 randomized trials showed that supplementation with calcium and vitamin D3 reduces risk of bone fractures by 24% and significantly reduces loss of bone mass.  
  |
| **Kyolic Reserve**                           | 1 capsule (600mg), 1-3 times daily                 | + Aged garlic is an antioxidant and helps improve the antioxidant glutathione levels in the liver and detoxification of the liver.  
  + Aged garlic also helps with immunity, protects against heart disease and may decrease the risk for certain cancers.  
  + Aged garlic has been reported not to interact with blood-thinning medicines, such as aspirin or warfarin (Coumadin).  
  However, if you take blood-thinning medications, you should be under the supervision of a doctor before taking any supplement.  
  |
| **Life Time Fitness FastFuel Complete**      | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
  + Helps support digestive function  
  + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses.  
  |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.  
  |
| **Life Time Fitness Peak Performance Whey Protein Isolate** | 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source  
  + Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).  
  + Provides 22gm protein per 2 scoops (30gm)  
<p>|</p>
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<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Multi-Probiotic 4000</strong></td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health&lt;sup&gt;262&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Supports vitamin B and K metabolism&lt;sup&gt;263&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Helps improve absorption of nutrients from foods</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Improves liver enzymes.&lt;sup&gt;264&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>N-acetyl cysteine (NAC)</strong></td>
<td>500 - 750mg, 1-2 times daily</td>
<td>+ Liver support</td>
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<td></td>
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<td>+ Improves glutathione (antioxidant) stores in the liver&lt;sup&gt;265&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>T.A.P.S</strong></td>
<td>1 capsule, 2 times daily</td>
<td>+ Contains liver-supportive herbs, including milk thistle, picrorhiza,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>artichoke and curcumin</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Helps improve liver detoxification processes and provides antioxidant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>support for the liver&lt;sup&gt;266&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Vitamin D 1000</strong></td>
<td>+ 1-5 capsules (1,000 – 5,000 IU) daily, depending on vitamin D lab</td>
<td>+ Bone support</td>
</tr>
<tr>
<td></td>
<td>value</td>
<td>+ Treatment of vitamin D deficiency improves bone mineral density&lt;sup&gt;267&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>+ If lab value 30 ng/ml or less, then take 5,000 IU daily; if 30-40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ng/ml, then take 1,000 IU daily both in addition to your multivit;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>retest in a month</td>
<td></td>
</tr>
</tbody>
</table>
Alanine Aminotransferase (ALT)

Alanine aminotransferase (ALT) is an enzyme present in the liver and to a lesser extent in skeletal muscle. ALT is also known as SGPT or seruchronim glutamate pyruvate transaminase. ALT is considered part of liver function tests (LFTs), which include aspartate aminotransferase (AST), alkaline phosphatase, and bilirubin. When the liver is under stress, serum ALT levels can be elevated. Plasma ALT levels are lower in healthy children than AST until approximately 15 to 20 years of age. Plasma ALT levels then tend to be higher than AST activity until age 60, when the activities become roughly equal. Highest levels generally occur in the afternoon and the lowest levels at night. A high body mass index (BMI) can increase ALT levels by 40 to 50%. Chronic excessive alcohol intake and drug use (both prescription, non-prescription and recreational) can also increase ALT levels. Very high levels of ALT (more than 10 times the highest normal level) are usually due to acute liver inflammation, often due to a viral infection.

The ALT test is often performed in conjunction with other tests that check for liver imbalances. Both ALT and AST levels are reliable tests for liver health. Levels can fluctuate 10% or so from test to test.

Pages 70-74
ALANINE ANINOTRANSFERASE

Reference Values
ALP blood values
(Measured in international units per liter = IU/L)

| Normal Adult Range (Male): | 0.0 – 55 IU/L |
| Normal Adult Range (Female): | 0.0 – 40 IU/L |

Why is an ALT level needed?
An alanine aminotransferase (ALT) level is tested routinely as part of your comprehensive metabolic panel (CMP). An ALT levels is generally used to determine liver and gallbladder health.

What Life Time Fitness Lab Tests Report the ALT value?
+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

What does a low ALT value mean?
ALT values that are low may indicate a vitamin B6 (pyridoxine) deficiency, but a low ALT value is generally not of concern. Supplements that can decrease ALT include N-acetyl cysteine (NAC). Medications that can lead to a vitamin B6 deficiency include:
+ Antibiotics
+ Isoniazid (INH)
+ Zonisamide (Zonegran)
+ Theophylline (Aminophylline)
+ Loop diuretics, including furosemide (Lasix) and bumetanide (Bumex)
+ Hormonal replacement therapy (estrogen/progesterone)
+ Oral contraceptives
+ Penicillamine (Cupramine)

What are steps you can take for a low ALT Value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.
General Dietary and Lifestyle Recommendations

+ The best sources of B6 (pyridoxine) are wheat germ, organ meats (especially liver), peanuts, legumes, potatoes, and bananas.
+ The normal flora in the human intestinal tract also synthesizes vitamin B6.
+ Stop smoking – smoking lowers vitamin B6 levels.268

Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Additional Information</th>
</tr>
</thead>
</table>
| Pyridoxal-5-phosphate               | 1 capsule (50mg) daily  | + Use if vitamin B6 values are low  
+ Can be taken as part of the Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM |
| Multi-Probiotic 4000                | 1 capsule, 1-3 times daily | + Supports gastrointestinal health269 
+ Supports vitamin B and K metabolism270 
+ Helps improve absorption of nutrients from foods 
+ Improves liver enzymes.271 |
| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.272 |

What does a high ALT value mean?

ALT values that are high may be due to liver or kidney problems, environmental intoxication (such as lead or mercury toxicity), exposure to pesticides or other environmental chemicals), excess liver fat, obesity, chronic inflammation, chronic alcohol abuse or a medication interaction/side effect. Medications that can increase ALT values include:

+ Acetaminophen (Tylenol)
+ Chemotherapy, various drugs
+ NSAIDs including ibuprofen (Advil) and naproxen (Aleve)
+ Tricyclic antidepressants including amitriptylline (Elavil)
+ Antibiotics such as the tetracyclines, sulfonamides, isoniazid (INH), sulfamethoxazole, trimethoprim, nitrofurantoin, etc.
+ Cardiovascular drugs such as amiodarone (Cordarone), hydralazine (Apresoline), quinidine
+ Zileuton (Zyflo)
+ Heparin
+ Antifungal drugs
+ Methotrexate (Rheumex)
+ Salicylates (aspirin)
+ Anticonvulsants
  • Phenobarbital
  • Phenytoin (Dilantin)
  • Primidone (Mysoline)
  • (Zonegram)
+ HMG-CoA Reductase Inhibitors
  • Atorvastatin (Lipitor)
  • Lovastatin (Mevacor, Altocor)
  • Fluvastatin (Lescol)
  • Pravastatin (Pravachol)
  • Simvastatin (Zocor)
+ Dietary supplements, including Kava (Piper methysticum), black cohosh (Actaea racemosa), Red yeast rice (Monascus purpureus)

What are steps you can take for a high ALT level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Limit fatty foods, such as meats, processed foods, fried foods, fast foods and dairy. Opt for salads with grilled, lean meats like chicken and fish.
+ Make sure to use “organic” meats and vegetables where possible to limit the potential for chemicals additives and toxins.
+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli, brussel sprouts), garlic, onions.
+ Saunas are beneficial for decreasing toxins in the body as is an increase in exercise. Get outside and walk or garden. Sweating is your body’s method of detoxification.
+ Nonalcoholic fatty liver disease (NAFLD) is a common condition associated with obesity and metabolic syndrome. Inappropriate dietary fat intake, excessive intake of soft drinks (due to high fructose corn syrup and sugar), insulin resistance caused by eating too much refined sugar and carbs and increased oxidative stress due to a poor diet combine to increase free fatty acid delivery to the liver. Losing weight will help improved liver function tests.
+ No alcohol until levels return to the normal range
+ Have a doctor or pharmacist review your prescription and non-prescription medications along with any dietary supplements you take for the possibility of liver toxicity. Make sure if you are taking OTC pain relievers that have acetaminophen (Tylenol) in them, you stop these medicines immediately until you talk to your doctor or pharmacist.

Supportive Supplements

<table>
<thead>
<tr>
<th>Suppplement</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Alpha lipoic acid                             | 500mg 2 times daily           | + Antioxidant
+ Helps improve energy production and regulate blood glucose levels
+ Builds glutathione pools n the liver         |
| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism. |

Better health & performance start here.
| Life Time Fitness Peak Performance Whey Protein Isolate | 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source\(^{277}\)  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH)\(^{278}\)  
+ Provides 22gm protein per 2 scoops (30gm) |
| Multi-Probiotic 4000 | 1 capsule, 1-3 times daily | + Supports gastrointestinal health\(^{279}\)  
+ Supports vitamin B and K metabolism\(^{280}\)  
+ Helps improve absorption of nutrients from foods  
+ Improves liver enzymes.\(^{281}\) |
| N-acetyl cysteine (NAC) | 500 - 750mg, 1-2 times daily | + Liver support  
+ Improves glutathione (antioxidant) stores in the liver\(^{282}\) |
| T.A.P.S | 1 capsule, 2 times daily | + Contains liver-supportive herbs, including milk thistle, picrorhiza, artichoke and curcumin  
+ Helps improve liver detoxification processes and provides antioxidant support for the liver\(^{283}\) |
| Ultra-D Tox | 1-2 capsules 2 times daily; use for 2-3 weeks | + Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C.  
+ Helps support digestive function and detoxification processes |
Aspartate Aminotransferase (AST)

Aspartate aminotransferase (AST, also called SGOT or serum glutamic oxaloacetic transaminase) is an enzyme normally found in many tissues of the body, including liver, heart, muscle, kidney, and brain. AST is released into blood when any one of these tissues is out of balance.

AST values can be altered due to several factors. AST levels are about 15% higher in African American than Caucasian men, while obese men may have mildly elevated AST levels. Moderate exercise increases AST levels for as long as 24 hours, usually less than 3 times the upper limit of normal. AST levels can fluctuate between 5 - 10% from one day to the next in the same individual.

The AST test is often performed in conjunction with other tests that check for liver imbalances. Both AST and ALT levels are reliable tests for liver health.

Pages 75-79
ALKALINE PHOSPHATASE

Reference Values
AST blood values
(Measured in international units per liter = IU/L)

| Normal Adult Range | 0.0 – 40.0 IU/L |

Why is an AST level needed?
An aspartate aminotransferase (AST) level is tested routinely as part of your complete metabolic panel (CMP). AST levels are generally used to determine liver and gallbladder health.

What Life Time Fitness Lab Tests Report the AST value?
+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

What does a low AST value mean?
AST values that are low may indicated a vitamin B6 (pyridoxine) deficiency, but a low AST is generally not of concern. Pregnancy may also cause lower than normal AST levels. Supplements that can decrease AST include N-acetyl cysteine (NAC). Medications that can lead to a vitamin B6 deficiency include:
+ Antibiotics
+ Isoniazid (INH)
+ Zonisamide (Zonegran)
+ Theophylline (Aminophylline)
+ Loop diuretics, including furosemide (Lasix) and bumetanide (Bumex)
+ Hormonal replacement therapy (estrogen/progesterone)
+ Oral contraceptives
+ Penicillamine (Cupramine)

What are steps you can take for a low AST value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations
+ The best sources of B6 (pyridoxine) are brewer’s yeast, wheat germ, organ meats (especially liver), peanuts, legumes, potatoes, and bananas.
+ The normal flora in the human intestinal tract also synthesize vitamin B6.
+ Stop smoking – smoking lowers vitamin B6 levels.²⁸⁴
### Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dose</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **Multi-Probiotic 4000**                        | 1 capsule, 1-3 times daily | + Supports gastrointestinal health[^85]  
+ Supports vitamin B and K metabolism[^86]  
+ Helps improve absorption of nutrients from foods  
+ Improves liver enzymes[^87] |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men's and Women's Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism[^88] |
| **Pyridoxal-5-phosphate (Vitamin B-6)**         | 1 capsule (50mg) daily | + Can be taken as part of the Life Time Fitness Men's or Women’s Performance Daily Multivitamin AM/PM |

### What does a high AST value mean?

AST values that are increased may be due to liver or kidney imbalances, environmental intoxication (such as lead or mercury poisoning, exposure to pesticides or other environmental chemicals), excess liver fat, obesity, chronic inflammation, chronic alcohol abuse or a medication interaction/side effect.

Medications that can increase AST values include:

+ Acetaminophen (Tylenol)
+ Chemotherapy, various drugs
+ NSAIDs including ibuprofen (Advil) and naproxen (Aleve)
+ Tricyclic antidepressants including amitriptyline (Elavil)
+ Antibiotics such as the tetracyclines, sulfonamides, isoniazid (INH), sulfamethoxazole, trimethoprim, nitrofurantoin, etc.
+ Cardiovascular drugs such as amiodarone (Cordarone), hydralazine (Apresoline), quinidine
+ Zileuton (Zyflo)
+ Heparin
+ Antifungal drugs
+ Methotrexate (Rheumex)
+ Salicylates (aspirin)
+ Anticonvulsants
  • Phenobarbital
  • Phenytoin (Dilantin)
  • Primidone (Mysoline)
  • (Zoneogram)
+ HMG-CoA Reductase Inhibitors
  • Atorvastatin (Lipitor)
  • Lovastatin (Mevacor, Altocor)
  • Fluvastatin (Lescol)
  • Pravastatin (Pravachol)
  • Simvastatin (Zocor)
What are steps you can take for a high AST level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Limit fatty foods, such as meats, processed foods, fried foods, fast foods and dairy. Opt for salads with grilled, lean meats like chicken and fish.
+ Make sure to use “organic” meats and vegetables where possible to limit the potential for chemicals additives and toxins.
+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli), garlic, onions.
+ Saunas are beneficial for decreasing toxins in the body as is an increase in exercise. Get outside and walk or garden.
+ It is important to limit your carbohydrate intake. Excess carbohydrate intake is associated with non-alcoholic fatty liver disease (NAFLD). Increase quality proteins and fresh vegetables. NAFLD is a common condition associated with obesity and metabolic syndrome. Inappropriate dietary fat intake, excessive intake of soft drinks (due to high fructose corn syrup), insulin resistance caused by eating too much refined sugar and carbohydrates and increased oxidative stress due to a poor diet combine to increase fat in the liver. Losing weight will help improve liver function tests.
+ No alcohol until levels return to the normal range
+ Have a doctor or pharmacist review your prescription and non-prescription medications along with any dietary supplements you take for the possibility of liver toxicity. Make sure if you are taking OTC pain relievers that have acetaminophen (Tylenol) in them, you stop these medicines immediately until you talk to your doctor or pharmacist.

**Supportive Supplements**

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage and Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha lipoic acid</td>
<td>500mg 2 times daily + Antioxidant + Helps improve energy production and regulate blood glucose levels + Supports glutathione production in the liver</td>
</tr>
<tr>
<td>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</td>
<td>3 capsules in the moring after breakfast and 3 capsules with dinner. + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.</td>
</tr>
</tbody>
</table>
| Life Time Fitness Peak Performance Whey Protein Isolate | 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source\(^{294}\)  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH)\(^{295}\)  
+ Provides 22gm protein per 2 scoops (30gm) |
| Multi-Probiotic 4000 | 1 capsule, 1-3 times daily | + Supports gastrointestinal health\(^{296}\)  
+ Supports vitamin B and K metabolism\(^{297}\)  
+ Helps improve absorption of nutrients from foods  
+ Improves liver enzymes\(^{298}\) |
| N-acetyl cysteine (NAC) | 500 - 750mg, 1-2 times daily | + Liver support  
+ Improves glutathione (antioxidant) stores in the liver\(^{299}\) |
| T.A.P.S | 1 capsule, 2 times daily | + Contains liver-supportive herbs, including milk thistle, picrorhiza, artichoke and curcumin  
+ Helps improve liver detoxification processes and provides antioxidant support for the liver\(^{300}\) |
| Ultra-D Tox | 1-2 capsules 2 times daily; use for 2-3 weeks | + Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C.  
+ Helps support digestive function and detoxification processes |
Bilirubin

Bilirubin is a yellow product in the blood that occurs due to the destruction of hemoglobin and aging red blood cells (erythrocytes). 80% of bilirubin comes from hemoglobin, the iron-containing component of red blood cells that transports oxygen to tissues. Bilirubin is excreted in urine and bile (produced by the liver). Bilirubin values are elevated in liver and gallbladder problems.

The liver produces and secretes bile into the intestines to help digest dietary fat. The liver also removes toxic chemicals or waste products from the blood, including bilirubin. After bilirubin enters the cells of the liver, other chemicals (primarily glucuronic acid) attach to bilirubin (called conjugation) and the complex (called conjugated bilirubin or direct bilirubin) is then excreted into the bile and eliminated through the feces. Direct or conjugated bilirubin is measured separately from bilirubin not removed from the blood (termed unconjugated or indirect bilirubin). Total bilirubin and direct bilirubin levels are measured in the blood, whereas indirect bilirubin levels are derived from the total and direct bilirubin measurements. A change in bilirubin level typically indicates liver stress.

Jaundice is a condition in which a person’s skin and the whites of the eyes are discolored yellow due to an increased level of bile pigments in the blood resulting from liver problems. When there is too much bilirubin being produced for the liver to remove from the blood, the result of which is jaundice.
**BILIRUBIN**

**Reference Values**

Bilirubin blood value

*Measured in milligrams per deciliter (mg/dL)*

<table>
<thead>
<tr>
<th>Bilirubin, Total</th>
<th>0.0 – 1.2 mg/dL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilirubin, Direct</td>
<td>0.0 – 0.4 mg/dL</td>
</tr>
</tbody>
</table>

**Why is an Bilirubin level needed?**

A bilirubin level is tested routinely as part of your complete metabolic panel (CMP). A bilirubin test is used to evaluate liver health, and assess how well your body breaks down, changes, and uses bilirubin.

**What Life Time Fitness Lab Tests Report the Bilirubin value?**

- Men's Core Health Profile
- Women's Core Health Profile
- Men's Longevity and Vitality Premium
- Women's Longevity and Vitality Premium

**What does a low Bilirubin value mean?**

A bilirubin level that is low may indicate liver or gallbladder problems, excessive fat digestion or diets low in nitrogen foods (like legumes). Medications that can lead to a low total bilirubin value include:

- Barbiturates
- Caffeine
- Penicillin
- Salicylates such as aspirin, in high doses

**What are steps you can take for a low Bilirubin Value?**

*DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.*

**General Dietary and Lifestyle Recommendations**

- Stop drinking beverages with caffeine, including coffee and tea, until your levels return to normal.
- Nonalcoholic fatty liver disease (NAFLD) is a common condition associated with obesity and metabolic syndrome. Inappropriate dietary fat intake, excessive intake of soft drinks (due to high fructose corn syrup), insulin resistance caused by eating too much refined sugar and carbohydrates and increased oxidative stress due to a poor diet combine to increase fat in the liver. Losing weight will help improved liver function tests.
- Limit fatty foods, such as meats, processed foods, fried foods, fast foods and dairy. Opt for salads with grilled, lean meats like chicken and fish.
- It is important to limit your carbohydrate intake. Excess carbohydrate intake is associated with NAFLD.
+ Increase quality proteins and fresh vegetables.
+ Do not take OTC pain relievers, including aspirin.
+ Increase nitrogen-bearing foods, including legumes (beans) and lean red meats like bison and organic beef.

**Supportive Supplements**

<table>
<thead>
<tr>
<th>Product</th>
<th>Usage</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **Life Time Fitness FastFuel Complete**                        | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
   + Helps support digestive function. 
   + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism. |
| **Life Time Fitness Peak Performance Whey Protein Isolate**     | 2 scoops in favorite beverage, mix and drink daily                    | + Easily digestible, high-quality protein source.  
   + Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).  
   + Provides 22gm protein per 2 scoops (30gm) |
| **Multi-Probiotic 4000**                                       | 1 capsule, 1-3 times daily                                            | + Supports gastrointestinal health.  
   + Supports vitamin B and K metabolism.  
   + Helps improve absorption of nutrients from foods  
   + Improves liver enzymes. |
| **T.A.P.S**                                                     | 1 capsule, 2 times daily                                              | + Contains liver-supportive herbs, including milk thistle, picrorhiza, artichoke and curcumin  
   + Helps improve liver detoxification processes and provides antioxidant support for the liver |

**What does a high Bilirubin value mean?**

Bilirubin values that are increased may be due to liver or gallbladder problems, environmental intoxication (such as lead or mercury poisoning, exposure to pesticides or other environmental chemicals), chronic alcohol abuse or a
medication interaction/side effect. Medications that can increase bilirubin values include:

+ Allopurinol
+ Anabolic steroids
+ Antibiotics, including sulfonamides
+ Antimalaria medications (Rifampin, isoniazide)
+ Azathioprine (Imuran)
+ Chlorpropamide (Diabinese)
+ Cholinergics
+ Opiates, including codeine, morphine, meperidine, oxycodone
+ MAO inhibitors
+ Epinephrine
+ Methotrexate
+ Methylprednisolone (Aldomet)
+ Nicotinic acid
+ Oral contraceptives
+ Quinidine
+ Theophylline

What are steps you can take for a high Bilirubin level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Nonalcoholic fatty liver disease (NAFLD) is a common condition associated with obesity and metabolic syndrome. Inappropriate dietary fat intake, excessive intake of soft drinks (due to high fructose corn syrup), insulin resistance caused by eating too much refined sugar and carbohydrates and increased oxidative stress due to a poor diet combine to increase fat in the liver. Losing weight will help improved liver function tests.
+ Limit fatty foods, such as meats, processed foods, fried foods, fast foods and dairy. Opt for salads with grilled, lean meats like chicken and fish.
+ It is important to limit your carbohydrate intake. Excess carbohydrate intake is associated with NAFLD.
+ Increase quality proteins and fresh vegetables.
+ Make sure to use “organic” meats and vegetables where possible to limit the potential for chemicals additives and toxins.
+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccolli), garlic, onions.
+ Saunas are beneficial for decreasing toxins in the body as is an increase in exercise. Get outside and walk or garden.
+ No alcohol until levels return to the normal range
+ Have a doctor or pharmacist review your prescription and non-prescription medications along with any dietary supplements you take for the possibility of liver toxicity. Make sure if you are taking OTC pain relievers that have acetaminophen (Tylenol) in them, you stop these medicines immediately until you talk to your doctor or pharmacist.
### Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage/Instructions</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha lipoic acid</td>
<td>4 scoops (approx. 65gm) in the morning as part of a healthy beverage</td>
<td>+ Antioxidant&lt;br&gt;+ Helps improve energy production and regulate blood glucose levels&lt;sup&gt;315&lt;/sup&gt;</td>
</tr>
<tr>
<td>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.&lt;sup&gt;316&lt;/sup&gt;</td>
</tr>
<tr>
<td>Life Time Fitness Peak Performance Whey Protein Isolate</td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>+ Easily digestible, high-quality protein source&lt;sup&gt;317&lt;/sup&gt;&lt;br&gt;+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH)&lt;sup&gt;318&lt;/sup&gt;&lt;br&gt;+ Provides 22gm protein per 2 scoops (30gm)</td>
</tr>
<tr>
<td>Multi-Probiotic 4000</td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health&lt;sup&gt;319&lt;/sup&gt;&lt;br&gt;+ Supports vitamin B and K metabolism&lt;sup&gt;320&lt;/sup&gt;&lt;br&gt;+ Helps improve absorption of nutrients from foods&lt;br&gt;+ Improves liver enzymes.&lt;sup&gt;321&lt;/sup&gt;</td>
</tr>
<tr>
<td>N-acetyl cysteine (NAC)</td>
<td>500 - 750mg, 1-2 times daily</td>
<td>+ Liver support&lt;br&gt;+ Improves glutathione (antioxidant) stores in the liver&lt;sup&gt;322&lt;/sup&gt;</td>
</tr>
<tr>
<td>T.A.P.S</td>
<td>1 capsule, 2 times daily</td>
<td>+ Contains liver-supportive herbs, including milk thistle, picrorhiza, artichoke and curcumin&lt;br&gt;+ Helps improve liver detoxification processes and provides antioxidant support for the liver&lt;sup&gt;323&lt;/sup&gt;</td>
</tr>
<tr>
<td>Ultra-D Tox</td>
<td>1-2 capsules 2 times daily; use for 2-3 weeks</td>
<td>+ Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C.&lt;br&gt;+ Helps support digestive function and detoxification processes</td>
</tr>
</tbody>
</table>
BUN (Blood Urea Nitrogen)

The BUN, or blood urea nitrogen, lab test measures the amount of nitrogen produced in the blood from urea, a waste product made in the liver and excreted by the kidneys. The BUN test, along with a creatinine test, indicates how well your kidneys are moving the toxin urea out of the body.

Pages 85-89
BUN (BLOOD UREA NITROGEN)

Reference Values
BUN blood value
(Measured in milligrams per deciliter = mg/dL)

<table>
<thead>
<tr>
<th>Normal Range (Adults):</th>
<th>5 – 26 mg/dL</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUN:Creatinine ratio (Adults):</td>
<td>8 – 27</td>
</tr>
</tbody>
</table>

Why is an BUN level needed?
A BUN level is tested routinely as part of your complete metabolic panel (CMP). A BUN blood test is used together with the creatinine blood level to determine the BUN/Creatinine ratio, an indicator of kidney health. A high BUN level may mean the kidneys are stressed. If the BUN level is rising, it is an indication that the kidneys may not doing their job of removing urea from the blood. Chronic use of prescription or over the counter pain medications such as non-steroidal anti-inflammatory drugs or NSAIDs (including ibuprofen or Advil and naproxyn or Aleve), aspirin and acetaminophen (Tylenol) has been associated with development of kidney imbalances. Overall kidney function is best evaluated when looking at BUN and creatinine together, called the BUN/Creatinine Ratio. You should watch your kidney values closely as you are aging as it an indicator of kidney imbalances, which can be common in those with a history of high blood sugar and high blood pressure.

What Life Time Fitness Lab Tests Report the BUN value?
+ Men's Core Health Profile
+ Women's Core Health Profile
+ Men's Longevity and Vitality Premium
+ Women's Longevity and Vitality Premium

What does a low total BUN value mean?
BUN levels that are low are not common and generally should not be of concern. Low levels may indicate a liver imbalance or malnutrition/protein deficit. Muscle injuries and too much water (over hydration) may also decrease BUN levels. A low BUN level can occur normally in the second or third trimester of pregnancy.

What are steps you can take for a low BUN Value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations
+ Decrease your fluid intake if you have been drinking lots of water.
+ Do not take OTC pain relievers, including aspirin.
+ Increase nitrogen-bearing foods, including legumes (beans) and lean red meats like bison and organic beef.  
+ Decrease phosphorus-containing food, like soft drinks, many snack foods, processed foods like processed cheeses and meats and fish sticks. Watch labels for sodium monophosphate and other names. Other foods high in phosphorus include beefalo, veal, clams, dairy products, bran cereal and almonds.  
+ Soft drinks, even artificially sweetened ones, contain high levels of phosphoric acid. Phosphoric acid in the drinks can also deplete calcium from the body, leading to bone loss.  

**Supportive Supplements**

<table>
<thead>
<tr>
<th><strong>Product</strong></th>
<th><strong>Dosage</strong></th>
<th><strong>Benefits</strong></th>
</tr>
</thead>
</table>
| **Alpha lipoic acid** | 500mg 2 times daily | + Antioxidant[^225]  
+ Helps improve energy production and regulate blood glucose levels[^226] |
| **Life Time Fitness FastFuel Complete** | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function[^227],[^228]  
+ If gas or bloating occurs, change to l-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.  
[^229] |
| **Life Time Fitness Peak Performance Whey Protein Isolate** | 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source[^237]  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).[^33]  
+ Provides 22gm protein per 2 scoops (30gm) |
| **T.A.P.S** | 1 capsule, 2 times daily | + Contains liver-supportive herbs, including milk thistle, picrorhiza, artichoke and curcumin  
+ Helps improve liver detoxification processes and provides antioxidant support for the liver[^332] |
What does a high BUN value mean?

BUN values that are increased may be due to kidney imbalances, including dehydration. A high BUN level may indicate your kidneys are not filtering toxins out properly. The number one cause of kidney failure is diabetes, followed by hypertension, which can be a result of insulin resistance and obesity. A diet high in protein can also increase a BUN value, as can exercise, age and sex (men generally have higher BUN values than women).

+ Corticosteroids
+ Tetracycline antibiotics
+ Samdimmune (cyclosporine)
+ Immuran (azathioprine)
+ Diuretics, including furosemide (Lasix) and hydrochlorothiazide

What are steps you can take for a high BUN level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Lose weight. Studies report kidney imbalances when you are overweight or obese.\(^{334}\) If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.
+ Eating a lower carbohydrate diet can help keep your kidneys healthy by decreasing blood sugar imbalances and insulin resistance.\(^{335}\) A decline in kidney function often seen in diabetes and obesity. Eat more quality protein, including lean meats, beans and nuts (as a snack).
+ Decrease phosphorus-containing food, like soft drinks, many snack foods, processed foods like processed cheeses and meats and fish sticks. Watch labels for sodium monophosphate and other names. Other foods high in phosphorus include beefalo, veal, clams, dairy products, bran cereal and almonds.
+ Soft drinks, even artificially sweetened ones, contain high levels of phosphoric acid. Phosphoric acid in the drinks can also deplete calcium from the body, leading to bone loss.\(^{336}\)
+ Control insulin and blood sugar levels through dietary changes. Over-consumption of simple carbohydrates like refined sugars and grains, causes unfriendly flora to grow in the GI tract. These foods also raise blood glucose and insulin levels, resulting in kidney imbalances.\(^{337}\)
+ Limit meats, at least to once daily.
+ Make sure to use “organic” meats and vegetables where possible to limit the potential for chemicals additives and toxins.
+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli), garlic, onions.
+ Saunas are beneficial for decreasing toxins in the body as is an increase in exercise. Get outside and walk or garden.
+ No alcohol until levels return to the normal range

Supportive Supplements

<p>| Alpha lipoic acid | 500mg 2 times daily | + Antioxidant(^{338}) + Helps improve energy production and regulate blood glucose levels(^{339}) |</p>
<table>
<thead>
<tr>
<th>Product</th>
<th>Dose/Use</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Dual-Source Chromium as chromium polynicotinate and chromium picolinate | 1 capsule (300mcg chromium) daily                                        | + Improves insulin regulation and glucose tolerance<sup>340</sup>  
+ Helps support serotonin levels<sup>341</sup>                                                                                          |
| Life Time Fitness FastFuel Complete                                     | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage    | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function<sup>342,343</sup>  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner.    | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.<sup>344</sup>                                                                 |
| Multi-Probiotic 4000                                                   | 1 capsule, 1-3 times daily                                               | + Supports gastrointestinal health<sup>345</sup>  
+ Supports vitamin B and K metabolism<sup>346</sup>  
+ Helps improve absorption of nutrients from foods                                                                                       |
Calcium is the most abundant mineral in the human body. Average healthy males contain about 2.5 to 3 pounds of calcium while females contain about 2 pounds. Approximately 99% of calcium is present in the bones and teeth, which leaves only about 1% in cells and body fluids. In bones and teeth, calcium exists primarily as hydroxyapatite, which is a calcium carbonate/calcium phosphate crystalline compound that provides rigidity and strength to these tissues.
CALCIUM

Reference Values
ALP blood values
(Measured in milligrams per deciliter = mg/dL)

<table>
<thead>
<tr>
<th>Normal Range (adults, 18-59 yrs)</th>
<th>8.7 – 10.2 mg/dL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Range (adults, 59 &gt; yrs)</td>
<td>8.6 – 10.2 mg/dL</td>
</tr>
</tbody>
</table>

Why is a Calcium blood level needed?
A calcium level is tested routinely as part of your complete metabolic panel (CMP). Calcium is an important and essential nutrient found in the body. Calcium is involved in the development of strong bones and teeth, plays a crucial role in nerve impulse transmission, blood clotting, proper enzyme function and nerve transmission, and is used for energy production by muscles. Appropriate levels of calcium are critical to decrease the chances of developing bone and mineral imbalances, and testing for blood calcium levels can let you know if you are susceptible to conditions relating to the bones, heart, nerves, kidneys and teeth.

The importance for all individuals to take adequate amounts of calcium in their diet is well known. As people age, they should increase their intake of calcium, particularly for bone strength. Calcium regulation is maintained by the parathyroid hormone (PTH), vitamin D, and calcitonin through complex feedback loops. Calcium also is affected by magnesium and phosphorus levels.

What Life Time Fitness Lab Tests Report a Calcium value?
+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

What does a low-calcium value mean?
Calcium levels that are low generally do not cause any symptoms, unless the levels are very low. Symptoms can include tingling extremities (fingers/toes) and muscle cramping. Low-calcium levels can be caused by kidney imbalances, malnutrition/low protein levels and alcoholism. Some foods in your diet can actually lead to low-calcium levels, especially those containing phytic acid and oxalic acid, which may bind to calcium and pull it from the body. These foods include spinach, collards, sweet potatoes, rhubarb and beans. Fiber from wheat bran contains high levels of phytates and may decrease calcium absorption. Low levels of magnesium and vitamin D can also lead to calcium deficiencies, as can too much phosphorus in the diet. If low-calcium levels are left untreated, then bone disease is likely to occur in old age.

Certain prescription drugs can also make your bones more brittle by depleting calcium. These drugs include:
+ Magnesium and aluminum antacids
+ Some antibiotics like tetracycline
+ Anticonvulsants like carbamazepine (Tegretol), phenytoin (Dilantin) and Phenobarbital
+ Steroids
+ Antiretroviral drugs for HIV
+ Loop diuretics, including furosemide (Lasix)
+ Potassium sparing diuretics like triamterene (Dyazide, Maxide)
+ Digoxin
+ Cholesterol-lowering drugs called bile acid sequestrants (cholestyramine or Questran)
+ Mineral oil
+ Phosphate enema
+ Bisphosphonates for osteoporosis like Fosamax, Boniva, Actonel
+ Anti-ulcer drugs
+ Colchicine for gout

What are steps you can take for a low-calcium value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Increase your intake of lean, high-quality proteins in the diet, including fish, turkey, bison and ostrich. Legumes (beans) are also good sources of quality protein. It is best to use organic, free-range meats that are raised without chemical additives, hormones and antibiotics.
+ Increase calcium-containing foods, such as green leafy vegetables and dairy products if you can tolerate dairy. If vitamin D levels are low, increase intake of vitamin D containing foods such as milk and other dairy products. Snack on almonds or Brazil nuts.
+ Soft drinks, even artificially sweetened ones, contain high levels of phosphoric acid. Phosphoric acid in the drinks can deplete calcium from the body, leading to bone loss. However, an acidic diet, which includes one high in meats, may decrease bone density. Fruit and vegetable intake was positively associated with bone density in a 1999 study in men and women.
+ Decrease caffeine intake. Caffeine has been reported to negatively affect vitamin D and bone formation. Caffeine is included in tea, coffee and chocolate.
+ Stop smoking.
+ Exercise appropriately, 30 minutes daily at least 3 times a week. Physical activity and fitness may help reduce risk of osteoporosis and fracture and fall-related injuries in men and women. Studies have also reported that bone mineral density in postmenopausal women can be maintained or increased with therapeutic exercise. Increase weight-bearing exercises, which include walking, cycling and weight training. These exercises can help slow down bone loss or osteoporosis. Swimming, yoga and dancing are also good activities to help decrease stress.
+ In a study in elderly men and women, higher dietary protein intake was associated with a lower rate of age-related bone loss. However, an acidic diet, which includes one high in meats, may decrease bone density. Fruit and vegetable intake was positively associated with bone density in a 1999 study in men and women.
### Supportive Supplements

<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cal/Mag 1001</strong></td>
<td>1 tablet, 2 times daily</td>
<td>+ Bone support &lt;br&gt; + Contains highly absorbable calcium, magnesium, vitamin D3, vitamin C, boron and glutamic acid. &lt;br&gt; + A meta analysis of 29 randomized trials showed that supplementation with calcium and vitamin D3 reduces risk of bone fractures by 24% and significantly reduces loss of bone mass.356</td>
</tr>
<tr>
<td><strong>Life Time Fitness FastFuel Complete</strong></td>
<td>4 scoops (approx. 65gm) in the morning as part of a healthy beverage</td>
<td>+ Contains whey protein concentrate &amp; isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend. &lt;br&gt; + Helps support digestive function357,358 &lt;br&gt; + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses.</td>
</tr>
<tr>
<td><strong>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</strong></td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.359</td>
</tr>
<tr>
<td><strong>Life Time Fitness Peak Performance Whey Protein Isolate</strong></td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>+ Easily digestible, high-quality protein source360 &lt;br&gt; + Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).361 &lt;br&gt; + Provides 22gm protein per 2 scoops (30gm)</td>
</tr>
<tr>
<td><strong>Multi-Probiotic 4000</strong></td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health362 &lt;br&gt; + Supports vitamin B and K metabolism363 &lt;br&gt; + Helps improve absorption of nutrients from foods</td>
</tr>
</tbody>
</table>
Vitamin D 1000

+ 1-5 capsules (1,000 – 5,000 IU) daily, depending on vitamin D lab value
+ If lab value 30 ng/ml or less, then take 5,000 IU daily; if 30-40 ng/ml, then take 1,000 IU daily both in addition to your multivit; retest in a month
+ Bone support
+ Treatment of vitamin D deficiency improves bone mineral density

What does a high calcium value mean?

Calcium levels that are high may be due to parathyroid problems or dehydration. Too much vitamin D can also lead to high calcium values.

What are steps you can take for a high calcium level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Increase fluid intake; drink at least 2 liters of filtered water daily
+ Substitute green tea for your morning coffee. Use organic green tea (sencha preferred). Steep 1-2 teaspoonsfuls in a cup of hot water, strain, drink 2-3 times daily.
+ Decrease vitamin D intake, including dairy products.
+ Incorporate low-calcium foods into your diet, such as chicken, cottage cheese, pinto beans, eggplant, apples, beets, grapes, tomatoes, pineapple, strawberries, cantaloupe, asparagus.
+ Increase foods that help detoxify the kidneys, including asparagus, artichoke, melons, parsley
+ Stay out of the sun as much as possible; wear sunscreen (SPF 30 or higher) and cover exposed body parts until calcium levels return to normal

Supportive Supplements

| Multi-Probiotic 4000 | 1 capsule, 1-3 times daily | + Supports gastrointestinal health
+ Supports vitamin B and K metabolism
+ Helps improve absorption of nutrients from foods |
|---------------------|---------------------------|---------------------------------------------------------------------|
| Tyrosine            | 500-1000mg daily          | + Amino acid
+ Supports thyroid hormone metabolism
+ Dairy products, meats, fish, wheat, oats contain tyrosine. |
Chloride

Chloride is an electrolyte that, along with sodium and potassium, helps balance the fluid inside and outside of your cells. Chloride also helps to maintain blood pressure through proper blood volume and pH. In addition, chloride is instrumental for normal metabolism, or the process of turning food into energy. Of interest is that sea water has almost the same concentration of chloride ion as fluids found in the human body.

Pages 95-99
CHLORIDE

Reference Values
Chloride blood values
(Measured in millimoles per liter = mmol/L)

| Normal Range (Adults) | 97 – 108 mmol/L |

Why is a Chloride blood level needed?
A chloride level is tested routinely as part of your complete metabolic panel (CMP). The normal way we obtain chloride is through food and table salt, which is made up of sodium and chloride. Most of the chloride is absorbed by the gastrointestinal tract, and the excess is excreted in urine. The amount of chloride in your blood is carefully controlled by your kidneys, so out of balance chloride levels may be due to kidney problems. Your salt consumption will also affect chloride levels, as too much salt intake will increase chloride. Fluid intake also affects chloride levels.

What Life Time Fitness Lab Tests Report a Chloride value?
+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

What does a low Chloride value mean?
Low levels of chloride may indicate overhydration (too much water) or not enough salt in the diet. Profuse sweating can lead to chloride loss, as can diarrhea and vomiting. When your body is too alkaline, or basic, then your chloride level may also be low.

The following drugs can cause a depletion of sodium and chloride:
+ ACE Inhibitors
+ Bicarbonates
+ Salicylates
+ Loop Diuretics (like Lasix or furosemide)
+ Thiazide Diuretics (like hydrochlorothiazide or HCTZ)
+ Colchicine

What are steps you can take for a low chloride value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations
+ Increase your intake of more acidic foods, such as shellfish (if no allergy), fish, eggs and dairy, most meats (especially organ meats), grains (if no allergy).
+ It is best to use organic, free-range meats that are raised without chemical additives, hormones and antibiotics.
+ Increase your intake of foods with natural chloride such as celery, lettuce, olives and tomatoes
+ Decrease fluid intake.
+ Get at least 7-8 hours of sleep a night.
+ If you take antacids or sodium bicarbonate (baking soda) for stomach problems frequently, this can lead to low chloride levels. Stop taking antacids.

**Supportive Supplements**

<p>| | |</p>
<table>
<thead>
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<tr>
<td><strong>Life Time Fitness FastFuel Complete</strong></td>
<td>4 scoops (approx. 65gm) in the morning as part of a healthy beverage</td>
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</table>
|  | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend. 
+ Helps support digestive function[^368][^369] 
+ If gas or bloating occurs, change to l-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Life Time Fitness Men's or Women's Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner. |
|  | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism. [^370] |
| **Multi-Probiotic 4000** | 1 capsule, 1-3 times daily |
|  | + Supports gastrointestinal health[^371] 
+ Supports vitamin B and K metabolism[^372] 
+ Helps improve absorption of nutrients from foods |
| **Tyrosine** | 500-1000mg daily |
|  | + Amino acid 
+ Supports thyroid hormone metabolism[^373] 
+ Dairy products, meats, fish, wheat, oats contain tyrosine. |

**What does a high chloride value mean?**

A chloride level that is high can be due to too much salt (sodium/chloride) consumption, high sodium water (like mineral water), diarrhea, and excess cortisol release (high stress levels). If your body is in an acidic state (called metabolic acidosis), then you may have an elevated chloride level.

Prescription and Non-prescription Drugs that can increase chloride levels include:
+ Acetazolamide
+ Ammonium chloride
+ Androgens (including testosterone)
+ Cortisone
+ Estrogen
+ Guanethidine
+ Methyldopa
+ Non-steroidal anti-inflammatory drugs (NSAIDs), including ibuprofen (Advil, Motrin) or naproxen (Aleve)

**What are steps you can take for a high chloride level?**

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Increase your intake of alkaline foods, including figs (watch the sugar content), lima beans, apricots, spinach, turnip, raisins (again watch the sugar content), almonds/Brazil nuts. Vegetable broth and juices are alkalinizing.
+ Avoid prepackaged dinners and smoked, pickled or cured meats like jerky, hot dogs, ham and canned meats which are all high in sodium.
+ Avoid fast foods.
+ Decrease stress; yoga, exercise, meditation can help.
+ Keep well hydrated. Drink at least 2 liters of filtered water daily.
+ Avoid caffeine and alcohol, as these can lead to electrolyte disturbances.
+ IF you are using salt-free alternatives, stop and use regular salt again.
+ Get at least 7-8 hours of sleep nightly.

**Supportive Supplements**

<table>
<thead>
<tr>
<th>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</th>
<th>3 capsules in the morning after breakfast and 3 capsules with dinner.</th>
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</tr>
</thead>
</table>
| L-Theanine                                                   | 100-200mg, 1-2 times daily                                   | + Antioxidant; nutrient support  
+ Isolated from green tea  
+ Helps decrease stress and improve neurochemical balance375,376 |
| Multi-Probiotic 4000                                         | 1 capsule, 1-3 times daily                                   | + Supports gastrointestinal health377  
+ Supports vitamin B and K metabolism378  
+ Helps improve absorption of nutrients from foods |
| **Relora Plex** | 2 capsules, 1-2 times daily | + Use for stress
+ Relora® is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (Magnolia officinalis) and Phellodendron bark (Phelodendron amurense).
+ Relora Plex also contains B-vitamins, which help in stress and nervous system balance
+ Useful in stress and decreasing cortisol levels
+ Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals. |
CO2 (Carbon dioxide/ Bicarbonate)

CO2 (or carbon dioxide) is a normal by-product of respiration. We take oxygen into our lungs, where it is transferred into the blood and bound to hemoglobin inside red blood cells (RBCs). Then the oxygen is carried to the tissues for nourishment. When the oxygen is metabolized and used up, carbon dioxide is produced. CO2 is then picked up by the hemoglobin in RBCs and taken back to the lungs for exhalation into the air. RBCs contain an enzyme called carbonic anhydrase, which metabolizes CO2 into bicarbonate. Bicarbonate helps control the pH in your blood and it later excreted either via your lungs or your kidneys. Some CO2 is dissolved directly into the blood directly and a small amount is actually carried on the hemoglobin molecules. However, most CO2 is converted to bicarbonate.

More than 90% of carbon dioxide in your blood exists in the form of bicarbonate (HCO3). The remainder of the carbon dioxide is either dissolved carbon dioxide gas (CO2) or carbonic acid (H2CO3). Too much carbon dioxide in the blood can result in a condition called hypercapnia, and may represent too much CO2 in the lungs (respiratory acidosis) or metabolic alkalosis. Conversely, too little carbon dioxide in the blood results in hypocapnia, which may represent not enough CO2 in the lungs (respiratory alkalosis) or metabolic acidosis.
CO2
(CARBON DIOXIDE BICARBONATE)

Reference Values
Bicarbonate blood values
(In millimoles per liter = mmol/L)

| Normal Range (Adults) | 20 - 32 mmol/L |

Why is a CO2 blood level needed?
A CO2 level (also called bicarbonate) is tested routinely as part of your complete metabolic panel (CMP). CO2 levels help determine if you have acid/base imbalances. The CO2 level is related to the respiratory exchange of carbon dioxide in the lungs and is part of the bodies buffering system.

What Life Time Fitness Lab Tests Report a CO2 range?
+ Men's Core Health Profile
+ Women's Core Health Profile
+ Men's Longevity and Vitality Premium
+ Women's Longevity and Vitality Premium

What does a low CO2 value mean?
Low levels of CO2 are also called hypocapnia. Low CO2 levels can be caused by:
+ Chronic anxiety and stress
+ Liver/kidney problems
+ Lung problems, like pneumonia, asthma, emphysema, chronic bronchitis
+ Hyperthyroidism
+ Deep or rapid breathing (hyperventilating)
+ Pain
+ High Altitude
+ Heat exhaustion
+ Drugs such as aspirin, nicotine and Acetazolamide (Diamox)
+ Metabolic acidosis (pH of the blood is too acidic)
+ Calcium, potassium and phosphorus imbalances; hypocapnia causes a reduction of serum levels of potassium and phosphate and a reduction in free serum calcium.
+ Diabetic ketoacidosis

Better health & performance start here.
Symptoms of low CO2 levels include:

+ Anxiety
+ Dizziness
+ Headaches
+ Nausea/Vomiting
+ Diarrhea
+ Abdominal pain
+ Chest pain; heart palpitations
+ Mental confusion
+ Fast heartbeat (tachycardia)
+ Tingling in hands and feet
+ Muscle cramps and muscle contractions known as tetany
+ Visual disturbances

What are steps you can take for a low CO2 value?

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Eat foods that are less acidic. Increase your intake of alkaline (basic) foods, including figs (watch the sugar content), lima beans, apricots, spinach, turnip, raisins (again watch the sugar content), almonds/Brazil nuts. Vegetable broth and juices are alkalinizing.
+ Decrease protein intake, especially from red meats.
+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which initiates the inflammatory signaling pathways. Modifying the diet can help decrease physical and mental stress, helping balance metabolism.
+ You can increase your protein also by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with almond milk or quality water.
+ Dietary factors that decrease phosphorus include eating foods high in fructose. Fructose is found in fruits and high fructose corn syrup, which is in most condiments like ketchup and sweetened beverages.
+ Increase potassium in the diet. Potassium-rich foods include fresh fruits and vegetables, nuts, meat, and dairy. A baked potato with the skin left on is very high in potassium. A vegetarian diet can lead to potassium deficiency. Salt substitutes contain potassium, but they can lead to iodine deficiency. Make sure the salt substitute has iodine added.
+ Increase calcium-containing foods, such as green leafy vegetables and dairy products if you can tolerate dairy. If vitamin D levels are low, increase intake of vitamin D containing foods such as milk and other dairy products. Snack on almonds or Brazil nuts.
+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours, suggesting that chronic insomnia is a
disorder of sustained excitation of the body’s stress response system. A low allergen diet (no wheat, no dairy or other identified food allergens) can be helpful. Food allergies and sensitivities can elevate cortisol and histamine levels along with other stress hormones that can keep your brain overexcited and decrease your ability to sleep properly.

Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.

Decrease stress; yoga, exercise, meditation can help.

Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.

Do not microwave food in plastic containers or covered in plastic.

Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates.

Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage and Administration</th>
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+ Helps support digestive function  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| Cal/Mag 1001            | 1 tablet 2 times daily                                                                   | + Bone support  
+ Contains highly absorbable calcium, magnesium, vitamin D3, vitamin C, boron and glutamic acid.  
+ A meta analysis of 29 randomized trials showed that supplementation with calcium and vitamin D3 reduces risk of bone fractures by 24% and significantly reduces loss of bone mass. |
| L-theanine              | 100-200mg, 1-2 times daily                                                               | + Antioxidant; nutrient support  
+ Isolated from green tea  
+ Helps decrease stress and improve neurochemical balance |
| Multi-Probiotic 4000    | 1 capsule, 1-3 times daily                                                               | + Supports gastrointestinal health  
+ Supports vitamin B and K metabolism  
+ Helps improve absorption of nutrients from foods |
Relora Plex

* If under chronic stress

2 capsules, 1-2 times daily

+ Use in chronic stress
+ Relora® is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (Magnolia officinalis) and Phellodendron bark (Phelodendron amurense).
+ Relora Plex also contains B-vitamins, which help in stress and nervous system balance
+ Useful in stress and decreasing cortisol levels. Relora can increase salivary DHEA and decreases salivary morning cortisol levels.
+ Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals.

What does a high CO2 value mean?

High levels of CO2 are called hypercapnia. High levels can occur with:

+ Lung problems like chronic obstructive pulmonary disease (COPD) and emphysema
+ Severe vomiting
+ Metabolic alkalosis
+ Alcohol abuse
+ High levels of calcium
+ Motor neuron problems, like Lou Gehrig’s disease

Symptoms associated with an elevated CO2 level include:

+ Shortness of breath
+ Dizziness and loss of consciousness
+ Flushed skin
+ Rapid pulse
+ High blood pressure
+ Disorientation
+ Irregular heartbeat (arrhythmia)
+ Muscle weakness and twitches

What are steps you can take for a high CO2 level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Eat a modified lower carbohydrate diet, decreasing the amount of high starch foods like grains, breads, pastas and high carb veggies such as potatoes, corn.
+ Increase nitrogen-bearing foods, including legumes (beans) and lean red meats like bison and organic beef, fish, turkey, lamb and ostrich.
+ Avoid animal protein that has been raised with hormones whenever possible. Europe won’t accept hormone-laden U.S. beef because of the health risks. Chicken should also be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your hormone receptors to function appropriately.
+ You can increase your protein also by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with almond milk or quality water.
+ Eat more acidic foods, like meats, beans, fermented (cabbage, other vegetables), dairy (if no allergy, including yogurt, buttermilk, sour cream), eggs, liver and other organ meats, shellfish (if no food allergy) aged cheeses. Include a digestive enzyme supplement.
+ Incorporate low-calcium foods into your diet, such as chicken, cottage cheese, pinto beans, eggplant, apples, beets, grapes, tomatoes, pineapple, strawberries, cantaloupe, asparagus.
+ Increase foods that help detoxify the kidneys, including asparagus, artichoke, melons, parsley
+ Increase iron in the diet. Iron helps carry oxygen to tissues and helps with body pH balance. Dried beans are also a good source of iron, followed by dried fruits (watch sugar content), nuts, and whole grain breads and cereals. Fortification of juices, cereals, flours, and bread with iron has contributed significantly to daily dietary iron consumption, although watch your carbohydrate intake and food allergies, as wheat is a major allergen.
+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which initiates the inflammatory signaling pathways.394,395
+ Keep well hydrated. Drink at least 2 liters of filtered water daily.
+ Avoid alcohol, as these can lead to electrolyte disturbances.
+ Decrease antacid intake, especially if containing magnesium and calcium. Tums contain calcium.
+ Stop smoking and chewing tobacco.
+ Lose weight. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.
+ Get at least 7-8 hours of sleep nightly. Sleep apnea is associated with increased CO2 levels and increased oxidative stress. Lose weight – sleep apnea is directly related to belly fat and obesity
+ Exercise, even a small daily amount. This helps you sleep and will help with controlling respiration when resting. Plan a regular exercise 30-minute routine 3 to 5 times a week or work more exercise, such as walking, into your daily routine. Combination of aerobics and strength training if possible is best.
+ Don’t eat or exercise too late in the evening, as this can disrupt sleeping patterns. It is best to eat your last meal of the day before 7pm, giving your body time to digest the foods you have eaten. An evening meal that contains complex carbohydrates, such as brown rice, can help stimulate serotonin.
## Supportive Supplements

<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.</td>
</tr>
<tr>
<td>Adrenomend</td>
<td>2-4 capsules, daily with food</td>
<td>+ Used in chronic stress</td>
</tr>
<tr>
<td>Multi-Probiotic 4000</td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Supports vitamin B and K metabolism</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Helps improve absorption of nutrients from foods</td>
</tr>
<tr>
<td>Sleep Solve 24/7</td>
<td>1 capsule daily, 1 hour before bedtime</td>
<td>+ Improves sleep/wake cycles</td>
</tr>
<tr>
<td>* Use if have trouble falling or staying asleep</td>
<td></td>
<td>+ Melatonin decreased with increased cortisol levels</td>
</tr>
</tbody>
</table>
CORTISOL

Cortisol, or hydrocortisone, is a corticosteroid hormone. Corticosteroids are also called glucocorticoids, and are produced in the cortex (outer layer) of the adrenal glands. The adrenal glands are located above the kidneys (actually resting on top of them) and help regulate blood pressure, blood mineral content, regulate the body’s response to danger or stress, and help maintain healthy thyroid function through the secretion of various hormones, including the principle stress hormone cortisol.

Cortisol is released in response to stress or a sudden drop in glucocorticoids found in the blood. The release leads to increases in blood sugar levels and the storage of sugar in the liver as glycogen. Normally, the adrenal cortex secretes approximately 15-20 mg of cortisol per day. When too much cortisol is produced over long periods of time, such as in chronic stress and sleep imbalances, it promotes inflammation, alters blood sugar control and insulin resistance, causes fat storage and increased “belly” fat, affects immune function, imbalances the probiotic flora in the intestines and alters sex hormone production, all leading to imbalances in metabolism.

A stressful lifestyle can lead to consistently high levels of cortisol that can be damaging to your metabolism. A Cortisol level is a measure of your individual response to stress and adrenal imbalances. DHEA-S salivary levels are tested along with cortisol to determine adrenal function and as an indicator of stress level, mental performance, and insulin resistance.

Pages 107-114
CORTISOL

Reference Values
Cortisol blood values
(Measured in micrograms per deciliter = μg/dL)

<table>
<thead>
<tr>
<th>Normal Range (Adult)</th>
<th>2.3 - 19.4 μg/dL</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>6.2 - 19.4 μg/dL</td>
</tr>
<tr>
<td>PM</td>
<td>2.3 - 11.9 μg/dL</td>
</tr>
</tbody>
</table>

Cortisol Salivary values – for Life Time Fitness Stress and Resilience Test only
(Measured in nanograms per milliliter = ng/mL)

Normal Range (Adults):

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 - Morning</td>
<td>3.7 – 9.5 ng/ml</td>
</tr>
<tr>
<td>C2 - Noon</td>
<td>1.2 – 3.0 ng/ml</td>
</tr>
<tr>
<td>C3 - Evening</td>
<td>0.6 – 1.9 ng/ml</td>
</tr>
<tr>
<td>C4 - Night</td>
<td>0.4 – 1.0 ng/ml</td>
</tr>
</tbody>
</table>

Why is a Cortisol Salivary level needed?
High cortisol levels have wide-ranging effects on your body such as increasing inflammation, increasing blood glucose and insulin levels, decreasing thyroid hormone production, impairing immunity, and causing weight gain. Your brain chemistry is also influenced by hormones. Imbalances in thyroid, cortisol, DHEA and sex hormones can lead to depression, anxiety, insomnia, and most importantly, cognitive decline.

A cortisol salivary test is an indicator of adrenal function and is recommended with those individuals under high stress and those with fatigue, easy weight gain, brain “fogginess” and sleep disturbances. The test collects your saliva over a 24 hour period, in the morning, noon, evening, and nighttime, in order to assess the corresponding cortisol levels. In normal people, cortisol levels are very low at bedtime and highest just after waking.

What Life Time Fitness Lab Tests Report a Cortisol range?
+ Men’s Sex Hormone Premium Profile
+ Women’s Sex Hormone Premium Profile
+ Stress and Resilience (salivary level)
+ Energy and Metabolism Premium Profile
+ Cardio Metabolic Risk Profile Premium Profile
+ Men’s Longevity and Vitality Profile
+ Men’s Longevity and Vitality Premium Profile
+ Women’s Longevity and Vitality Profile
+ Women’s Longevity and Vitality Premium Profile
What does a low cortisol value mean?

Low cortisol values can be due to an impaired stress response, which has been found in many chronic illnesses. This typically results when a person has stress for prolonged periods of time and the body loses its ability to respond appropriately that results in low cortisol production. Common symptoms include fatigue, chronic pain and sensitivity to stress. Low cortisol is often confused with other problems such as depression, and has been linked to “burn out,” chronic fatigue syndrome, fibromyalgia, allergies and asthma, and more.

The following drugs can cause a depletion of cortisol:

+ Corticosteroid medicines, including prednisone, cortisone, hydrocortisone and methylprednisolone

What are steps you can take for a low cortisol value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which initiates the inflammatory signaling pathways.\textsuperscript{404,405} Modifying the diet can help decrease physical and mental stress, helping balance metabolism.
+ Eat meals at regular times each day. It’s best not to eat after 7 pm.
+ Remember to chew your food. Saliva begins the process of digestion — it tells your stomach that food is coming. Chewing your food thoroughly, rather than bolting it, is the first step in healthy digestion.
+ It is best to use organic, free-range meats that are raised without chemical additives, hormones and antibiotics.
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.
+ Avoid overeating, as this creates too much demand on your body and your digestive tract.
+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours, suggesting that chronic insomnia is a disorder of sustained excitation of the body’s stress response system.\textsuperscript{406}

**Supportive Supplements**

<table>
<thead>
<tr>
<th><strong>Cortrex</strong></th>
<th>1 capsule, 2 times daily</th>
<th>+ Contains herbs and nutrients to help balance the adrenal glands and the levels of cortisol, the stress hormone\textsuperscript{407}</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>+ Contains adrenal gland extract</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ If you have a heart condition or high blood pressure, speak to a healthcare professional before using Cortrex</td>
</tr>
<tr>
<td>Product</td>
<td>Usage &amp; Benefits</td>
<td></td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
</tbody>
</table>
| **Life Time Fitness Peak**      | **Performance Whey Protein Isolate**  
2 scoops in favorite beverage, mix and drink daily  
+ Easily digestible, high-quality protein source  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).  
+ Provides 22gm protein per 2 scoops (30gm)                                                                                                               |
| **L-theanine**                   | 100-200mg, 1-2 times daily  
+ Antioxidant; nutrient support  
+ Isolated from green tea  
+ Helps decrease stress and improve neurochemical balance                                                                                               |
| **Multi-Probiotic 4000**        | 1 capsule, 1-3 times daily  
+ Supports gastrointestinal health  
+ Supports vitamin B and K metabolism  
+ Helps improve absorption of nutrients from foods                                                                                                    |
| **Relora Plex**                 | 2 capsules, 1-2 times daily  
+ Relora® is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (Magnolia officinalis) and Phellodendron bark (Phelodendron amurense).  
+ Relora Plex also contains B-vitamins, which help in stress and nervous system balance  
+ Useful in stress and decreasing cortisol levels  
Relora can increase salivary DHEA and decreases salivary morning cortisol levels  
+ Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals. |
| **Tyrosine**                    | 500-1000mg daily  
+ Amino acid  
+ Supports thyroid hormone metabolism  
+ Dairy products, meats, fish, wheat, oats contain tyrosine.                                                                                           |

**What does a high cortisol value mean?**

High levels of CO2 are called hypercapnia. When excessive levels of cortisol are produced over long periods of time, it promotes inflammation, alters blood sugar control (hyperinsulinemia), causes fat storage and weight gain, affects immune and thyroid function, and alters sex hormone production.  
417,418,419,420
High cortisol levels block the production of serotonin (a calming neurotransmitter), which can lead to cravings for comfort foods that are usually high in carbohydrates and sugars, like chocolate, chips and pretzels. In addition, serotonin is the precursor for the primary sleep hormone melatonin. So when chronic stress is down regulating serotonin, melatonin production will suffer, and this why chronic stress can lead to insomnia.

Second, cortisol elevates blood sugar in ways that mimic diabetes. This raises insulin levels, leading to insulin resistance. When the body’s cells no longer respond well to insulin, glucose cannot be transported properly into the cells, preventing the body from breaking down fat.

Third, elevated cortisol can knock thyroid hormone levels out of balance. Thyroid hormones are critical for cellular energy and your metabolic rate that helps burn fat. High cortisol levels can lower metabolism by as much as 40%. Chronic stress can also lead to decreased levels of essential nutrients in your body, including magnesium, chromium and zinc. Magnesium is important in blood sugar regulation and in control of inflammation. Chromium is also important in blood sugar regulation, and zinc is important in the health of your immune system.

Chronic stress creates imbalances in your intestinal flora as well — the beneficial bacterial, or “probiotics,” that help keep your metabolism properly functioning. This can then result in a host of other problems such as headaches, fatigue, gas/bloating, ulcers, lack of ability to concentrate, nerve pain, skin rashes, joint pain, and decreased immune function.

Repeated exercise can induce chronically elevated cortisol levels, as can a poor diet, high in refined sugars and carbs, artificial ingredients and low in nutrient-rich, fresh vegetables.

Cortisol is made from progesterone. So if you are under lots of stress and make excessive amounts of cortisol, progesterone pools can decrease causing a shift in the estrogen to progesterone ratios. Cortisol will also block progesterone receptors, making the imbalance even greater. Cortisol also lowers DHEA. DHEA maintains normal sex hormone levels, protects immunity and is also thought to combat the effects of stress by balancing cortisol. In addition, DHEA increases insulin sensitivity, enhances fat metabolism, increases antioxidant enzyme synthesis in the liver, and protects against free radical damage. An increased cortisol level along with a decreased DHEA-S level is a good indicator that your are chronically stressed.

What are steps you can take for a high cortisol level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which initiates the inflammatory signaling pathways. Modifying the diet can help decrease physical and mental stress, helping balance metabolism.
+ Eat meals at regular times each day. It’s best not to eat after 7 pm.
+ Remember to chew your food. Saliva begins the process of digestion — it tells your stomach that food is coming. Chewing your food thoroughly, rather than bolting it, is the first step in healthy digestion.
+ Your protein requirements increase when you’re under ongoing stress — especially physical stress and illness. And even if you don’t feel ill, your body probably still needs some extra protein to heal the hidden damage metabolic imbalances have done to your intestines and other especially vulnerable areas of your body. You may want to consider adding a protein drink to your diet.
+ There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana, or other fruit in a blender with rice milk or quality water.
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.
+ Avoid overeating, as this creates too much demand on your body and your digestive tract.
+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours, suggesting that chronic insomnia is a disorder of sustained excitation of the body’s stress response system.\(^{433}\)
+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended

### Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-HTP Plus</td>
<td>1-2 capsules daily, between meals</td>
<td>+ 5-HTP Plus(^ {TM}) contains natural L-5-hydroxytryptophan (5-HTP), together with pyridoxal-5-phosphate and 50 mg of a proprietary blend of the neurotransmitters L-tyrosine and L-glutamine. + Helps improve serotonin levels, decrease food cravings(^ {434})</td>
</tr>
<tr>
<td>Adrenomend</td>
<td>2-4 capsules, daily with food</td>
<td>+ Used in chronic stress + Contains a proprietary adaptogenic herb blend that helps decrease the effects of chronic stress on the body(^ {435})</td>
</tr>
</tbody>
</table>
### Life Time Fitness LeanSource™ Weight Loss

* Use if BMI 25 or >

| 4 capliques daily, 2 with breakfast and 2 with dinner | + LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat—all promoting and sustaining weight loss. + LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements 436, 437 |

### Life Time Fitness Peak Performance Whey Protein Isolate

| 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source 438 + Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH). 439 + Provides 22gm protein per 2 scoops (30gm) |

### L-theanine

| 100mg, 1-2 times daily | + Antioxidant; nutrient support + Isolated from green tea + Helps decrease stress and improve neurochemical balance 440, 441 |

### Multi-Probiotic 4000

| 1 capsule, 1-3 times daily | + Supports gastrointestinal health 442 + Supports vitamin B and K metabolism 443 + Helps improve absorption of nutrients from foods |

### Relora Plex

| 2 capsules, 1-2 times daily | + Relora® is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (Magnolia officinalis) and Phellodendron bark (Phellodendron amurense). + Relora Plex also contains B-vitamins, which help in stress and nervous system balance + Useful in stress and decreasing cortisol levels 444 Relora can increase salivary DHEA and decreases salivary morning cortisol levels 445 + Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals. |
| **Sleep Solve 24/7** | 1 capsule daily, 1 hour before bedtime | + Improves sleep/wake cycles  
+ Melatonin decreased with increased cortisol levels[^446] |

* Use if have trouble falling or staying asleep
Creatinine

The creatinine test measures the amount of the protein, creatinine, in the blood. Creatinine is a waste product created when muscle breaks down, such as in strenuous exercise or malnutrition. Creatinine is produced from creatine, a protein of major importance for energy production in muscles. About 2% of your body’s creatine is converted to creatinine daily. The creatinine test, along with a BUN test, indicates how well your kidneys are moving toxins out of the body.

A combination of blood and urine creatinine levels may be used to calculate a creatinine clearance rate (CRCL). This test measures how effectively your kidneys are filtering small molecules such as creatinine out of your blood. Serum creatinine measurements (along with your age, weight, and gender) also are used to calculate the estimated glomerular filtration rate (eGFR).

Pages 115-119
CREATININE

Reference Values

Blood creatinine value
(Measured in milligrams per deciliter = mg/dL)

| Normal Range (adult males 15yrs and older) | 0.76 - 1.27 mg/dL |
| Normal Range (adult females 15yrs and older): | 0.57 - 1.0 mg/dL |

Why is a Creatinine blood level needed?

A creatinine level is tested routinely as part of your complete metabolic panel (CMP). A creatinine test is used together with the BUN level to determine the BUN/Creatinine ratio, an indicator of kidney health and how well your kidneys are filtering out toxins. Overall kidney function is best evaluated when looking at BUN and creatinine together, called the BUN/Creatinine Ratio. You should watch your kidney values closely as you are aging as it an indicator of kidney problems, which can be common in those with a history of high blood sugar levels and high blood pressure.

What Life Time Fitness Lab Tests Report the Creatinine value?

+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

What does a low creatinine value mean?

Low creatinine levels are not common and generally should not be of concern. Low levels may indicate a diet low in protein or a liver imbalance. Decreases in muscle mass, such as in malnutrition, extreme weight loss, protein deficiency, may also decrease creatinine levels. A low creatinine level can occur normally during pregnancy.

What are steps you can take for a low creatinine value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Increase nitrogen-bearing foods, including legumes (beans) and lean red meats like bison and organic beef.
+ Decrease phosphorus-containing food, like soft drinks, many snack foods, processed foods like processed cheeses and meats and fish sticks. Watch labels for sodium monophosphate and other names. Other foods high in phosphorus include beefalo, veal, clams, dairy products, bran cereal and almonds.
+ Soft drinks, even artificially sweetened ones, contain high levels of phosphoric acid. Phosphoric acid in the drinks can also deplete calcium from the body, leading to bone loss.*
+ When you eat foods, try to buy organic when possible. The use of chemical additives, hormones, pesticides and antibiotics in our food supply can lead to imbalances in the immune system. Foods that you should avoid include processed meats, frozen dinners, preserved meats like hot dogs or bacon, fast foods, artificial ingredients and sweeteners, anything with MSG or monosodium glutamate.
### Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage/Usage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha lipoic acid</td>
<td>500mg 2 times daily</td>
<td>+ Antioxidant&lt;sup&gt;448&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Helps improve energy production and regulate blood glucose levels&lt;sup&gt;449&lt;/sup&gt;</td>
</tr>
<tr>
<td>Life Time Fitness Creatine</td>
<td>10gm daily in divided doses for 1 week, then 5gm daily</td>
<td>+ Promotes protein synthesis and enhances muscle mass</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Important in exercise and fitness performance&lt;sup&gt;450&lt;/sup&gt;</td>
</tr>
<tr>
<td>Life Time Fitness FastFuel</td>
<td>4 scoops (approx. 65gm) in the morning as part of a healthy beverage</td>
<td>+ Contains whey protein concentrate &amp; isolate, Sunfiber&lt;sup&gt;TM&lt;/sup&gt; medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend. + Helps support digestive function&lt;sup&gt;451,452&lt;/sup&gt; + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses.</td>
</tr>
<tr>
<td>Complete</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life Time Fitness Peak Performance Whey Protein Isolate</td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>+ Easily digestible, high-quality protein source&lt;sup&gt;453&lt;/sup&gt; + Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH)&lt;sup&gt;454&lt;/sup&gt; + Provides 22gm protein per 2 scoops (30gm)</td>
</tr>
<tr>
<td>Multi-Probiotic 4000</td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health&lt;sup&gt;455&lt;/sup&gt; + Supports vitamin B and K metabolism&lt;sup&gt;456&lt;/sup&gt; + Helps improve absorption of nutrients from foods</td>
</tr>
<tr>
<td>T.A.P.S</td>
<td>1 capsule, 2 times daily</td>
<td>+ Contains liver-supportive herbs, including milk thistle, picrorhiza, artichoke and curcumin + Helps improve liver detoxification processes and provides antioxidant support for the liver&lt;sup&gt;457&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

**What does a high creatinine value mean?**

Creatinine levels that are increased may be due to kidney problems, including dehydration. The number one cause of kidney failure is diabetes, followed by hypertension, which can be a result of insulin resistance and obesity, so preventing these imbalances can improve your kidney function. A diet high in protein can also increase creatinine, as...
can exercise. If you take creatine, your creatinine levels may be higher than when you do not take the supplement. Oral medications that can increase creatinine values include:

+ Cholesterol drugs called Fibrates such as gemfibrozil (Lopid)
+ ACE inhibitors used as diuretics and blood pressure lowering; especially when given with ARB’s or angiotensin receptor binding drugs
+ NSAIDs (includes ibuprofen, naproxyn)
+ Aspirin
+ Acetaminophen
+ Methyldopa (Aldomet)
+ Sulfamethoxazole/trimethoprin (Bactrim)
+ Cimetidine (Tagamet)
+ Vancomycin (Vancocin)
+ Vitamin C

**What are steps you can take for a high creatinine level?**

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Lose weight. Studies report kidney imbalances when you are overweight or obese. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.
+ Control insulin and blood sugar levels through dietary changes. Over-consumption of simple carbohydrates like refined sugars and grains, causes unfriendly flora to grow in the GI tract. These foods also raise blood glucose and insulin levels, resulting in kidney imbalances.
+ Decrease phosphorus-containing food, like soft drinks, many snack foods, processed foods like processed cheeses and meats and fish sticks. Watch labels for sodium monophosphate and other names. Other foods high in phosphorus include beefalo, veal, clams, dairy products, bran cereal and almonds.
+ Soft drinks, even artificially sweetened ones, contain high levels of phosphoric acid. Phosphoric acid in the drinks can also deplete calcium from the body, leading to bone loss.
+ Increase fluid intake; drink at least 2 liters of filtered water daily
+ Substitute green tea for your morning coffee
+ Limit meats, at least to smaller portions and once or twice daily. Creatinine levels may be 10%-30% higher in people who eat a diet that is very high in meat.
+ Make sure to use “organic” meats and vegetables where possible to limit the potential for chemical additives and toxins.
## Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage/Use</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **Alpha lipoic acid**                          | 500mg 2 times daily                                                       | + Antioxidant[^62^]  
+ Helps improve energy production and regulate blood glucose levels[^63^]                |
| **Dual-Source Chromium as chromium polynicotinate and chromium picolinate** | 1 capsule (300mcg chromium) daily                                           | + Improves insulin regulation and glucose tolerance[^46^]  
+ Helps support serotonin levels[^65^]                                                      |
| **Life Time Fitness FastFuel Complete**         | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage    | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function[^46^,^47^]  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Multi-Probiotic 4000**                        | 1 capsule, 1-3 times daily                                                | + Supports gastrointestinal health[^68^]  
+ Supports vitamin B and K metabolism[^69^]  
+ Helps improve absorption of nutrients from foods                                              |
| **Life Time Fitness LeanSource™ Weight Loss**  | 4 capliques daily, 2 with breakfast and 2 with dinner                    | + LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat - all promoting and sustaining weight loss.  
+ LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements[^470^,^47^] |
CRP-HS
(HIGH SENSITIVITY)

CRP or C-reactive Protein is a critical component of the immune system and is a complex set of proteins that our bodies make to increase inflammation when faced with a major infection or trauma.

On average, individuals who smoke, have high blood pressure, are overweight, and fail to exercise tend to have high levels of CRP, whereas thin, athletic individuals tend to have lower levels. Over a dozen major studies demonstrate that baseline levels of CRP in apparently healthy men and women are highly predictive of future risk of heart attack, stroke, sudden cardiac death, and the development of peripheral arterial disease.

Besides being a known risk factor for heart disease, recent research has demonstrated that C-reactive protein can cause problems with the hunger-regulating protein, leptin. C-reactive protein binds with leptin, in which case the brain no longer recognizes it, and that means you will feel hungry and have a much harder time controlling your caloric intake. If those calories are from simple carbohydrates and the wrong kind of fats, (pro-inflammatory foods,) it results in more leptin-unresponsive cells and the interruption of normal physiologic control of hunger. The result: more eating, less satisfaction and obesity.

Pages 120-125
CRP-HS (HIGH SENSITIVITY)

Reference Values
CRP-hs blood value
(Measured in milligrams per liter = mg/L)

| Normal (Adult) | 0.00 – 3.0 mg/L |

Cardiovascular Risk Association
(Measured in milligrams per liter = mg/L)

| Low Risk | < 1.0 mg/L |
| Moderate Risk | 1.0 – 3.0 mg/L |
| High Risk | > 3.0 mg/L |

A CRP-hs level of > 10 mg/L should be repeated within 2 weeks.

Why is a CRP-hs level needed?
C-reactive protein (CRP) itself is not a cause of heart disease, but it is a marker for inflammation that is occurring in the body. CRP levels help determine the degree of inflammation the body is experiencing. Chronic inflammation can lead to insulin resistance and type 2 diabetes, obesity, heart diseases, immune imbalances, neurological conditions like depression, sleep disorders and, and even cancer.

What Life Time Fitness Lab Tests Report a CRP-hs range?
+ Cardio Metabolic Risk Profile
+ Cardio Metabolic Risk Premium Profile
+ Men’s Longevity and Vitality Profile
+ Men’s Longevity and Vitality Premium Profile
+ Women’s Longevity and Vitality Profile
+ Women’s Longevity and Vitality Premium Profile

What does a low CRP-hs value mean?
Since CRP-hs is a marker for inflammation in the body, a low reading will not be discussed. Anti-inflammatory medications may cause a low CRP value. These drugs include:
+ Aspirin
+ Corticosteroids like dexamethasone (Decadron), methylprednisolone (Medrol),
+ NSAIDs (non-steroidal anti-inflammatory drugs) like ibuprofen (Advil, Motrin), naproxen (Aleve, Naprosyn)
+ Statins, including mevacor (Privastatin), simvastatin (Zocor) and lovastatin (Lipitor)
What does an elevated CRP-hs value mean?

An elevated CRP-hs level generally indicates there is inflammation occurring in the body. Studies report that individuals with elevated levels of CRP have about a 2-3 times higher risk of developing heart disease than the risk of those with low levels. This doesn’t mean that if you have CRP levels that trend on the high side that a heart attack is imminent, but it does mean that there is inflammation present. There are other conditions that can raise CRP levels, including exercise and weight training, trauma/surgery, diabetes and insulin resistance, infection (including dental problems), irritable bowel and other gastrointestinal disturbances, cancer and a poor diet. Postmenopausal women who take standard estrogen or estrogen plus progesterone oral hormone replacement therapy (HRT) or oral contraception and those pregnant tend to have elevated levels of CRP. Topical hormonal therapy does not seem to increase CRP levels. The general aging process can also increase CRP levels.

What are steps you can take for a high CRP-hs level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Lose weight. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are consumed in adequate amounts it lowers health risks, especially for heart disease, and new studies are suggesting that adequate intakes may even help prevent obesity.
+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day.
+ Avoid heating the oil, but it’s great on salads and sprayed on foods.
+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and inflammation. Modifying the diet can help decrease inflammation, physical and mental stress, all helping to balance metabolism.
+ Avoid overeating, as this creates stress on the digestive tract.
+ Eat meals at regular times each day. It’s best not to eat after 7 pm.
+ Remember to chew your food. Saliva begins the process of digestion — it tells your stomach that food is coming. Chewing your food thoroughly, rather than bolting it, is the first step in healthy digestion.
+ The diet should also limit other inflammatory foods, such as processed meats, chemical preservatives, and food additives. Studies have found that nitrite or nitrate treated meats such as bacon, sausage, smoked foods, and lunch meats increase the risk of cancer.
+ High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketchup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such as liver imbalance.
+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible. Ninety percent of all pesticides used are used on our foods.
+ High-fiber foods, including fresh vegetables, and beans should be part of the diet. These foods should
supply the 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar. These foods also provide important benefits, such as antioxidant vitamins, minerals, and phytochemicals. Make sure to include green, orange, and yellow fruits and vegetables - such as broccoli, carrots, cantaloupe, and citrus fruits. Cocoa is also a significant source of antioxidants - so enjoy some low-sugar dark chocolate. The antioxidants and other nutrients in these foods may help protect against inflammatory chemistry and also help regulate immune function.485

+ Animal fat (saturated fat), which can raise blood cholesterol levels may need to be minimized. Some experts believe that saturated animal fats from animals exposed to growth hormones and pesticides may also lead to health conditions, such as hormonal imbalances and cancer and other chronic illnesses. Choose lean meats from quality sources, organic skinless poultry, and dairy products. Red meat should always be organic grass-fed when eaten and the rest of proteins should be from a variety of sources – beans, fish, chicken, turkey, buffalo/bison, and seafood.

+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.

+ A low intake of magnesium can lead to higher CRP levels.486 Magnesium from nuts and seeds to help control blood pressure and reduce blood vessel spasm. Various surveys report that between 69-73% of the U.S. population is low in dietary magnesium.

+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of inflammation than those that get regular sleep.487

+ Exercise and other physical activity are essential in managing stress and maintaining a healthy weight. At least 30 minutes of exercise daily, 5 days a week is recommended. Reduction in hs-CRP concentrations seemed to be associated with strength gains and adiposity loss.488

+ Quit smoking or tobacco use. Tobacco use is reported to increase CRP levels and inflammation489

+ Drink less alcohol.

**Supportive Supplements**

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage/Usage</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Cal/Mag 1001 | Take 1 tablet 2 times daily with food                                       | + Magnesium plays an essential role in a wide range of fundamental cellular reactions.  
+ Magnesium is involved in maintaining already normal heart function and blood pressure.490  
+ Supplies 150 mg of elemental magnesium from bioavailable magnesium citrate in each capsule |
| Ubiquinol-QH | 1 capsule (100mg) daily                                                     | + Highly absorbable coenzyme Q10 (CoQ10)  
+ Necessary for cellular energy and important in heart protection  
+ Reported to lower blood pressure.491 |
<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **Dual-Source Chromium as chromium polynicotinate and chromium picolinate** | 1 capsule (300mcg chromium) daily                                     | + Improves insulin regulation and glucose tolerance<sup>492</sup>  
+ Helps support serotonin levels<sup>493</sup> |
| **Life Time Fitness FastFuel Complete**                                  | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage   | + Contains whey protein concentrate & isolate, Sunfiber<sup>TM</sup> medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function<sup>494,495</sup>  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Life Time Fitness LeanSource™ Weight Loss**                           | 4 caplique daily, 2 with breakfast and 2 with dinner                   | + LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat - all promoting and sustaining weight loss.  
+ LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements<sup>496,497</sup> |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + Multivitamin/mineral supplement contains anti-inflammatory nutrients.  
+ Low levels of B vitamins, especially B6 (pyridoxine), are reported to be correlated with increased levels of CRP<sup>498</sup>  
+ Vitamin E is reported to decrease inflammatory markers like CRP<sup>499</sup> |
| **Life Time Fitness Omega-3 Fish Oil** | 1 – 2 capsules, 2 times daily | + Helps decrease inflammation and the consequences it has on your metabolism. \(^{500}\)
+ Studies have reported that fish oil significantly lowers C reactive protein, compared to omega 6 fats like safflower oil. \(^{500,502}\)
+ Helps support heart and blood vessel health. \(^{503,504}\)
+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction. \(^{505}\) |
| **Multi-Probiotic 4000** | 1 capsule, 1-3 times daily | + Supports gastrointestinal health\(^{506}\)
+ Supports vitamin B and K metabolism\(^{507}\)
+ Helps improve absorption of nutrients from foods
+ Helps decrease inflammation including CRP levels\(^{508}\) |
| **Perfusia SR** | 2 capsules 2 times daily; each cap contains 1,000mg time release L-arginine | + Perfusia SR\(^{5}\) contains sustained-release L-arginine, an amino acid which helps support vascular health by improving nitric oxide production and use.\(^{509}\)
+ Individuals with a known herpes infection should not take L-arginine without also taking lysine (500-1,000mg daily), as L-arginine alone has been noted to cause herpes eruptions in susceptible individuals. |
DHEA or dehydroepiandrosterone, is produced mainly in the adrenal glands. DHEA helps to make the body’s sex hormones, including testosterone, estrone, and estradiol. In males, DHEA assists the development of male secondary sexual characteristics at puberty and can be metabolized into the male sex hormones testosterone and androstenedione. In women, DHEA can be made into estrogen. It is estimated that from 30-50% of testosterone in men and about 75% of estrogen in women is derived from DHEA. While the main role of DHEA is to maintain normal sex hormone levels, it also helps combat the effects of stress by balancing the stress hormone cortisol and protecting the immune system. In addition, DHEA increases insulin sensitivity, enhances fat metabolism, increases antioxidant enzyme synthesis in the liver, and protects against free radical damage.\textsuperscript{510,511}

DHEA is also involved in the conversion of T4 thyroid hormone to T3, the active form of thyroid hormone. Thyroid hormones drive cellular metabolism and give the body energy. DHEA helps with immunity, food cravings, memory and cognition, and general well-being.\textsuperscript{512}

Since DHEA does not last very long in the serum, the highest level of DHEA is in the sulfated form, called DHEA-S, which provides a ready source of DHEA for the production of estrogens and androgens. This is tested in the salivary DHEA test with cortisol (Life Time Fitness Stress and Resilience Test).

Pages 126-133
DHEA

Reference Values
DHEA-S salivary values - for Life Time Fitness Stress and Resilience Test only
(Measured in nanograms per milliliter = ng/mL)

DHEA-S (women):

<table>
<thead>
<tr>
<th>Ages</th>
<th>DHEA-S (ng/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Ages</td>
<td>2 – 19</td>
</tr>
<tr>
<td>Ages 16-30</td>
<td>6.4 – 18.6</td>
</tr>
<tr>
<td>Ages 31-45</td>
<td>3.9 – 11.4</td>
</tr>
<tr>
<td>Ages 46-60</td>
<td>2.7 – 8.0</td>
</tr>
<tr>
<td>Ages 61-75</td>
<td>2 – 6</td>
</tr>
</tbody>
</table>

After Supplementation (12-24hrs):

<table>
<thead>
<tr>
<th>Supplement</th>
<th>DHEA-S (ng/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral DHEA (25mg)</td>
<td>2.8 – 8.6</td>
</tr>
<tr>
<td>Topical DHEA (10mg)</td>
<td>3 – 8</td>
</tr>
</tbody>
</table>

DHEA-S (men):

<table>
<thead>
<tr>
<th>Ages</th>
<th>DHEA-S (ng/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Ages</td>
<td>2 – 23</td>
</tr>
<tr>
<td>Ages 16-30</td>
<td>7 – 23</td>
</tr>
<tr>
<td>Ages 31-45</td>
<td>6.0 – 18</td>
</tr>
<tr>
<td>Ages 46-60</td>
<td>4.0 – 11.5</td>
</tr>
<tr>
<td>Ages 61-75</td>
<td>2.4 – 7.5</td>
</tr>
</tbody>
</table>

After Supplementation (12-24hrs):

<table>
<thead>
<tr>
<th>Supplement</th>
<th>DHEA-S (ng/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral DHEA (25mg)</td>
<td>6 – 17</td>
</tr>
<tr>
<td>Topical DHEA (10mg)</td>
<td>4 – 15</td>
</tr>
</tbody>
</table>

Blood:
(ug/dL – micrograms per deciliter)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>DHEA-S (ug/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male/Female ages 15-16</td>
<td>39-481</td>
</tr>
<tr>
<td>Male/Female ages 17-19</td>
<td>40-491</td>
</tr>
<tr>
<td>Male/Female, ages &gt;19</td>
<td>31-701</td>
</tr>
</tbody>
</table>

Why is a DHEA level needed?
Salivary DHEA-S levels are obtained to determine stress and hormone levels. DHEA blood levels are important to determine hormonal balance (testosterone, estrogen) when using the blood test and adrenal function when using a saliva test. As we age, our levels of DHEA declines, so testing becomes very important for a balanced metabolism.
What Life Time Fitness Lab Tests Report a DHEA value?

+ Men's Sex Hormone Premium Profile
+ Women's Sex Hormone Premium Profile
+ Stress and Resilience (salivary test)
+ Energy and Metabolism Premium Profile
+ Men's Longevity and Vitality Profile
+ Men's Longevity and Vitality Premium Profile
+ Women's Longevity and Vitality Profile
+ Women's Longevity and Vitality Premium Profile

What does a low DHEA value mean?

Low levels of DHEA are found in adrenal gland “burn out,” hormonal imbalances and/or pituitary gland problems. As people age, their levels of DHEA decline naturally.513

In post-menopausal women, low levels of DHEA have been associated with musculoskeletal pain and imbalances in estrogens and progesterone that may play a pivotal role in the development of bone disorders, obesity and belly fat accumulation.514,515 Imbalances in the Cortisol/DHEA ratio have been found to alter metabolism and lead to metabolic syndrome.516

During periods of chronic stress, the release of the stress hormone cortisol can decrease levels of DHEA, lowering immunity and potentially accelerating aging processes. Studies have found that DHEA therapy in women with adrenal insufficiency can help sexual side effects often seen during menopause, such as lowered libido.517

Low levels of DHEA have also been linked to increased weight gain and a decrease in bone mineral density (which can lead to osteoporosis).518 DHEA is involved in the regulation of glucose-6-phosphate, which can increase oxidative stress and inflammatory signaling, leading to glucose regulatory problems.519 Medications that deplete DHEA include:

+ Corticosteroids, including dexamethasone (Decadron), methylprednisolone (Medrol) and hydrocortisone
+ Insulin

What are steps you can take for a low DHEA level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.
+ Use olive oil in cooking. Avoid heating the oil, but it’s great on salads and sprayed on foods.
+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible.
+ High-fiber foods, including fresh vegetables, and beans should be part of the diet. These foods should supply the 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar. Such foods also provide important benefits, such as
antioxidant vitamins, minerals, and phytochemicals. Make sure to include green, orange, and yellow fruits and vegetables - such as broccoli, carrots, cantaloupe, and citrus fruits. The antioxidants and other nutrients in these foods may help protect against inflammatory chemistry and also help regulate immune function.\(^{520}\)

+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which initiates the inflammatory signaling pathways and imbalances DHEA levels.\(^{521,522}\) Modifying the diet can help decrease physical and mental stress, helping balance metabolism.

+ Eat meals at regular times each day. It’s best not to eat after 7 pm.
+ Remember to chew your food. Saliva begins the process of digestion — it tells your stomach that food is coming. Chewing your food thoroughly, rather than bolting it, is the first step in healthy digestion.
+ Your protein requirements increase when you’re under ongoing stress — especially physical stress and illness. And even if you don’t feel ill, your body probably still needs some extra protein to heal the hidden damage metabolic imbalances have done to your intestines and other especially vulnerable areas of your body. You may want to consider adding a protein drink to your diet.
+ There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana, or other fruit in a blender with rice milk or quality water.
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.
+ Avoid overeating, as this creates too much demand on your body and your digestive tract.
+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours, suggesting that chronic insomnia is a disorder of sustained excitation of the body’s stress response system.\(^{523}\) This can also imbalance DHEA-S.
+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.
+ If you are a man or woman needing hormonal replacement therapy, talk to your doctor about natural alternatives, including bio-identical hormone therapy (BHT).
+ Stop smoking. DHEA-S levels are directly influenced by tobacco smoke.\(^{524}\)

**Supportive Supplements**

<table>
<thead>
<tr>
<th><strong>Life Time Fitness Men's or Women's Performance Daily Multivitamin AM/PM</strong></th>
<th>3 capsules in the morning after breakfast and 3 capsules with dinner.</th>
<th>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.(^{525})</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DHEA (dehyroepiandosterone)</strong> 50mg daily; depending upon laboratory results</td>
<td>50mg daily; depending upon laboratory results</td>
<td>+ Supports DHEA levels</td>
</tr>
<tr>
<td>Product</td>
<td>Usage</td>
<td>Benefits</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Life Time Fitness FastFuel Complete          | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function.  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| Life Time Fitness Omega-3 Fish Oil           | 1-2 capsules, 2 times daily                                           | + Helps decrease inflammation and the consequences it has on your metabolism.  
+ Helps support heart and blood vessel health.  
+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction. |
| Life Time Fitness Peak Performance Whey Protein Isolate | 2 scoops in favorite beverage, mix and drink daily                   | + Easily digestible, high-quality protein source.  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).  
+ Provides 22gm protein per 2 scoops (30gm) |
| Multi-Probiotic 4000                         | 1 capsule, 1-3 times daily                                            | + Supports gastrointestinal health  
+ Supports vitamin B and K metabolism  
+ Helps improve absorption of nutrients from foods  
+ Helps decrease inflammation including CRP levels |

Better health & performance start here.
Relora Plex

*Use if chronic stress is present

| 2 capsules, 1-2 times daily | + Use in chronic stress
+ Relora® is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (Magnolia officinalis) and Phellodendron bark (Phellodendron amurense).
+ Relora Plex also contains B-vitamins, which help in stress and nervous system balance
+ Useful in stress and decreasing cortisol levels\(^5\) Relora can increase salivary DHEA and decreases salivary morning cortisol levels\(^6\)
+ Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals.

What does a high DHEA value mean?

High DHEA levels can signal hormonal imbalances due to adrenal gland problems. In women, overproduction of DHEA can cause menstruation to stop and lead to development of male characteristics, including excessive facial or body hair, male pattern baldness, masculinity or a deep voice. A high DHEA level in women has been linked to PCOS or polycystic ovary syndrome.\(^5\)

What are steps you can take for a high DHEA value?

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.
+ Use olive oil in cooking. Avoid heating the oil, but it’s great on salads and sprayed on foods.
+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible.
+ High-fiber foods, including fresh vegetables, and beans should be part of the diet. These foods should supply the 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar. Such foods also provide important benefits, such as antioxidant vitamins, minerals, and phytochemicals. Make sure to include green, orange, and yellow fruits and vegetables - such as broccoli, carrots, cantaloupe, and citrus fruits. The antioxidants and other nutrients in these foods may help protect against inflammatory chemistry and also help regulate immune function.\(^4\)
+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined
sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which initiates the inflammatory signaling pathways and imbalances DHEA levels. Modifying the diet can help decrease physical and mental stress, helping balance metabolism.

+ Eat meals at regular times each day. It’s best not to eat after 7 pm.
+ Remember to chew your food. Saliva begins the process of digestion — it tells your stomach that food is coming. Chewing your food thoroughly, rather than bolting it, is the first step in healthy digestion.
+ Your protein requirements increase when you’re under ongoing stress — especially physical stress and illness. And even if you don’t feel ill, your body probably still needs some extra protein to heal the hidden damage metabolic imbalances have done to your intestines and other especially vulnerable areas of your body. You may want to consider adding a protein drink to your diet.
+ There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana, or other fruit in a blender with rice milk or quality water.
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. A minimum of Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.
+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours, suggesting that chronic insomnia is a disorder of sustained excitation of the body’s stress response system. This can also imbalance DHEA.
+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.
+ If you are a man or woman needing hormonal replacement therapy, talk to your doctor about natural alternatives, including bio-identical hormone therapy (BHT).
+ Stop smoking. DHEA levels are directly influenced by tobacco smoke.

Supportive Supplements

| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.
<p>| Life Time Fitness FastFuel Complete | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate &amp; isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend. + Helps support digestive function. + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |</p>
<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage/Directions</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **Life Time Fitness Omega-3 Fish Oil**       | 1-2 capsules, 2 times daily                                                       | + Helps decrease inflammation and the consequences it has on your metabolism<sup>548</sup>  
+ Helps support heart and blood vessel health<sup>549,550</sup>  
+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction.<sup>551</sup> |
| **Life Time Fitness Peak Performance Whey Protein Isolate** | 2 scoops in favorite beverage, mix and drink daily                                | + Easily digestible, high-quality protein source<sup>552</sup>  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH)<sup>553</sup>  
+ Provides 22gm protein per 2 scoops (30gm)                                                                                                                   |
| **Multi-Probiotic 4000**                     | 1 capsule, 1-3 times daily                                                        | + Supports gastrointestinal health<sup>554</sup>  
+ Supports vitamin B and K metabolism<sup>555</sup>  
+ Helps improve absorption of nutrients from foods  
+ Helps decrease inflammation including CRP levels<sup>556</sup>                                                                                       |
| **Relora Plex**                              | 2 capsules, 1-2 times daily                                                       | + Relora<sup>®</sup> is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (Magnolia officinalis) and Phellodendron bark (Phelodendron amurense).  
+ Relora Plex also contains B-vitamins, which help in stress and nervous system balance  
+ Useful in stress and decreasing cortisol levels<sup>557</sup>  
Relora can increase salivary DHEA and decreases salivary morning cortisol levels<sup>558</sup>  
+ Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals. |

<sup>*</sup> If chronic stress is present
Estradiol is in the estrogen family, which also include estrone and estriol. Estradiol is produced by the ovaries from estrone. Estradiol is generally thought of as the most potent estrogen, meaning it binds to estrogen receptors very strongly. Smaller amounts of estradiol are also produced by the adrenal glands and (in men), by the testes. In both sexes, testosterone is converted to estradiol. In the blood, estradiol is largely bound to sex hormone-binding globulin (SHBG) and also to albumin.

Estradiol levels in young girls are very low, but as puberty approaches (between the ages of 8 and 14), the pituitary gland in the brain begins to secrete two hormones: luteinizing hormone (or LH) and follicle-stimulating hormone (or FSH). These two hormones stimulate the ovaries to make estradiol and secondary sex female characteristics associated in puberty, including breast development, genital growth, and changes in the distribution of body fat.

Estradiol also stimulates the growth of the lining of the uterus in the first 2 weeks of the monthly cycle, and it helps in triggering ovulation. Estradiol has many protective effects on the body, including maintaining bone density, improving growth hormone production and release, improving blood vessel flexibility, keeping your blood from getting “sticky” and clotting, aiding in the absorption of nutrients (including calcium, magnesium and zinc), supporting brain health, memory and mood, assisting in growth hormone release, and improving your cholesterol and triglyceride profiles.

For women, it is important to compare the relationship between estradiol and progesterone in evaluating menopausal symptoms such as hot flashes, mood disorders, and aging skin.

Estrogens convert into several metabolites. Estradiol is metabolized into 2-hydroxyestradiol, 4-hydroxyestradiol and 16-hydroxyestradiol. 2-hydroxyestradiol is known as a “good estrogen” metabolite, while 16-hydroxyestradiol and 4-hydroxyestradiol (“bad” estrogens) have been associated with the development of certain types of cancer, like breast and ovarian, ovarian cysts, fibrocystic disease and uterine fibroids. In men, this same estradiol metabolism issue can cause prostate problems as they age, as well leading to prostate tissue growth. Metabolism of estrogens occurs in several areas of the body — however, the main spots are the liver and GI tract. Your diet is very important if you want to have hormonal balance. It is very important to keep the metabolism of estrogen from making the “bad” metabolites.
ESTRADIOL

Reference Values
Estradiol blood value
(Measured in picograms per milliliter = pg/mL)

Normal Ranges:

<table>
<thead>
<tr>
<th>Category</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>7.6 – 42.6 pg/mL</td>
</tr>
<tr>
<td>Women, Follicular</td>
<td>12.5 – 166.0 pg/mL</td>
</tr>
<tr>
<td>Women, Ovulation</td>
<td>85.8 – 498.0 pg/mL</td>
</tr>
<tr>
<td>Women, Luteal</td>
<td>43.8 – 211.0 pg/mL</td>
</tr>
<tr>
<td>Women, Postmenopausal</td>
<td>&lt;6.0 – 54.7 pg/mL</td>
</tr>
<tr>
<td>Women, Pregnancy (1st trimester)</td>
<td>215.0 – 4300.0 pg/mL</td>
</tr>
</tbody>
</table>

Why is an Estradiol level needed?
This test measures the amount of estradiol in the blood. Estradiol is a common form of estrogen, and levels may help determine if there are hormonal imbalances in men and women.

What Life Time Fitness Lab Tests Report an Estradiol range?
+ Women’s Sex Hormone Profile
+ Women’s Sex Hormone Premium Profile
+ Women’s Longevity and Vitality Profile
+ Women’s Longevity and Vitality Premium Profile

What does a low Estradiol value mean?
Women experiencing menopause will have decreased levels of estradiol due to the ovaries producing less estrogens. This decrease is often accompanied by hot flashes and night sweats, a rise in incidence of heart disease, and an increasing rate of bone loss (osteoporosis). Estrogen replacement for alleviation of menopausal symptoms has become very common, although studies have reported that hormonal replacement with synthetic estrogens can lead to adverse health events. In 2002, the Women’s Health Initiative (WHI) study of postmenopausal women with an average age of 65 and older found that taking PremPro, a synthetic conjugated estrogen in combination with progestin a synthetic analog of progesterone, increased the risk of breast cancer (26%), heart disease (29%), stroke (41%), and blood clots (200%) versus women who were taking placebo. Another part of the WHI found that women on PremPro had double the risk of developing dementia in the 65 and up age group. In both men and women, low levels of estradiol are associated with osteoporosis.

Drugs that can decrease levels of estradiol include:
+ Oral contraceptives
+ Anticonvulsants
+ Clomiphene (Clomid, Serophene)
What are steps you can take for a low Estradiol level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Increase foods with phytoestrogens, including soy (if no allergy), pomegranate, resveratrol from red wine and flax seed. Phytoestrogens may help reduce the risk of hormonally related health problems, like menopause symptoms, breast cancer, prostate cancer and heart disease along with helping protect against bone loss. Additionally, they may help reduce the risk of hormonally related health problems, like menopause symptoms, breast cancer, prostate cancer and heart disease along with helping protect against bone loss.564
+ There are great foods that can help improve the conversion of estrogen into “good” metabolites and away from “bad” metabolites. These foods include insoluble dietary fibers such as lignin found in flaxseeds, bran, beans, and seeds.565
+ Dietary fiber improves the composition of intestinal bacteria, reduces beta-glucuronidase. Dietary fiber intake also increases serum concentrations of SHBG, a protein that binds to estrogen. This helps to reduce levels of free estrogens and the chance of developing estrogen receptor positive cancers like most breast cancer.566
+ Eat more fresh fruits and vegetables. Diets low in fruits (such as apples, grapefruit and oranges) and cruciferous vegetables (such as broccoli, cabbage, and Brussels sprouts) may result in a relative deficiency of calcium-D-glucarate and its metabolites, which help metabolize estrogen into its healthy forms. To increase calcium-containing foods, such as green leafy vegetables and dairy products if you can tolerate dairy. If vitamin D levels are low, increase intake of vitamin D containing foods such as milk and other dairy products. Snack on almonds or Brazil nuts.
+ Soft drinks, even artificially sweetened ones, contain high levels of phosphoric acid. Phosphoric acid in the drinks can deplete calcium from the body, leading to bone loss.567
+ Decrease caffeine intake. Caffeine has been reported to negatively affect vitamin D and bone formation.568
+ Decrease stress – chronic stress leads to imbalances in metabolism and hormonal imbalances. Caffeine is included in tea, coffee and chocolate.
+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible. Currently the foods that are on the most-contaminated list are peaches, apples, sweet bell peppers, celery, nectarines, strawberries, cherries, lettuce, imported grapes, pears, spinach, and potatoes. Pesticides are known hormone disruptors and have been proven to have estrogenic activity.
+ Avoid animal protein that has been raised with hormones whenever possible. Europe won’t accept hormone-laden U.S. beef because of the health risks. But don’t forget about chicken — it should be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your hormone receptors to function appropriately.
+ Control insulin and blood sugar levels through dietary changes. Over-consumption of simple carbohydrates like refined sugars and grains, causes unfriendly flora to grow in the GI tract. These foods also raise blood glucose and insulin levels, resulting in adverse influences on sex hormone balance.569 Belly fat is a factory for making the enzyme aromatase which increases estrone production.
+ Excess carbohydrates have also been associated with postmenopausal breast cancer risk among overweight women and women with large waist circumference.570 Men who are insulin resistant are also more likely to have reduced testosterone secretion.571
+ Lose weight. Studies report imbalances in hormone levels when you are overweight or obese.572 If you are overweight or obese based on your BMI (body mass index), then consider Life Time Fitness LeanSource Weight Loss Supplement.
+ The diet should be focused on limiting inflammatory foods, such as processed meats, chemical preservatives, and food additives. High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketchup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such as hormonal imbalances.  
+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. A minimum of six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.
+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have more chances of hormonal imbalances.
+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.
+ Limit drinking out of plastic containers. Plastics contain residues, including phthalates and bisphenol A (BPA), that can bind to estrogen receptors and disrupt hormonal balance.
+ Do not microwave food in plastic containers or covered in plastic.
+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates. Phthalates and other chemicals used in plastic have estrogen like binding ability and can cause hormone imbalances.

**Supportive Supplements**

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage/Instructions</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| DIM                  | 2 capsules daily                                                                     | + DIM™ is a synergistic combination of plant based ingredients including diindolylmethane, curcumin, green tea, and wasabia, which helps support healthy hormone balance by improving estrogen metabolism.  
                        |                                                                                      |                                                                          |
| Calcium-d-glucarate  | 500mg, 1-2 times daily                                                              | + Improves estrogen metabolism                                          |
| Life Time Fitness FastFuel Complete | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
                        |                                                                                      | + Helps support digestive function                                       |
                        |                                                                                      | + If gas or bloating occurs, change to l-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |

Better health & performance start here.
**Life Time Fitness LeanSource™ Weight Loss**

* Use if BMI 25 or >

| 4 capliques daily, 2 with breakfast and 2 with dinner | + LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat - all promoting and sustaining weight loss. + LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements. |

**Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM**

| 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism. |

**Multi-Probiotic 4000**

| 1 capsule, 1-3 times daily | + Supports gastrointestinal health. + Supports vitamin B and K metabolism. + Helps improve absorption of nutrients from foods |

**Ultra-D Tox**

| 1-2 capsules 2 times daily; use for 2-3 weeks | + Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C. + Helps support digestive function + Helps clear the body of environmental toxins |

**What does a high Estradiol value mean?**

In men, high levels of estradiol are associated with abdominal fat, chronic inflammation, enlargement of the prostate and cardiovascular risk. As estrogen levels increase with age, lower testosterone reduces sexual arousal and sensation and causes loss of libido, a common problem in aging men. As men age, their serum hormone binding globulin (SHBG) starts to increase leading to a decrease in free testosterone. At the same time, their estrogen levels start to increase. This is partly because aging men convert much of their testosterone into estradiol with an enzyme called aromatase. Of the remaining testosterone, much of it is bound to SHBG. As long as free testosterone is low and relative estrogen (estradiol and estrone) is high, a man will store fat around his belly, hence the “pot belly”. Belly fat cells can create aromatase, thereby decreasing testosterone and increasing estradiol, which then increases prostate growth. So the more overweight a man is, the higher his estradiol level will be.

High estradiol levels in ovulating women can lead to decreases in pregnancy rate. High estradiol levels in women, however, lower the incidence of heart disease in postmenopausal women. Drugs that can increase estradiol levels include:

+ Corticosteroids (including prednisone, cortisone, hydrocortisone and methylprednisolone)
+ Antibiotics including ampicillin and tetracycline
+ Estrogen-containing drugs, including hormonal replacement therapy
+ Phenothiazines (including chlorpromazine and promethazine)
Certain pesticides are called endocrine (hormone) disruptors and can lead to hormonal imbalances, insulin resistance and diabetes. Make sure to wash your foods well and eat organic foods grown without pesticides.

**What are steps you can take for a high Estradiol value?**

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ There are great foods that can help improve the conversion of estrogen into “good” metabolites and away from “bad” metabolites. These foods include insoluble dietary fibers such as lignin found in flaxseeds, bran, beans, and seeds.
+ Dietary fiber improves the composition of intestinal bacteria, reduces beta-glucuronidase. Dietary fiber intake also increases serum concentrations of SHBG, a protein that binds to estrogen. This helps to reduce levels of free estrogens and the chance of developing estrogen receptor positive cancers like most breast cancer. Dietary fiber also decrease the conversion of testosterone into estrogens in fat and breast cells.
+ Eat more fresh fruits and vegetables. Diets low in fruits (such as apples, grapefruit and oranges) and cruciferous vegetables (such as broccoli, cabbage, and brussel sprouts) may result in a relative deficiency of calcium-D-glucarate and its metabolites, which help metabolize estrogen into its healthy forms.
+ Zinc is important for men and prostate health. Increase your zinc intake. The best dietary sources of zinc are lean meats, liver, eggs, and seafood (especially oysters, but make sure they are from a good source). Whole grain breads and cereals are also good sources of zinc, but limit your carbohydrate intake as this can lead to insulin resistance, blood sugar imbalances and weight gain.
+ Decrease stress – chronic stress leads to imbalances in metabolism and hormonal imbalances.
+ Decrease meat consumption, especially red meats. Studies have found that those consuming less fat, especially saturated fat, have significantly lower estrone and estradiol levels compared to meat eaters.
+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible. Currently the foods that are on the most-contaminated list are peaches, apples, sweet bell peppers, celery, nectarines, strawberries, cherries, lettuce, imported grapes, pears, spinach, and potatoes.
+ Avoid animal protein that has been raised with hormones whenever possible. Europe won’t accept hormone-laden U.S. beef because of the health risks. But don’t forget about chicken — it should be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your hormone receptors to function appropriately.
+ Choose other forms of protein, such as beans and soy (if no allergy). Your protein requirements increase when you’re under ongoing stress — especially physical stress and illness. And even if you don’t feel ill, your body probably still needs some extra protein to heal the hidden damage metabolic imbalances have done to your intestines and other especially vulnerable areas of your body. You may wants to consider adding a protein drink to your diet.
+ There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana (limit this due to high glycemic index), or other fruit in a blender with rice milk or quality water.
+ Control insulin and blood sugar levels through dietary changes. Over-consumption of simple carbohydrates like refined sugars and grains, causes unfriendly flora to grow in the GI tract. These foods also raise blood glucose and insulin levels, resulting in adverse influences on sex hormone balance.
Excess carbohydrates have also been associated with postmenopausal breast cancer risk among overweight women and women with large waist circumference. Studies report imbalances in hormone levels when you are overweight or obese. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.

The diet should limit inflammatory foods, such as processed meats, chemical preservatives, and food additives. High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketchup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such as hormonal imbalances.

Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.

Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.

Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have more chances of hormonal imbalances.

Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.

Limit drinking out of plastic containers. Plastics contain residues, including phthalates and bisphenol A (BPA), that can bind to estrogen receptors and disrupt hormonal balance.

Do not microwave food in plastic containers or covered in plastic.

Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates. Phthalates and other chemicals used in plastic have estrogen like binding ability and can cause hormone imbalances.

**Supportive Supplements**

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Calcium-d-glucarate</strong></td>
<td>500mg, 1-2 times daily</td>
<td>+ Improves estrogen metabolism</td>
</tr>
<tr>
<td><strong>DIM</strong></td>
<td>2 capsules daily</td>
<td>+ DIM™ is a synergistic combination of plant based ingredients including diindolylmethane, curcumin, green tea, and wasabia, which helps support healthy hormone balance by improving estrogen metabolism.</td>
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</tbody>
</table>

Better health & performance start here.
<table>
<thead>
<tr>
<th><strong>Life Time Fitness FastFuel Complete</strong></th>
<th>4 scoops (approx. 65gm) in the morning as part of a healthy beverage</th>
<th>+ Contains whey protein concentrate &amp; isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.&lt;br&gt; + Helps support digestive function&lt;sup&gt;605,606&lt;/sup&gt;&lt;br&gt; + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses.</th>
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</thead>
<tbody>
<tr>
<td><strong>Life Time Fitness LeanSource™ Weight Loss</strong>&lt;br&gt;* Use if BMI 25 or &gt;</td>
<td>4 capliques daily, 2 with breakfast and 2 with dinner</td>
<td>+ LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat - all promoting and sustaining weight loss.&lt;br&gt; + LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements&lt;sup&gt;607,608&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</strong></td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.&lt;sup&gt;609&lt;/sup&gt;</td>
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<tr>
<td><strong>Life Time Fitness Peak Performance Whey Protein Isolate</strong></td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>+ Easily digestible, high-quality protein source&lt;sup&gt;610&lt;/sup&gt;&lt;br&gt; + Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH)&lt;sup&gt;611&lt;/sup&gt;&lt;br&gt; + Provides 22gm protein per 2 scoops (30gm)</td>
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<td><strong>Ultra-D Tox</strong></td>
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<td>+ Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C.&lt;br&gt; + Helps support digestive function&lt;br&gt; + Helps clear the body of environmental toxins</td>
</tr>
</tbody>
</table>
ESTROGEN, TOTAL

The total estrogen test measures the total amounts of the most important estrogens including estradiol, estriol, and estrone in the blood.

Estrone (E1) the main estrogen made by women after menopause, is implicated in breast, uterine, and prostate problems including cancer. Before menopause, the body makes estradiol out of estrone in the ovaries. After menopause however, estrone is no longer converted to estradiol. Once a woman reaches menopause, estrone production is made by fat cells, the liver, and the adrenal glands. Your body still needs estrogens so these areas of manufacturing have to pick up the pace. It is interesting to note that obese women have a higher rate of breast cancer and increased estrone production is thought to be a significant factor. Alcohol consumption also makes your body favor estrone production — that could be the reason for the association between alcohol intake and breast cancer.

Estradiol (E2), the potent estrogen, is produced in the ovaries and has many protective effects including maintaining bone density, improving growth hormone production and vascular flexibility, keeping your blood from getting sticky, supporting cognitive function and mood, assisting in growth hormone release, and improving your cholesterol and triglyceride levels.

Estradiol is also the primary cardio-protective estrogen. Too much estradiol can be associated with estrogen-related cancers, but deficiencies can lead to osteoporosis, heart disease, dementia and other problems associated with aging. In men high estradiol can cause prostate problems as they age, as well leading to prostate tissue growth.

Estriol (E3) is the weakest of the three estrogens and has a protective role in breast tissue. It is believed to protect vaginal and urethra tissue as well. Estriol helps to reduce hot flashes in women, protects the urinary tract, and plays a role in retention of bone density. It can help increase “good” HDL and decrease “bad” LDL cholesterol, so it is heart protective. Estriol blocks the effects of estrone by occupying estrogen receptor sites. This is important in estrogen balance, as more estrone is related to health issues.

Estrogens convert into several metabolites. Estradiol is metabolized into 2-hydroxyestradiol, 4-hydroxyestradiol and 16-hydroxyestradiol. 2-hydroxyestradiol is known as a “good estrogen” metabolite, while 16-hydroxyestradiol and 4-hydroxyestradiol ("bad" estrogens) have been associated with the development of certain types of cancer, like breast and ovarian, ovarian cysts, fibrocystic disease and uterine fibroids. In men, this same estradiol metabolism issue can cause prostate problems as they age, as well leading to prostate tissue growth. Metabolism of estrogens occurs in several areas of the body — however, the main spots are the liver and GI tract. Your diet is very important if you want to have hormonal balance. It is very important to keep the metabolism of estrogen from making the “bad” metabolites.
ESTROGEN, TOTAL

Reference Values
Blood
(in picograms per milliliter = pg/ml)

Female Cycle

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Days 1-10</strong></td>
<td>61-394 pg/mL</td>
</tr>
<tr>
<td><strong>Days 11-20</strong></td>
<td>122-437 pg/mL</td>
</tr>
<tr>
<td><strong>Days 21-30</strong></td>
<td>156-350 pg/mL</td>
</tr>
<tr>
<td><strong>Postmenopausal</strong></td>
<td>&lt;40 pg/mL</td>
</tr>
</tbody>
</table>

Adult male
40 – 115 pg/ml

Why is a Total Estrogen level needed?
This test measures the amount of estradiol, estrone and estriol in the blood. Estrogen measurements are used to evaluate hormonal imbalances in women and men.

As women age their estradiol levels go down and their estrone levels increase. In men, their relative estradiol and estrone levels go up. Both men and women will make more estrogens if they accumulate visceral (belly) fat. Excessive estrogen makes cells grow, which can affect the ovaries and breast in women and the prostate tissue in men.

Estrogen is needed particularly in women to make serotonin receptors function in the brain — serotonin, is a feel good brain chemical. With low estrogen levels, your mood can change to anxiousness and depression. Estradiol has cardio-protective effects, so as women enter menopause and lose their estradiol production, they actually have a higher heart disease risk than men.

Estrogen also helps keep bones strong — women and men are more susceptible to bone loss with low estradiol levels. Skin wrinkling is accelerated as estrogen is lost from a woman’s body. Cognitive function — critical thinking and short-term memory — are eroded with the loss of estrogen production.

What Life Time Fitness Lab Tests Report a Total Estrogen range?
+ Women’s Sex Hormone Profile
+ Women’s Sex Hormone Premium Profile
+ Women’s Longevity and Vitality Profile
+ Women’s Longevity and Vitality Premium Profile

What does a low Total Estrogen value mean?
Women experiencing menopause will have decreased levels of estradiol due to the ovaries producing less estrogen.
This decrease is often accompanied by hot flashes and night sweats, a rise in incidence of heart disease, and an increasing rate of bone loss (osteoporosis). Estrogen replacement for alleviation of menopausal symptoms has become very common, although studies have reported that hormonal replacement with synthetic estrogens can lead to adverse health events. In 2002, the Women’s Health Initiative (WHI) study of postmenopausal women with an average age of 65 and older found that taking PremPro, a synthetic conjugated estrogen in combination with progestin, increased the risk of breast cancer (26%), heart disease (29%), stroke (41%), and blood clots (200%) versus women who were taking placebo. Another part of the WHI found that women on PremPro had double the risk of developing dementia in the 65 and up age group. Women with low body fat, such as athletes and models, often do not produce sufficient amounts of sex hormones. These women can experience cessation of menstruation, develop bone loss and other metabolic imbalances.

Drugs that can decrease levels of estradiol include:
+ Oral contraceptives
+ Anticonvulsants
+ Clomiphene (Clomid, Serophene)

What are steps you can take for a low Total Estrogen level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations
+ Increase foods with phytoestrogens, including soy (if no allergy), pomegranate, resveratrol from red wine and flax seed. Phytoestrogens may help reduce the risk of hormonally related health problems, like menopause symptoms, breast cancer, prostate cancer and heart disease along with helping protect against bone loss.
+ There are foods that can help improve the conversion of estrogen into “good” metabolites and away from “bad” metabolites. These foods include insoluble dietary fibers such as lignin found in flaxseeds, bran, beans, and seeds.
+ Eat more fresh fruits and vegetables. Diets low in fruits (such as apples, grapefruit and oranges) and cruciferous vegetables (such as broccoli, cabbage, and Brussels sprouts) may result in a relative deficiency of calcium-D-glucarate and its metabolites, which help metabolize estrogen into its healthy forms.
+ Increase calcium-containing foods, such as green leafy vegetables and dairy products if you can tolerate dairy. If vitamin D levels are low, increase intake of vitamin D containing foods such as milk and other dairy products. Snack on almonds or Brazil nuts.
+ Soft drinks, even artificially sweetened ones, contain high levels of phosphoric acid. Phosphoric acid in the drinks can deplete calcium from the body, leading to bone loss.
+ Decrease caffeine intake. Caffeine has been reported to negatively affect vitamin D and bone formation. Caffeine is included in tea, coffee and chocolate.
+ Decrease stress — chronic stress leads to imbalances in metabolism and hormones.
+ Exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible. Currently the foods that are on the most-contaminated list are peaches, apples, sweet bell peppers, celery, nectarines, strawberries, cherries, lettuce, imported grapes, pears, spinach, and potatoes.
+ Avoid animal protein that has been raised with hormones whenever possible. Chicken should be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that
act to reduce inflammation chemistry and help your hormone receptors to function appropriately. Excess carbohydrates have also been associated with postmenopausal breast cancer risk among overweight women and women with large waist circumference.632 Men who are insulin resistant are also more likely to have reduced testosterone secretion.633

Studies report imbalances in hormone levels when you are overweight or obese.634 Higher body weight also predisposes you to bone loss.635 If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.

The diet should limit inflammatory foods, such as processed meats, chemical preservatives, and food additives. High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketchup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such as hormonal imbalances.636

Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.

Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.

Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have more chances of hormonal imbalances.637

Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.

Limit drinking out of plastic containers. Plastics contain residues, including phthalates and bisphenol A (BPA), that can bind to estrogen receptors and disrupt hormonal balance.638

Do not microwave food in plastic containers or covered in plastic.

Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates. Phthalates and other chemicals used in plastic have estrogen like binding ability and can cause hormone imbalances.

**Supportive Supplements**

<table>
<thead>
<tr>
<th><strong>Calcium-d-glucarate</strong></th>
<th>500mg, 1-2 times daily</th>
<th>+ Improves estrogen metabolism639</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIM</strong></td>
<td>2 capsules daily</td>
<td>+ DIM™ is a synergistic combination of plant based ingredients including diindolylmethane, curcumin, green tea, and wasabia, which helps support healthy hormone balance by improving estrogen metabolism.640</td>
</tr>
</tbody>
</table>

Better health & performance start here.
Life Time Fitness FastFuel Complete

- 4 scoops (approx. 65gm) in the morning as part of a healthy beverage
- + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.
- + Helps support digestive function.  
  + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses.

Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM

- 3 capsules in the morning after breakfast and 3 capsules with dinner.
- + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.

Multi-Probiotic 4000

- 1 capsule, 1-3 times daily
- + Supports gastrointestinal health
- + Supports vitamin B and K metabolism
- + Helps improve absorption of nutrients from foods

Ultra-D Tox

- 1-2 capsules 2 times daily; use for 2-3 weeks
- + Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C.
- + Helps support digestive function
- + Helps clear the body of environmental toxins

What does a high Total Estrogen value mean?

Estrone is the estrogen that is associated with the development of breast cancer in women and men and prostate cancer in men. Decreasing estrone is important in menopausal and postmenopausal women and andropausal men.

In men, high levels of estradiol are associated with abdominal fat, chronic inflammation, enlargement of the prostate and cardiovascular risk. As estrogen levels increase with age, lower testosterone reduces sexual arousal and sensation and causes loss of libido, a common problem in aging men. As men age, their serum hormone binding globulin (SHBG) starts to increase leading to a decrease in free testosterone. At the same time, their estrogen levels increase. This is partly because aging men convert much of their testosterone into estradiol with an enzyme called aromatase. Of the remaining testosterone, much of it is bound to SHBG. As long as free testosterone is low and relative estrogen (estradiol and estrone) is high, a man will store fat around his belly, hence the “pot belly.” Belly fat cells can create aromatase, thereby decreasing testosterone and increasing estradiol, which then increases prostate growth. So the more overweight a man is, the higher his estradiol level will be.
High estradiol levels in ovulating women can lead to decreases in pregnancy rates. However, lower the incidence of heart disease in postmenopausal women. Drugs that can increase estradiol levels include:

- Corticosteroids (including prednisone, cortisone, hydrocortisone and methylprednisolone)
- Antibiotics including ampicillin and tetracycline
- Estrogen-containing drugs, including hormonal replacement therapy
- Phenothiazines (including chlorpromazine and promethazine)

Certain pesticides called endocrine (hormone) disruptors can lead to hormonal imbalances, insulin resistance and diabetes. Make sure to wash your foods well and eat organic foods grown without pesticides.

**What are steps you can take for a high Total Estrogen level?**

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

- There are great foods that can help improve the conversion of estrogen into “good” metabolites and away from “bad” metabolites. These foods include insoluble dietary fibers such as lignin found in flaxseeds, bran, beans, and seeds.
- Dietary fiber intake increases serum concentrations of SHBG, a protein that binds to estrogen. This helps to reduce levels of free estrogens and the chance of developing estrogen receptor positive cancers like most breast cancer. Dietary fiber also decrease the conversion of estosterone into estrogens in fat and breast cells.
- Eat more fresh fruits and vegetables. Diets low in fruits (such as apples, grapefruit and oranges) and cruciferous vegetables (such as broccoli, cabbage, and brussel sprouts) may result in a relative deficiency of calcium-D-glucarate and its metabolites, which help metabolize estrogen into its healthy forms.
- Zinc is important for men and prostate health. Increase your zinc intake. The best dietary sources of zinc are lean meats, liver, eggs, and seafood (especially oysters, but make sure they are from a good source). Whole grain breads and cereals are also good sources of zinc, but limit your carbohydrate intake as this can lead to insulin resistance, blood sugar imbalances and weight gain.
- Decrease stress – chronic stress leads to imbalances in metabolism and hormones.
- Decrease meat consumption, especially red meats. Studies have found that those consuming less fat, especially saturated fat, have significantly lower estrone and estradiol levels compared to meat eaters.
- The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible. Currently the foods that are on the most-contaminated list are peaches, apples, sweet bell peppers, celery, nectarines, strawberries, cherries, lettuce, imported grapes, pears, spinach, and potatoes.
- Avoid animal protein that has been raised with hormones whenever possible. Chicken should be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your hormone receptors to function appropriately.
- Choose other forms of protein, such as beans and soy (if no allergy). Your protein requirements increase when you’re under ongoing stress — especially physical stress and illness. And even if you don’t feel ill, your body probably still needs some extra protein to heal the hidden damage metabolic imbalances have done to your intestines and other especially vulnerable areas of your body. You may want to consider adding a protein drink to your diet.
There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana (limit this due to high glycemic index), or other fruit in a blender with rice milk or quality water.

Excess carbohydrates have also been associated with postmenopausal breast cancer risk among overweight women and women with large waist circumference. Men who are insulin resistant are also more likely to have reduced testosterone secretion.

Studies report imbalances in hormone levels when you are overweight or obese. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.

Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.

Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.

Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have more chances of hormonal imbalances.

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**Supportive Supplements**

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium-d-glucarate</td>
<td>500mg, 1-2 times daily</td>
<td>+ Improves estrogen metabolism&lt;sup&gt;663&lt;/sup&gt;</td>
</tr>
<tr>
<td>DIM</td>
<td>2 capsules daily</td>
<td>+ DIM&lt;sup&gt;™&lt;/sup&gt; is a synergistic combination of plant based ingredients including diindolylmethane, curcumin, green tea, and wasabia, which helps support healthy hormone balance by improving estrogen metabolism&lt;sup&gt;664&lt;/sup&gt; + Use in men and women</td>
</tr>
<tr>
<td>Product Name</td>
<td>Dosage</td>
<td>Benefits</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Life Time Fitness FastFuel Complete                            | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage   | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner.   | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism. |
| Life Time Fitness Omega-3 Fish Oil                             | 1-2 capsules, 2 times daily                                             | + Helps decrease inflammation and the consequences it has on your metabolism.  
+ Helps support heart and blood vessel health.  
+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction. |
| Multi-Probiotic 4000                                           | 1 capsule, 1-3 times daily                                              | + Supports gastrointestinal health  
+ Supports vitamin B and K metabolism  
+ Helps improve absorption of nutrients from foods |
| Ultra-D Tox                                                    | 1-2 capsules 2 times daily; use for 2-3 weeks                          | + Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C.  
+ Helps support digestive function  
+ Helps clear the body of environmental toxins                 |
ESTRONE

Estrone is in the estrogen family, which also include estradiol and estriol. Estrone is the main estrogen made by women after menopause. Steroid hormones, like estrogens, are made from cholesterol. Before menopause, your body makes estradiol (the major, protective estrogen) from estrone in the ovaries. After menopause however, estrone is no longer converted to estradiol. Once a woman reaches menopause, estrone production is made by fat cells, the liver, and the adrenal glands and the ovaries no longer make estradiol from the estrone. As women age their estradiol levels decline and their estrone levels increase. As men age, their relative estradiol and estrone levels increase. Both men and women will make more estrogens if they accumulate visceral (belly) fat.

Since estrone is the most cancer promoting of the estrogens, it is no surprise that the majority of breast cancer occurs in post-menopausal women. It is interesting to note that obese women have a higher rate of breast cancer and increased estrone production is thought to be a significant factor. Alcohol consumption also makes your body favor estrone production — that could be the reason for the association between alcohol intake and breast conditions like cancer. In men, elevated estrone is linked to prostate problems.

Estrogens convert into several metabolites. Estrone, for example, may convert into three different forms, including 2-hydroxyestrone, 4-hydroxyestrone and 16-alpha-hydroxyestrone. 2-hydroxyestrone is known as a “good estrogen” metabolite, while 16-alpha-hydroxyestrone and 4-hydroxyestrone (“bad” estrogens) have been associated with the development of certain types of cancer, like breast and ovarian, ovarian cysts, fibrocystic disease and uterine fibroids. In men, this same estrone metabolism issue can cause prostate problems as they age, as well leading to prostate tissue growth.

Metabolism of estrogens occurs in several areas of the body — however, the main spots are the liver and GI tract. Your diet is very important if you want to have hormonal balance.
**ESTRONE**

**Reference Values**

Blood  
(*Blood, in picograms/milliliter = pg/mL*)

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Men</strong></td>
<td><strong>Normal Range</strong></td>
</tr>
<tr>
<td></td>
<td>12 - 72 pg/mL</td>
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</tbody>
</table>

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<tbody>
<tr>
<td><strong>Women</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Follicular phase</strong></td>
<td>37 – 138 pg/mL</td>
</tr>
<tr>
<td><strong>Midcycle</strong></td>
<td>60 – 229 pg/mL</td>
</tr>
<tr>
<td><strong>Luteal phase</strong></td>
<td>50 – 114 pg/mL</td>
</tr>
<tr>
<td><strong>Postmenopausal</strong></td>
<td>14 – 103 pg/mL</td>
</tr>
</tbody>
</table>

**Why is an Estrone level needed?**

This test measures the amount of estrone in the blood. Estrone is a common form of estrogen, and levels may help determine if there are hormonal imbalances in men and women. Concentrations of estrone in women will vary quite a lot day to day, especially during menstruation.

**What Life Time Fitness Lab Tests Report an Estrone range**

+ Men’s Sex Hormone Profile  
+ Men’s Sex Hormone Premium Profile  
+ Women’s Sex Hormone Profile  
+ Women’s Sex Hormone Premium Profile  
+ Men’s Longevity and Vitality Profile  
+ Men’s Longevity and Vitality Premium Profile  
+ Women’s Longevity and Vitality Profile  
+ Women’s Longevity and Vitality Premium Profile

**What does a low Estrone value mean?**

*See low estradiol levels in the Life Time Fitness Estrogen Panel for more information*

**What does a high Estrone value mean?**

Estrone is metabolized into 3 forms, 2-hydroxyestrone, 4-hydroxyestrone and 16-alpha-hydroxyestrone. High levels of “bad” estrone metabolites, including 16-alpha-hydroxyestrone and 4-hydroxyestrone, have been associated with heart disease, obesity, the development of certain types of cancer, like breast and ovarian, ovarian cysts, PCOS or polycystic ovary disease, fibrocystic disease and uterine fibroids. High estrone in men is associated with an increase in prostate problems, including cancer. It is important to keep estrone metabolism driven toward the...
“good” metabolite, 2-hydroxyestrone, in order to prevent imbalances in metabolism and the development of health problems.

Certain pesticides are called endocrine (hormone) disruptors and can lead to hormonal imbalances, insulin resistance and diabetes. Make sure to wash your foods well and eat organic foods grown without pesticides.

What are steps you can take for a high Estrone level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

- There are great foods that can help improve the conversion of estrogen into “good” metabolites and away from “bad” metabolites. These foods include insoluble dietary fibers such as lignin found in flaxseeds, bran, beans, and seeds. Dietary fiber improves the composition of intestinal bacteria, reduces beta-glucuronidase. Dietary fiber intake also increases serum concentrations of SHBG, a protein that binds to estrogen. This helps to reduce levels of free estrogens and the chance of developing estrogen receptor positive cancers like most breast cancer.

Dietary fiber also decrease the conversion of testosterone into estrogens in fat and breast cells.

- Dietary fiber improves the composition of intestinal bacteria, reduces beta-glucuronidase. Dietary fiber intake also increases serum concentrations of SHBG, a protein that binds to estrogen. This helps to reduce levels of free estrogens and the chance of developing estrogen receptor positive cancers like most breast cancer.

Dietary fiber also decrease the conversion of testosterone into estrogens in fat and breast cells.

- Eat more fresh fruits and vegetables. Diets low in fruits (such as apples, grapefruit and oranges) and cruciferous vegetables (such as broccoli, cabbage, and brussel sprouts) may result in a relative deficiency of calcium-D-glucarate and its metabolites, which help metabolize estrogen into its healthy forms.

- Decrease stress — chronic stress leads to imbalances in metabolism and hormonal imbalances.

- Decrease meat consumption, especially red meats. Studies have found that those consuming less fat, especially saturated fat, have significantly lower estrone and estradiol levels compared to meat eaters.

- The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible. Currently the foods that are on the most-contaminated list are peaches, apples, sweet bell peppers, celery, nectarines, strawberries, cherries, lettuce, imported grapes, pears, spinach, and potatoes.

- Avoid animal protein that has been raised with hormones whenever possible. Europe won’t accept hormone-laden U.S. beef because of the health risks. But don’t forget about chicken — it should be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your hormone receptors to function appropriately.

- Choose other forms of protein, such as beans and soy (if no allergy). Your protein requirements increase when you’re under ongoing stress — especially physical stress and illness. And even if you don’t feel ill, your body probably still needs some extra protein to heal the hidden damage metabolic imbalances have done to your intestines and other especially vulnerable areas of your body. You may want to consider adding a protein drink to your diet.

- There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana (limit this due to high glycemic index), or other fruit in a blender with rice milk or quality water.

- Control insulin and blood sugar levels through dietary changes. Over-consumption of simple carbohydrates like refined sugars and grains, causes unfriendly flora to grow in the GI tract. These foods also raise blood glucose and insulin levels, resulting in adverse influences on sex hormone balance.
+ Excess carbohydrates have also been associated with postmenopausal breast cancer risk among overweight women and women with large waist circumference.\textsuperscript{686} Men who are insulin resistant are also more likely to have reduced testosterone secretion.\textsuperscript{687}

+ Lose weight. Studies report imbalances in hormone levels when you are overweight or obese.\textsuperscript{688} If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.

+ The diet should limit inflammatory foods, such as processed meats, chemical preservatives, and food additives. High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketchup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such as hormonal imbalances.\textsuperscript{689}

+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.

+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.

+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have more chances of hormonal imbalances.\textsuperscript{649}

+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 3-5 days a week is recommended.

+ Limit drinking out of plastic containers. Plastics contain residues, including phthalates and bisphenol A (BPA), that can bind to estrogen receptors and disrupt hormonal balance.\textsuperscript{691}

+ Do not microwave food in plastic containers or covered in plastic.

+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates. Phthalates and other chemicals used in plastic have estrogen like binding ability and can cause hormone imbalances.\textsuperscript{692}

+ Decrease alcohol consumption.

**Supportive Supplements**

<p>| DIM | 2 capsules daily | + DIM\textsuperscript{TM} is a synergistic combination of plant based ingredients including diindolymethane, curcumin, green tea, and wasabia, which helps support healthy hormone balance by improving estrogen metabolism.\textsuperscript{693} |</p>
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<thead>
<tr>
<th>Product</th>
<th>Dosage/Description</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **Life Time Fitness FastFuel Complete** | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage              | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function.  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Life Time Fitness LeanSource™ Weight Loss** | 4 caplique daily, 2 with breakfast and 2 with dinner | + LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat - all promoting and sustaining weight loss.  
+ LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner.              | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism. |
| **Life Time Fitness Peak Performance Whey Protein Isolate** | 2 scoops in favorite beverage, mix and drink daily                               | + Easily digestible, high-quality protein source.  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).  
+ Provides 22gm protein per 2 scoops (30gm) |
| **Multi-Probiotic 4000**        | 1 capsule, 1-3 times daily                                                          | + Supports gastrointestinal health  
+ Supports vitamin B and K metabolism  
+ Helps improve absorption of nutrients from foods |
| **Saw Palmetto Max-V™**         | For men: 1 capsule 2 times daily                                                   | + Used for prostate problems  
+ Studies indicate that saw palmetto may be able to inhibit the conversion of testosterone to its more active and potentially damaging form, dihydrotestosterone (DHT), via inhibition of alpha-5-reductase. |
<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage and Usage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ubiquinol-QH</td>
<td>1 capsule (100mg) daily</td>
<td>+ Highly absorbable coenzyme Q10 (CoQ10) + Necessary for cellular energy and important in heart protection.</td>
</tr>
<tr>
<td>Ultra-D Tox</td>
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<td>+ Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C. + Helps support digestive function + Helps clear the body of environmental toxins</td>
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FERRITIN

Ferritin is a protein that binds to iron stored in the body. Ferritin production is stimulated by the presence of iron in the blood. Thus, the ferritin test is an indirect measure of the amount of iron that is stored in the body for future use. Low levels might indicate iron deficiency anemia (too little iron). High levels are associated with hemochromatosis (too much iron) and inflammation.

Iron plays a role in many biochemical pathways. The primary functions of iron involve oxygen transport within blood and muscle, electron transfer in relation to the cellular uptake of oxygen, and the conversion of blood sugar to energy. Iron is also a part of many enzymes that are involved with making new cells, amino acids, hormones, and neurotransmitters. Iron exists in various forms in the body: in functional forms (in hemoglobin and in enzymes) and in transport and storage forms (ferritin, transferrin, and hemosiderin). Free iron in the blood can be toxic, leading to an increase in free radical production and oxidative stress.

Briefly, free radicals are highly unstable and highly reactive molecules (usually oxygen molecules gone haywire) in the body. Free radicals are formed as a result of the normal energy production that goes on in all the cells of our body. If free radicals are not quickly neutralized after being produced, they bounce around in the body and can damage our cell membranes and organs in the body, leading to imbalances in metabolism. This is called oxidative stress. Think of oxidative stress like rusting – it occurs naturally as a normal by-product of metabolism. If toxins are not eliminated, then excessive free-radical damage can occur, leading to chronic health problems and at the very least accelerated aging. Increased oxidative stress is linked to most imbalances in metabolism, including hormonal (thyroid, adrenal, sex), neurochemistry (brain chemicals), weight gain, gastrointestinal, blood sugar regulation, heart and blood vessel, kidney, liver and cancer.

Thyroid hormone, insulin and insulin growth factor-1 are involved in the control of ferritin. Ferritin and iron balance can cause many disorders, including problems with iron absorption, transport and storage (called hemochromatosis) as well as in atherosclerosis, Parkinson’s disease, Alzheimer disease, and restless leg syndrome. Genetic mutations in the ferritin gene can lead to inflammation, infections, autoimmune conditions like lupus and cancer. Low thyroid hormones decrease the acidity of the stomach, thereby decreasing the absorption of iron and can lead to iron deficiencies like anemia. Low ferritin can mean that hypothyroidism or subclinical hypothyroidism is present. See Life Time Fitness Thyroid Panel for more information.

Pages 156-161
FERRITIN

Reference Values

Ferritin value
(Measured in nanograms per milliliter = ng/ml)

<table>
<thead>
<tr>
<th>Normal Range (adult males)</th>
<th>30 - 400 ng/ml</th>
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<tbody>
<tr>
<td>Normal Range (adult females)</td>
<td>13 – 150 ng/ml</td>
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Why is a Ferritin level needed?
Ferritin levels in the blood are tested to determine the amount of iron stored in the body. Ferritin levels are generally used to determine if there is iron overload (too much iron) or iron deficiency in the body. Ferritin levels in the blood are also used as a marker for thyroid hormone imbalances.

What Life Time Fitness Lab Tests Report a Ferritin range?
+ Energy and Metabolism Profile
+ Energy and Metabolism Premium Profile
+ Men’s Longevity and Vitality Premium Profile
+ Women’s Longevity and Vitality Premium Profile

What does a low Ferritin value mean?
Low levels of ferritin in the blood are an indication of iron deficiency that can lead to a type of anemia in which there isn’t enough of the oxygen carrying molecules in the blood. Iron is necessary in forming hemoglobin, the molecule that carries oxygen in red blood cells to tissues. When iron levels in hemoglobin get low, you can feel fatigued and lack energy due to a lack of oxygen to tissues and organs. A loss of blood (including menstruation in women or gastric ulcers), pregnancy or a diet poor in iron can lead to low ferritin and iron levels. Overuse of drugs that can lead to ulcers can also cause low ferritin and iron levels, including anti-inflammatory drugs like ibuprofen (Motrin, Advil), naproxen (Naprosyn, Aleve), indomethacin (Indocin) and others. Certain cancers, such as colon cancer, can lead to low ferritin and iron levels.

Low ferritin can suggest low levels of thyroid hormones. It is important to support thyroid function with a low ferritin level. Low thyroid hormone levels lead to less energy and also decreases the amount of acid in your stomach, leading to problems absorbing nutrients from foods including iron. Iron needs acid to be absorbed from the foods we eat, so low thyroid and acid leads to low iron and ferritin levels. Eating an unhealthy diet, high in refined carbohydrates and sugars, full of high fructose corn syrup and chemical additives can also lead to thyroid imbalances. Low thyroid levels can also lead to heavier periods in women, which can lower ferritin and iron levels. Low iron levels also decrease deiodinase activity, which slows down the conversion of the thyroid hormone T4 to T3 (the active thyroid hormone).

Some symptoms of low ferritin in the body:
+ Fatigue and weakness
+ Dizziness
+ Headaches
+ Irritability
+ Loss of libido or sex drive
+ Pale skin
+ Sore mouth corners
+ Burning sensation of the tongue
+ Urge to eat mud or chalk (geophagy)

Drugs that can cause a low iron level include:

+ Aspirin and salicylates
+ Cholestyramine
+ Colestipol
+ H-2 receptor antagonists including cimetidine, famotidine, nizatidine, and ranitidine
+ Indomethacin
+ Levothyroxine
+ Quinolone antibiotics, including Levaquin and Cipro
+ Tetracyclines

What are steps you can take for a low Ferritin value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Increase your consumption of animal proteins, including meats and seafood. Liver and other organ meats are especially high in iron. Dairy products also contain iron, but not in the same amount, so combining different animal sources is best.
+ Liver is by far the richest iron-containing food, although when eating organ meats you definitely should buy organic, no hormone and antibiotic meats. Other good sources of iron-rich foods include fish and poultry.
+ There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana (limit this due to high glycemic index), or other fruit in a blender with rice milk or quality water.
+ Eat green leafy vegetables, including broccoli, kale and spinach, on a regular basis. Iron in vegetables is not as quickly or readily absorbed as iron from animal sources, but it is still valuable. Other vegetable sources of iron include beans and peas.
+ Dried beans are also a good source of iron, followed by dried fruits (watch sugar content), nuts, and whole grain breads and cereals. Fortification of juices, cereals, flours, and bread with iron has contributed significantly to daily dietary iron consumption, although watch your carbohydrate intake and food allergies, as wheat is a major allergen.
+ Decrease using antacids and OTC medications for ulcers (like Zantac, Tagamet and Pepcid) that lower the stomach acid. Lower acid production will lead to low iron levels.
+ Stop smoking.
+ Exercise appropriately, 30 minutes daily at least 3-5 times a week.
### Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dose and Method</th>
<th>Benefits and Notes</th>
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</table>
| **Life Time Fitness FastFuel Complete**       | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage            | + Contains whey protein concentrate & isolate, Sunfiber-medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function\(^{716,717}\)  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner.            | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.\(^{718}\) |
| **Life Time Fitness Peak Performance Whey Protein Isolate** | 2 scoops in favorite beverage, mix and drink daily                               | + Easily digestible, high-quality protein source.\(^{719}\)  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).\(^{720}\)  
+ Provides 22gm protein per 2 scoops (30gm) |
| **Multi-Probiotic 4000**                      | 1 capsule, 1-3 times daily                                                      | + Supports gastrointestinal health\(^{721}\)  
+ Supports vitamin B and K metabolism\(^{722}\)  
+ Helps improve absorption of nutrients from foods |
| **Thyro Mend**                                | 1 capsule, 2 times daily with food                                              | + Thyro-Mend™ is a proprietary combination of iodine from seaweeds and synergistic herbs that support thyroid function.  
+ Thyro-Mend™ helps maintain proper iodine levels necessary for an increase in thyroid hormone production.\(^{723}\) |
| **Time Release Iron**                         | 2 tablets daily with meals                                                      | + Specially designed to provide 54 mg of carbonyl iron (Ferronyl\(^{®}\)) per serving for a 6- to 8-hour period.  
+ Use with caution in men |

*Use if iron levels are low*
What does a high Ferritin value mean?

High ferritin generally means a high iron level. The free radicals produced by excess iron can cause a high level of oxidative stress in the body, which can lead to blood sugar imbalances, chronic inflammation, sleep problems, liver and heart problems, chronic infection, hormonal imbalances, autoimmune disorders, and some types of cancer including breast and prostate. An abnormally high ferritin level can also indicate thyroid imbalances. If an organ that contains ferritin like the liver, spleen or bone marrow is damaged, an increase in ferritin levels can be seen even with a normal iron level. Ferritin can also be increased due to genetic problems.

High levels of ferritin can lead to iron being deposited in the body, such as in the joints or skin, that leads to symptoms like pain and darkening of the skin. Other signs of high ferritin levels include:

+ Fatigue, tiredness
+ Abdominal pain
+ Lack of sex drive

What are steps you can take for a high Ferritin level?

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Several foods contain high amounts of iron. You may want to avoid vitamin and mineral supplements that contain iron, especially if you are a man. Also avoid iron-fortified foods such as juices, some breakfast cereals, and especially avoid beef, liver, and pork.
+ Decrease protein intake from meat. Choose other forms of protein, such as beans and soy (if no allergy). Your protein requirements increase when you’re under ongoing stress — especially physical stress and illness. And even if you don’t feel ill, your body probably still needs some extra protein to heal the hidden damage metabolic imbalances have done to your intestines and other especially vulnerable areas of your body. You may want to consider adding a protein drink to your diet.
+ There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana (limit this due to high glycemic index), or other fruit in a blender with rice milk or quality water.
+ Nonalcoholic fatty liver disease (NAFLD) is a common condition associated with obesity and metabolic syndrome. Inappropriate dietary fat intake, excessive intake of soft drinks (due to high fructose corn syrup), insulin resistance caused by eating too much refined sugar and carbohydrates and increased oxidative stress due to a poor diet combine to increase fat in the liver.
+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. Fatty acid balance improves immunity.
+ The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods should be eliminated. These contaminants can lower your immunity. Buy organic foods where possible.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.  
+ Control insulin and blood sugar levels through dietary changes. Over-consumption of simple carbohydrates like refined sugars and grains, causes unfriendly flora to grow in the GI tract. These foods also raise blood glucose and insulin levels, resulting in chronic inflammation.  
+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli), garlic, onions  
+ Increase water intake – stay hydrated; a minimum of 2 liters of filtered water daily is recommended  
+ Limit alcohol intake  
+ Substitute green tea for your morning coffee and increase your citrus fruit consumption. Both contain chemicals that can decrease iron absorption and lower its level.

**Supportive Supplements**

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<th>Supplement</th>
<th>Dosage and Formulation</th>
<th>Benefits</th>
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| Alpha lipoic acid | 500mg 1-2 times daily | + Antioxidant  
+ Helps improve energy production and regulate blood glucose levels  

| Dual-Source Chromium as chromium polynicotinate and chromium picolinate | 1 capsule (300mcg chromium) daily | + Improves insulin regulation and glucose tolerance  
+ Helps support serotonin levels  

| L-glutamine | 1-4 capsules (500mg-2 grams) daily in divided doses | + Supports digestive tract tissue and immune function  

| Life Time Fitness Peak Performance Whey Protein Isolate | 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH)  
+ Provides 22gm protein per 2 scoops (30gm)  

| N-acetyl cysteine (NAC) | 500 - 750mg, 1-2 times daily | + Liver support  
+ Improves glutathione (antioxidant) stores in the liver  

| T.A.P.S | 1 capsule, 2 times daily | + Contains liver-supportive herbs, including milk thistle, picrorhiza, artichoke and curcumin  
+ Helps improve liver detoxification processes and provides antioxidant support for the liver.
FIBRINOGEN

Fibrinogen is a component of blood clotting. It is made in the liver from sugar and protein (called glycoprotein) and converted to fibrin by thrombin during blood clotting. Fibrin is the molecule that starts forming a “mesh” during injury and bleeding so that blood will clot. Fibrinogen levels have been directly linked to inflammation in the body and to the risk of developing heart disease.

Pages 162-169
FIBRINOGEN

Reference Values
Fibrinogen value
(Measured in milligrams per deciliter = mg/dL)

| Normal Range (Adult, antigen): | 180 – 350 mg/dL |

Why is a Fibrinogen level needed?
Fibrinogen is generally ordered with other blood clotting tests. Fibrinogen levels are a reflection of your blood’s clotting ability and activity. Also, increased fibrinogen levels have been linked to chronic inflammation and heart disease. Fibrinogen levels are often used along with C-reactive protein (CRP) levels to determine your risks for developing heart disease (see Life Time Fitness CRP-hs Panel).

What Life Time Fitness Lab Test Reports a Fibrinogen level?
+ CardioMetabolic Risk Premium

What does a low Fibrinogen value mean?
Low levels of fibrinogen may decrease your body’s ability to form a blood clot. Chronic low levels may be related to a genetic disorder (afibrinogenemia or hypofibrinogenemia), a blood transfusion, cancer (including lung and prostate) or due to liver damage or severe malnutrition. An acute low level of fibrinogen can be due to a clot that travels in the blood, called DIC or disseminated intravascular clot.

Many over-the-counter (OTC) and prescription drugs contain aspirin and should only be used under the supervision of a doctor if you have low fibrinogen levels. Aspirin-containing drugs include:

+ Alka Seltzer
+ Anacin
+ ASA
+ Bufferin
+ Ecotrin
+ Excedrin
+ Fiorinal
+ Percodan

What are steps you can take for a low Ferritin value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations
+ Make sure to take a Life Time Fitness Men and Women’s AM/PM Multivitamin/mineral to make sure you are getting the right nutrients.
+ Increase foods high in vitamin K. The major source of Vitamin K is green, leafy, vegetables — kale, collards, spinach, and turnip greens are the highest.
+ Increase vitamin B12 containing foods. Vitamin B12 is produced by microbial synthesis in the digestive tract of animals. Therefore, animal protein products are the source of this nutrient. Organ meats are the best source of vitamin B12, followed by clams, oysters, beef, eggs, milk, chicken, and cheese. If you are eating meat, buy organic and all natural meat. Do not buy processed meats, packaged meats, deli meats unless the meat does not have chemical additives. Choose lean meats from quality sources, skinless poultry, and nonfat or low-fat or nonfat dairy products. Red meat should always be organic grass-fed when eaten and free of hormones and antibiotics. Get the rest of protein from a variety of sources like beans, fish, chicken, turkey, buffalo/bison, and seafood.

+ Increase folic acid containing foods. Folic acid occurs in a wide variety of foods, including dark green leafy vegetables, brewer’s yeast, liver, and eggs. Other good sources are beets, broccoli, Brussels sprouts, asparagus, orange juice, cabbage, cauliflower, cantaloupe, kidney and lima beans, wheat germ, and whole grain cereals and breads. Limit your breads though, as high carbohydrate diets can lead to insulin resistance, hormonal imbalances and weight gain.

+ The probiotic “friendly” intestinal bacteria also synthesize B vitamins and folic acid.

+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day.

+ Avoid heating the oil, but it’s great on salads and sprayed on foods.

+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.

+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible.

+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli), garlic, onions

+ Increase your protein by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with almond milk or quality water.

+ Stop smoking and do not drink alcohol.

+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.742

+ Do not take over-the-counter (OTC) pain relievers that contain aspirin, ibuprofen (Advil) or naproxen (Aleve). Decrease acetaminophen intake also if you take Tylenol containing products.

**Supportive Supplements**

| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.743 |
### Life Time Fitness Peak Performance Whey Protein Isolate

| Life Time Fitness Peak Performance Whey Protein Isolate | 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source.\(^{744}\)  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).\(^{745}\)  
+ Provides 22gm protein per 2 scoops (30gm) |

### Multi-Probiotic 4000

| Multi-Probiotic 4000 | 1 capsule, 1-3 times daily | + Supports gastrointestinal health\(^{746}\)  
+ Supports vitamin B and K metabolism\(^{747}\)  
+ Helps improve absorption of nutrients from foods |

### N-acetyl cysteine (NAC)

| N-acetyl cysteine (NAC)  
*Take if liver stress exists, such as in chronic alcohol use | 500 - 750mg 1-3 times daily | + Liver support  
+ Improves glutathione (antioxidant) stores in the liver\(^{748}\) |

### T.A.P.S

| T.A.P.S  
*Take if liver stress exists, such as in chronic alcohol use | 1 capsule, 3 times daily | + Contains liver-supportive herbs, including milk thistle, picrorhiza, artichoke and curcumin  
+ Helps improve liver detoxification processes and provides antioxidant support for the liver\(^{749}\) |

### What does a high Fibrinogen level mean?

Fibrinogen levels may increase in any condition that causes inflammation or tissue damage. Elevated levels may be seen in:

+ Acute infections  
+ Diabetes  
+ Cancer  
+ Heart disease  
+ Stroke  
+ Inflammatory disorders, like rheumatoid arthritis, inflammatory bowel diseases  
+ Trauma

Increased fibrinogen levels can predispose you to developing a blood clot, and over time, increase your risk for developing heart problems, including high blood pressure, atherosclerosis (hardening of the arteries) and heart attack.\(^{750}\) Chronic inflammation can lead to insulin resistance and type 2 diabetes, obesity, heart diseases, immune imbalances, neurological conditions like depression, sleep disorders and, and even cancer.\(^{751}\)

### What are steps you can take for a high Fibrinogen level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.
General Dietary and Lifestyle Recommendations

+ Lose weight. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are consumed in adequate amounts it lowers health risks, especially for heart disease, and new studies are suggesting that adequate intakes may even help prevent obesity.\textsuperscript{752,753}
+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day.
+ Avoid heating the oil, but it’s great on salads and sprayed on foods.
+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and inflammation.\textsuperscript{754,755} People with diabetes and blood sugar regulation problems have a higher level of fibrinogen.\textsuperscript{756} Modifying the diet can help decrease inflammation, physical and mental stress, all helping to balance metabolism.
+ Avoid overeating, as this creates stress on the digestive tract.
+ Eat meals at regular times each day. It’s best not to eat after 7 pm.
+ Remember to chew your food. Saliva begins the process of digestion — it tells your stomach that food is coming. Chewing your food thoroughly, rather than bolting it, is the first step in healthy digestion.
+ The diet should also limit other inflammatory foods, such as processed meats, chemical preservatives, and food additives. Studies have found that nitrite or nitrate treated meats such as bacon, sausage, smoked foods, and lunch meats increase the risk of cancer.\textsuperscript{757,758} High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketsup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such as liver imbalance.\textsuperscript{759}
+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible. Ninety percent of all pesticides used are used on our foods.
+ High-fiber foods, including fresh vegetables, and beans should be part of the diet. These foods should supply the 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar. These foods also provide important benefits, such as antioxidant vitamins, minerals, and phytochemicals. Make sure to include green, orange, and yellow fruits and vegetables - such as broccoli, carrots, cantaloupe, and citrus fruits. Cocoa is also a significant source of antioxidants - so enjoy some low-sugar dark chocolate. The antioxidants and other nutrients in these foods may help protect against inflammatory chemistry and also help regulate immune function.\textsuperscript{760}
+ Animal fat (saturated fat), which can raise blood cholesterol levels and increase inflammation, needs to be minimized. Some experts believe that saturated animal fats from animals exposed to growth hormones and pesticides may also lead to health conditions, such as hormonal imbalances and cancer and other chronic illnesses. Choose lean meats from quality sources, organic skinless poultry, and dairy products. Red meat should always be organic grass-fed when eaten and the rest of proteins should be from a variety of sources – beans, fish, chicken, turkey, buffalo/bison, and seafood.
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that
has been purified by reverse osmosis your drink of choice whenever possible.
+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of inflammation than those that get regular sleep.\textsuperscript{761}
+ Exercise in moderation, 3-4 days a week.
+ Quit smoking or tobacco use. Tobacco use is reported to increase fibrinogen levels and inflammation\textsuperscript{762}
+ Drink less alcohol.

**Supplements**

| **Cal/Mag 1001** | Take 1 tablet 2 times daily with food | + Magnesium plays an essential role in a wide range of fundamental cellular reactions.  
+ Magnesium is involved in maintaining already normal heart function and blood pressure.\textsuperscript{763}  
+ Supplies 150 mg of elemental magnesium from bioavailable magnesium citrate in each capsule |
|----------------|----------------------------------|--------------------------------------------------------------------------------|
| **Coenzyme Q10 (CoQ10)** | 1-2 capsules (100-200mg) daily | + Necessary for cellular energy and important in heart protection  
+ Reported to lower blood pressure.\textsuperscript{764} |
| **Dual-Source Chromium as chromium polynicotinate and chromium picolinate** | 1 capsule (300mcg chromium) daily | + Improves insulin regulation and glucose tolerance\textsuperscript{765}  
+ Helps support serotonin levels\textsuperscript{766} |
| **Life Time Fitness FastFuel Complete** | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber\textsuperscript{TM} medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function\textsuperscript{767,768}  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
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<tr>
<th>Product</th>
<th>Serving Instructions</th>
<th>Benefits</th>
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| Life Time Fitness LeanSource™ Weight Loss   | 4 capliques daily, 2 with breakfast and 2 with dinner                                  | + LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat - all promoting and sustaining weight loss.  
+ LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements |
| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner.                  | + Multivitamin/mineral supplement contains anti-inflammatory nutrients.  
+ Low levels of B vitamins, especially B6 (pyridoxine), are reported to be correlated with increased levels of CRP.  
+ Vitamin E is reported to decrease inflammatory markers like CRP |
| Life Time Fitness Omega-3 Fish Oil           | 2-4 capsules daily                                                                      | + Helps decrease inflammation and the consequences it has on your metabolism.  
+ Studies have reported that fish oil significantly lowers C reactive protein, compared to omega 6 fats like safflower oil.  
+ Helps support heart and blood vessel health.  
+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction. |
| Multi-Probiotic 4000                         | 1 capsule 1-2 times daily                                                               | + Supports gastrointestinal health  
+ Supports vitamin B and K metabolism  
+ Helps improve absorption of nutrients from foods  
+ Helps decrease inflammation including CRP levels |
| **Perfusia SR** | 2 capsules 2 times daily; each cap contains 1,000mg time release L-arginine | + Perfusia SR® contains sustained-release L-arginine, an amino acid which helps support vascular health by improving nitric oxide production and use.\(^{782}\) + Individuals with a known herpes infection should not take L-arginine without also taking lysine (500-1,000mg daily), as L-arginine alone has been noted to cause herpes eruptions in susceptible individuals. |
Luteinizing hormone (LH) and follicle-stimulating hormone (FSH) are gonadotropin hormones, meaning they stimulate the gonads in men (testes) and women (ovaries) and are essential for reproduction. Both FSH and LH are produced in the brain by the pituitary gland. FSH and LH regulate the development, growth and reproductive processes of the body. In both sexes, LH stimulates secretion of sex steroids from the gonads. As men and women age, a rise in LH and FSH levels may signal menopause (in women) or andropause (in men). The main regulator of the secretion of LH and FSH is gonadotropin-releasing hormone (GnRH), also known as LH-releasing hormone. GnRH is made and secreted in the hypothalamus region of the brain.

In women, FSH and LH levels increase during the regular menstrual cycle, generally a day or two before ovulation. LH stimulates estrogen and progesterone production from the ovary. FSH stimulates the ovary to ripen a follicle, and then in conjunction with LH, to release an egg. FSH also readies the mammary glands for milk production. LH and FSH levels then decrease as the uterus begins to prepare for pregnancy or if another menstrual cycle begins.

In men, FSH is necessary for sperm production and maturation. LH stimulates the production and secretion of testosterone.

Pages 170-179
## FSH and LH

### Reference Values

**Blood**

*FSH (mIU/mL = milli international units per milliliter)*

#### Normal Range (Men)

| All ages | 1.7 – 8.6 mIU/mL |

#### Normal Range (Women)

| Premenopausal (follicular) | 2.4 – 12.6 mIU/mL |
| Premenopausal (ovulation) | 14.0 – 95.6 mIU/mL |
| Premenopausal (luteal) | 1.0 – 11.4 mIU/mL |
| Postmenopausal | 7.7 – 58.5 mIU/mL |

**Blood**

*FSH (mIU/mL = milli international units per milliliter)*

#### Normal Range (Men)

| Adult | 1.5 – 12.4 mIU/mL |

#### Normal Range (Women)

| Premenopausal (follicular) | 3.5 – 12.5 mIU/mL |
| Premenopausal (ovulation) | 4.7 – 21.5 mIU/mL |
| Premenopausal (luteal) | 1.7 – 7.7 mIU/mL |
| Postmenopausal | 25.8 – 134.8 mIU/mL |

### Why are FSH and LH levels needed?

Generally, a test for FSH and LH levels is part of an infertility test. With regard to metabolism, FSH and LH levels help determine overall hormonal balance. In women, levels of FSH and LH fluctuate greatly from month to month in the years approaching menopause.

### What Life Time Fitness Lab Tests Report FSH and LH Values?

+ Women’s Sex Hormone Profile
+ Women’s Sex Hormone Premium Profile
+ Women’s Longevity and Vitality Profile
+ Women’s Longevity and Vitality Premium Profile
What low FSH and LH values mean?

Low levels generally indicate under functioning of the pituitary or hypothalamus. In women that are still menstruating, low levels of FSH and LH may indicate excessive estrogen and may lead to estrogen dominance which can increase the risk for female problems such as polycystic ovarian syndrome (PCOS) and fibrocystic breast disease.

In men, low FSH and LH levels may indicate low production of testosterone by the testes. When testosterone levels in men decrease, generally estrogen levels increase. High levels of estradiol and low levels of testosterone are associated with abdominal fat, chronic inflammation, enlargement of the prostate and cardiovascular risk. As estrogen levels increase with age, lower testosterone reduces sexual arousal and sensation and causes loss of libido, a common problem in aging men. Low testosterone levels in men can lead to weight gain, memory problems, bone loss, insulin resistance, type 2 diabetes, heart problems, and even cancer.

FSH levels can decrease if using the following drugs:

- Oral contraceptives
- Phenothiazines, including chlorpromazine (Thorazine)
- Hormone replacement therapy

What are steps you can take for low FSH and LH levels?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

- Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.
- Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are consumed in adequate amounts it lowers health risks, especially for heart disease, and new studies are suggesting that adequate intakes may even help prevent obesity.
- Use healthy fats like olive oil, grape seed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day. Avoid heating the oil, but it’s great on salads and sprayed on foods.
- Zinc is important for both female and male reproductive health. Increase your zinc intake. The best dietary sources of zinc are lean meats, liver, eggs, and seafood (especially oysters, but make sure they are from a good source). Whole grain breads and cereals are also good sources of zinc, but limit your carbohydrate intake as this can lead to insulin resistance, blood sugar imbalances and weight gain.
- Selenium is important for male reproductive health. Increase foods that contain selenium, including seafood, garlic, liver, eggs, dairy products, and some vegetables including cabbage, celery, cucumbers, and radishes. Brazil nuts have the highest amount of selenium. Food processing causes substantial loss of selenium. For example, whole wheat bread has twice the selenium as white bread, and brown rice has 15 times more selenium than white rice. Human breast milk contains six times more selenium than cow’s milk. A cow’s milk diet for infants can contribute to low selenium levels and depressed immune systems in infants.
- Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible.
+ High-fiber foods, including flax, fresh vegetables, and beans should be part of the diet. These foods should supply the 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar. High-fiber foods help with hormonal balance. Dietary fiber also decreases the conversion of testosterone into estrogens in fat and breast cells.
+ Limit soy consumption, like tofu and soymilk. An increase in soy consumption has been found to lower testosterone in men.
+ Over-consumption of simple carbohydrates like refined sugars and grains, causes unfriendly flora to grow in the GI tract. These foods also raise blood glucose and insulin levels, resulting in adverse influences on sex hormone balance.
+ Make sure to include green, orange, and yellow fruits and vegetables - such as broccoli, carrots, cantaloupe, and citrus fruits. The antioxidants and other nutrients in these foods may help balance hormones.
+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which can imbalance hormone levels. Modifying the diet can help decrease physical and mental stress, helping balance metabolism.
+ Diets low in protein in elderly men may lead to elevated SHBG levels and decreased testosterone bioactivity, leading to metabolic imbalances. You may want to consider adding a protein drink to your diet.
+ Avoid animal protein that has been raised with hormones whenever possible. Europe won’t accept hormone-laden U.S. beef because of the health risks. Chicken should also be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your hormone receptors to function appropriately.
+ There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana, or other fruit in a blender with rice milk or quality water.
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance hormone levels.
+ Do not microwave food in plastic containers or covered in plastic.
+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates.
+ Obtain adequate rest — about 7-8 hours of uninterrupted sleep per night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours, suggesting that chronic insomnia is a disorder of sustained excitation of the body’s stress response system. This can also imbalance sex hormones. Reduced sleep can lower testosterone production, and negatively affect other hormones like thyroid hormone.
+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended. Exercise can help improve testosterone levels.
+ Decrease stress – take a walk, garden, do yoga or Tai Chi.
+ Stop smoking. Hormone levels are influenced by tobacco smoke.\textsuperscript{802}
+ Drink alcohol in moderation.

**Supportive Supplements**

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Serving Size</th>
<th>Description</th>
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</thead>
</table>
| Life Time Fitness FastFuel Complete    | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber\textsuperscript{TM} medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function\textsuperscript{833,834}  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| DIM                                    | 2 capsules daily | + DIM\textsuperscript{TM} is a synergistic combination of plant based ingredients including diindolylmethane, curcumin, green tea, and wasabia, which helps support healthy hormone balance by improving estrogen metabolism.\textsuperscript{805} |
| Feminine Herbal Balance                 | 1-2 capsules daily | + Feminine Herbal Balance\textsuperscript{TM} is a blend of standardized Chasteberry (Angus Castus, Vitex), standardized Black Cohosh and standardized Kudzu root, which help balance female hormonal levels and decrease negative symptoms associated with menopause and PMS.  
+ Black cohosh has positive effects on menopausal symptoms including hot flashes; may decrease risk of breast cancer\textsuperscript{806}  
+ Vitex has both progestogenic- and estrogenic-like activity.\textsuperscript{807} |
<p>| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.\textsuperscript{808} |</p>
<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Life Time Fitness Omega-3 Fish Oil</strong></td>
<td>1-2 capsules, 2 times daily</td>
<td>+ Helps decrease inflammation and the consequences it has on your metabolism.</td>
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<td></td>
<td></td>
<td>+ Helps support heart and blood vessel health.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction.</td>
</tr>
<tr>
<td><strong>Life Time Fitness Peak Performance Whey Protein Isolate</strong></td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>+ Easily digestible, high-quality protein source.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Provides 22gm protein per 2 scoops (30gm)</td>
</tr>
<tr>
<td><strong>Multi-Probiotic 4000</strong></td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Supports vitamin B and K metabolism.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Helps improve absorption of nutrients from foods</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Helps decrease inflammation including CRP levels.</td>
</tr>
<tr>
<td><strong>Vitamin D 1000</strong></td>
<td>+ 1-5 capsules (1,000 – 5,000 IU) daily, depending on vitamin D3 lab value</td>
<td>+ Bone support.</td>
</tr>
<tr>
<td></td>
<td>+ If lab value 30 ng/ml or less, then take 5,000 IU daily; if 30-40 ng/ml, then take 1,000 IU daily; both in addition to your multivit; retest in a month</td>
<td>+ Treatment of vitamin D deficiency improves bone mineral density.</td>
</tr>
</tbody>
</table>

**What does a high FSH and LH value mean?**

If FSH and LH levels are abnormally high, it may indicate problems with the ovaries or testicles. The pituitary gland secretes FSH in response to low estrogen levels in women. Because estrogen levels decrease in women as menopause approaches, FSH levels tend to be higher. LH levels also go up as menopause approaches. Increased FSH and LH in women that are ovulating may indicate infertility. Increased levels of FSH and LH in menopausal and
postmenopausal women may indicate chronic stress and high cortisol levels, neurochemical imbalances, chronic inflammation and thyroid imbalances. Increased levels of FSH and LH can lead to excess testosterone in men. FSH has been reported to increase with age and in smokers.819

FSH results can be increased with use of drugs, including:

+ Cimetidine (Tagamet)
+ Clomiphene (Serophene)
+ Digitalis (Digoxin)
+ Levodopa

What are steps you can take for high FSH and LH levels?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, Wieners, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.
+ There are foods that can help improve the conversion of estrogen into “good” metabolites and away from “bad” metabolites. These foods include insoluble dietary fibers such as lignin found in flaxseeds, bran, beans, and seeds.820
+ Dietary fiber improves the composition of intestinal bacteria, reduces beta-glucuronidase. Dietary fiber intake also increases serum concentrations of SHBG, a protein that binds to estrogen. This helps to reduce levels of free estrogens and the chance of developing estrogen receptor positive cancers like most breast cancer.821 Dietary fiber also decreases the conversion of testosterone into estrogens in fat and breast cells.
+ Eat more fresh fruits and vegetables. Diets low in fruits (such as apples, grapefruit and oranges) and cruciferous vegetables (such as broccoli, cabbage, and Brussels sprouts) may result in a relative deficiency of calcium-D-glucarate and its metabolites, which help metabolize estrogen into its healthy forms.
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are consumed in adequate amounts it lowers health risks, especially for heart disease, and new studies are suggesting that adequate intakes may even help prevent obesity.822,823
+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day. Avoid heating the oil, but it’s great on salads and sprayed on foods.
+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible.
+ High-fiber foods, including flax, fresh vegetables, and beans should be part of the diet. These foods should supply the 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar. High-fiber foods help with hormonal balance.824 Such foods also provide important benefits, such as antioxidant vitamins, minerals, and phytochemicals.
+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which can imbalance hormone levels.825,826
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.\(^{527}\)
+ Lose weight. Studies report imbalances in hormone levels when you are overweight or obese.\(^{528}\) If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.
+ Decrease stress — chronic stress leads to imbalances in metabolism and hormonal imbalances.
+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible. Currently the foods that are on the most-contaminated list are peaches, apples, sweet bell peppers, celery, nectarines, strawberries, cherries, lettuce, imported grapes, pears, spinach, and potatoes.
+ Do not microwave food in plastic containers or covered in plastic.
+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates.
+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours, suggesting that chronic insomnia is a disorder of sustained excitation of the body's stress response system.\(^{529}\) This can also imbalance sex hormones.
+ Exercise in moderation.
+ Decrease stress — take a walk, garden, do Yoga or Tai Chi.
+ Stop smoking. Hormone levels are influenced by tobacco smoke.\(^{530}\)
+ Drink alcohol in moderation.

### Supplements

| Life Time Fitness FastFuel Complete | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend. + Helps support digestive function\(^{631, 632}\) + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
### Life Time Fitness LeanSource™ Weight Loss

* Use if BMI 25 or >

<table>
<thead>
<tr>
<th>Dose</th>
<th>4 capliques daily, 2 with breakfast and 2 with dinner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note</td>
<td>+ LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat - all promoting and sustaining weight loss. + LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements^{833,834}.</td>
</tr>
</tbody>
</table>

### Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM

<table>
<thead>
<tr>
<th>Dose</th>
<th>3 capsules in the morning after breakfast and 3 capsules with dinner.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism^{835}.</td>
</tr>
</tbody>
</table>

### Life Time Fitness Omega-3 Fish Oil

<table>
<thead>
<tr>
<th>Dose</th>
<th>1-2 capsules, 2 times daily</th>
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</thead>
<tbody>
<tr>
<td>Note</td>
<td>+ Helps decrease inflammation and the consequences it has on your metabolism^{836}. + Helps support heart and blood vessel health^{837,838}. + Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction^{839}.</td>
</tr>
</tbody>
</table>

### Multi-Probiotic 4000

<table>
<thead>
<tr>
<th>Dose</th>
<th>1 capsule, 1-3 times daily</th>
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</thead>
<tbody>
<tr>
<td>Note</td>
<td>+ Supports gastrointestinal health^{840}. + Supports vitamin B and K metabolism^{841}. + Helps improve absorption of nutrients from foods. + Helps decrease inflammation and improve hormone levels^{842}.</td>
</tr>
</tbody>
</table>
| **Relora Plex** | 2 capsules, 1-2 times daily | + Relora® is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (Magnolia officinalis) and Phellodendron bark (Phellodendron amurense).  
+ Relora Plex also contains B-vitamins, which help in stress and nervous system balance  
+ Useful in stress and decreasing cortisol levels[843] Relora can increase salivary DHEA and decreases salivary morning cortisol levels, which can both help balance DHT and testosterone[844]  
+ Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals. |
| **Saw Palmetto Max-V™** | For men: 1 capsule 2 times daily, | + Used for prostate problems  
+ Studies indicate that saw palmetto may be able to inhibit the conversion of testosterone to its more active and potentially damaging form, dihydrotestosterone (DHT), via inhibition of alpha-5-reductase.[845] |
GLOBULINS

Globulins are proteins found in the blood that are the basis for antibodies, glycoproteins (protein-carbohydrate compounds), lipoproteins (proteins involved in fat transport), and clotting factors. Globulins, together with albumin, make up your total protein on the blood test lab results. There are 4 “types” or subsets of globulins – alpha-1, alpha-2, beta and gamma. Both alpha and beta globulins are carrier proteins – they deal with much of the binding of substances in the blood to protein, including lipoproteins, thyroid hormones, sex hormones, drugs, vitamins, minerals and clotting factors. Gamma globulins are part of the immune system.

Pages 180-184
GLOBULINS

Reference Values

Blood Globulin value
(Measured in grams per deciliter = g/dL)

<table>
<thead>
<tr>
<th>Normal range</th>
<th>1.5 - 4.5 g/dL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal Range</td>
<td>2.8 - 3.2 g/dL</td>
</tr>
</tbody>
</table>

Why is a Globulin level needed?

A globulin level is tested routinely as part of your comprehensive metabolic panel (CMP). Individuals with liver and/or kidney imbalances or those with protein deficiencies in the diet may have globulin levels that are out of range. In addition, individuals with gastrointestinal disorders who do not absorb nutrients properly and individuals who have chronic diarrhea and develop dehydration can have globulin levels that are out of range.

What Life Time Fitness Lab Tests Report the Globulin value?

+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

What does a low globulin value mean?

Low levels of globulins can mean that your immune system is imbalanced, you are undernourished or you have liver or kidney problems.

What are steps you can take for a low globulin value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Cut out refined sugars and carbohydrates to decrease inflammation and improve insulin function. Insulin resistance can lower your immunity.846
+ When eating protein, use high-quality protein, like lean meats, bison, fish, chicken, turkey or ostrich.
+ There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana (limit this due to high glycemic index), or other fruit in a blender with rice milk or quality water.
+ Avoid common food allergens, including wheat, dairy, soy.
+ When you eat foods, try to buy organic when possible. The use of chemical additives, hormones, pesticides and antibiotics in our food supply can lead to imbalances in the immune system. Foods that you should
avoid include processed meats, frozen dinners, preserved meats like hot dogs or bacon, fast foods, artificial ingredients and sweeteners, anything with MSG or monosodium glutamate.

+ Drink at least 8 glasses of filtered water daily to improve detoxification and hydration.

### Supportive Supplements

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **Life Time Fitness FastFuel Complete**            | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage                                                                                                                                       | + Contains whey protein concentrate & isolate, SunfiberÔ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function\(^{847,848}\)  
+ If gas or bloating occurs, change to l-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses.                                      |
| **Aller DMG**                                      | 1 tablet, 1-2 times daily                                                                                                                                                                                  | + Contains antioxidant nutrients, including quercetin, vitamin C, grape seed extract and polyphenols.  
+ Also contains DMG (dimethylglycine) which supports immune function\(^{849}\)                                                                 |
| **Dual-Source Chromium as chromium polynicotinate and chromium picolinate** | 1 capsule (300mcg chromium) daily                                                                                                                                                                            | + Improves insulin regulation and glucose tolerance\(^{850}\)  
+ Helps support serotonin levels\(^{851}\)                                                                                     |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner.                                                                                                                                       | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.\(^{852}\) |
| **Life Time Fitness Peak Performance Whey Protein Isolate** | 2 scoops in favorite beverage, mix and drink daily                                                                                                                                                           | + Easily digestible, high-quality protein source\(^{853}\)  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).\(^{854}\)  
+ Provides 22gm protein per 2 scoops (30gm)                                                                                                                                 |
| **Multi-Probiotic 4000**                          | 1 capsule, 1-3 times daily                                                                                                                                                                                  | + Supports gastrointestinal health\(^{855}\)  
+ Supports vitamin B and K metabolism\(^{856}\)  
+ Helps improve absorption of nutrients from foods                                                                                                                                 |
What does a high globulin value mean?
High globulin levels may indicate that your immune system is being overworked, possibly due to a chronic infection, chronic stress and inflammation, gastrointestinal imbalances including peptic ulcer, or liver and kidney problems.

What are steps you can take for a high globulin level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations
+ Increase water intake – stay hydrated; a minimum of 2 liters of filtered water daily is recommended
+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.
+ Limit alcohol intake

Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage and Administration</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha lipoic acid</td>
<td>500mg 2 times daily</td>
<td>+ Antioxidant(^{658})</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Helps improve energy production and regulate blood glucose levels(^{659})</td>
</tr>
<tr>
<td>L-glutamine</td>
<td>500mg – 2 grams daily in divided doses</td>
<td>+ Gastrointestinal support</td>
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<tr>
<td></td>
<td></td>
<td>+ Supports digestive tract tissue and immune function(^{660})</td>
</tr>
<tr>
<td>N-acetyl cysteine (NAC)</td>
<td>500 - 750mg, 1-2 times daily</td>
<td>+ Liver support</td>
</tr>
<tr>
<td></td>
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<td>+ Improves glutathione (antioxidant) stores in the liver(^{661})</td>
</tr>
</tbody>
</table>
| T.A.P.S | 1 capsule, 2 times daily | + Contains liver-supportive herbs, including milk thistle, picrorhiza, artichoke and curcumin  
+ Helps improve liver detoxification processes and provides antioxidant support for the liver. |
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<td>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</td>
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</tbody>
</table>
GLUCOSE

Glucose is a simple sugar that is used by the body to make energy. We obtain glucose from our diet – mainly from carbohydrates like sugars, breads, pasta, cereals, fruits and fruit juices. Proteins and fats also supply glucose in smaller amounts.

Glucose levels are controlled by insulin. After you eat, your glucose levels will rise. The pancreas will then release insulin so that the blood sugar levels do not become too high. Insulin promotes the breakdown of glucose and fats for energy production. Insulin helps in the absorption of glucose from the blood by causing it to be stored in the liver as glycogen or transported to tissues of the body for metabolism or storage in fat (adipose). Insulin levels rise and fall in accordance with the foods you eat. The higher the carbohydrate content of the meal — specifically glucose and fructose — the more insulin will be produced. Glucose is then used by the cells to create energy in the form of ATP (adenosine triphosphate).

The highest blood levels of insulin are reached after about one hour after eating a meal. A rapid fall in insulin level then will follow, allowing for reduced uptake of blood sugar (glucose) in skeletal muscles and fat tissue, allowing stabilization of blood glucose levels. When diabetes occurs, glucose uptake into the muscle and fat is decreased due to a decrease in insulin production and function. The liver also helps regulate glucose levels by storing glucose in the form of glycogen.

When insulin is functioning well, energy levels are increased, the glucose is removed from the bloodstream efficiently, and insulin levels do not rise above expected normal ranges. Insulin in excess is a very inflammatory compound in the body. High carbohydrate and sugar intake is one of the fastest ways to make your pancreas release too much insulin. Even when your body has not yet become resistant to insulin, high levels in the blood just in response to meals can start to trigger problems. Excessive insulin production causes you to release inflammatory hormones like cortisol (the stress hormone) and store visceral fat. When insulin is continually released, it becomes less and less effective at binding to blood sugar and lowering the levels. This is called Insulin Resistance (IR). IR is associated with the Metabolic Syndrome (Syndrome X) and Pre-diabetes (impaired glucose tolerance or IGT). IR refers to the inability to efficiently use insulin, a hormone produced by the pancreas that helps move blood sugar and other nutrients into cells. If insulin resistance is not corrected, then generally, type 2 diabetes will follow as the individual ages.
GLUCOSE

Reference Values

Blood Glucose (Sugar), Fasting
(In milligrams per deciliter = mg/dL)

| Normal Range (Adults) | 65 – 99 mg/dL |

Blood Glucose (Sugar), 2 hours post-prandial (after eating)
(In millingrams per deciliter = mg/dL)

| Normal Value (Adults) | 65 - 139 mg/dL |

Why is a Fasting Blood Glucose level needed?

Testing for blood glucose (sugar) in the blood helps determine if you have blood sugar regulation problems and if you are at risk for developing type 2 diabetes and the complications associated with this condition.

A total of 1.6 million new cases of diabetes were diagnosed in people ages 20 years or older in 2007. Also, it is estimated that 24% (almost 1 in 4) people in the US have symptoms of insulin resistance, placing an alarming est. 57 million people at risks associated with insulin resistance, including weight gain/obesity, brain chemistry (neurochemical) imbalances, sleep problems, hormonal and immune imbalances, nutrient deficiencies like chromium, magnesium and vitamin D, Type 2 diabetes, heart problems and cancer. A fasting blood glucose level will be used along with fasting insulin levels to help determine if you are prone to blood sugar imbalances that could lead to insulin resistance and type 2 diabetes.

Glucose can also be tested in the urine as part of a urinalysis lab test. Urine glucose readings are much less useful in determining blood sugar imbalances. Glucose does not usually appear in the urine until the blood levels are substantially high. Glucose in the urine generally means diabetes is present.

** Note: You should not eat or drink anything but water at least 8 hours before the test.

What Life Time Fitness Lab Tests Report a Fasting Blood Glucose level?

+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Energy and Metabolism Premium Profile
+ Cardio Metabolic Risk Profile
+ Cardio Metabolic Risk Profile Premium Profile
+ Men’s Longevity and Vitality Profile
+ Men’s Longevity and Vitality Premium Profile
+ Women’s Longevity and Vitality Profile
+ Women’s Longevity and Vitality Premium Profile

What does a low Fasting Blood Glucose value mean?

A low blood glucose (sugar) level is called hypoglycemia. The incidence of hypoglycemia, with blood sugar levels below 50 mg/dL, generally occurs in 5-10% of people with symptoms of hypoglycemia.
Hypoglycemia is more common in people with diabetes than those with normal blood sugar levels. Drinking too much alcohol, or liver and kidney problems may also lead to low blood glucose levels.

Symptoms of hypoglycemia include:

+ Sweating
+ Hunger
+ Trembling
+ Anxiety
+ Confusion
+ Blurred Vision
+ Coma and death can occur if the blood glucose is not stabilized*

* Note: Someone experiencing an episode of hypoglycemia needs to eat something with glucose and relieve the symptoms, which serve as a warning sign. Regular sweetened soda, juice, lifesavers, or glucose tablets are traditionally recommended. If, after trying these or similar options containing glucose (sugar) a couple of times, the person does not respond, an ambulance should be called.

Drugs that can decrease glucose measurements include the following:

+ Acetaminophen (Tylenol), generally in toxic amounts
+ Alcohol
+ Anabolic steroids (testosterone)
+ Beta-blockers, including propranolol (Inderal) and metoprolol (Lopressor, Toprol)
+ Clofibrate (Atromid-S)
+ Disopyramide (Norpace)
+ Gemfibrozil (Lopid)
+ Haloperidol (Haldol)
+ Insulin
+ Monoamine oxidase inhibitors (MAOIs), including Marplan, Nardil and Parnate
+ Quinine
+ Sulfamethoxizole/Trimethoprin (Bactrim)
+ Sulfonylurea anti-diabetic medications, including glipizide (Glucotrol), glyburide (Micronase, Diabeta), and glimepiride (Amaryl)

What are steps you can take for a low Fasting Blood Glucose value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Multivitamin/mineral plus fish oil is recommended.
+ Increase your intake of lean, high-quality proteins in the diet, including fish, turkey, bison and ostrich.
+ Avoid animal protein that has been raised with hormones whenever possible. Chicken should also be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your hormone receptors to function appropriately.
+ You can increase your protein also by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with almond milk or quality water.
+ Increase your intake of fruits, vegetables. Standard rule 3 veggies to every 1 fruit.
+ Choose fruit that is low in glycemic load like berries, pears, peaches, apples — grapefruit are best.
+ Increase trace minerals such as chromium, zinc and vanadium in the diet.
+ Good chromium food sources include lean meats, cheeses, and some condiments, such as black pepper and thyme. Brewer’s yeast is also rich in chromium.
+ The best dietary sources of zinc are lean meats, liver, eggs, and seafood (especially oysters).
+ Fats and vegetable oils are the richest food sources of vanadium. Vanadium also occurs in grains, meats, fish, nuts, dill seeds, parsley, black pepper, and mushrooms.
+ Eat foods that are high in fiber (25 to 35 grams or more per day)
+ Eat more nuts, seeds
+ Eat small meals and/or snacks every 3 hours
+ Eliminate refined sugars and refined carbs like white breads and pastas
+ Stop drinking alcohol, coffee and caffeine related drinks or at least significantly reduce your intake
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.
+ Carry a source of glucose with you, or stash in your drawers at work, in case you feel such symptoms (lightheadedness, dizziness, palpitations, etc.) This might mean a can of soda, a roll or lifesavers, fresh or dried fruits, cake or biscuits made with whole-wheat flour or oats. This is only to get you through your severe glycemic episode. Eating at regular intervals with foods such as nuts, seeds, low-sugar protein bar is a better snack option.
+ Increase your physical activity. Exercise moderately at least 30 minutes a day, 3 days a week.

### Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Dual-Source Chromium as chromium polynicotinate and chromium picolinate | 1 capsule (300mcg chromium) daily | + Improves insulin regulation and glucose tolerance \(^{869}\)
+ Helps support serotonin levels \(^{870}\) |
| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism. \(^{871}\) |
| Life Time Fitness Peak Performance Whey Protein Isolate | 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source. \(^{872}\)
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH). \(^{873}\)
+ Provides 22gm protein per 2 scoops (30gm) |
What does a high Fasting Blood Glucose value mean?

A high blood glucose (sugar) level is called hyperglycemia. A high fasting blood glucose levels can indicate that you have insulin resistance (IR) or progressing toward type 2 diabetes.

Type 2 diabetes occurs when either the body does not produce enough insulin or the cells ignore the insulin. Insulin is necessary for the body to be able to use glucose for energy. When you eat food, the body breaks down all of the sugars and starches into glucose, which is the basic fuel for the cells in the body. Insulin takes the sugar from the blood into the cells. Insulin resistance is the impairment of insulin’s action on the body where insulin cannot utilize blood glucose. When insulin doesn’t attach to the receptor effectively, blood sugar (glucose) cannot get into the cells and therefore builds up in the blood, causing the body to continually make insulin to try to decrease the sugar levels. Over time, high blood sugar levels sets up damaging processes to the body, like triglyceride and cholesterol imbalances, which can lead to non-alcoholic fatty liver and an increase in oxidation of low density lipoprotein (LDL, the “bad” cholesterol). If free radical damage oxidizes LDL, it will contribute to plaque build-up in the arteries and can lead to atherosclerosis (hardening of the arteries) and other heart problems. Elevated insulin also stimulates smooth muscle growth in your arteries, which compresses them and causes elevations in blood pressure.

Poor blood sugar control also leads to the accumulation of belly fat. Belly fat is metabolically active, and a factory for making several inflammatory chemicals, hormones, enzymes, and signaling substances that begin to accumulate and accelerate the march toward chronic illnesses.

Poor blood sugar control affects the kidneys by producing a byproduct of increased insulin called insulin growth factor -1 (IGF-1). IGF-1 can lead to increased blood flow through the kidneys, putting a lot stress on them. IR also leads to kidney damage by depleting the natural antioxidant, glutathione. Glutathione helps detoxify substances (including drugs, environmental chemicals, metabolic waste products) in the blood that are being filtered through the kidneys. With IR, the increased free radicals and oxidative stress deplete the pool of glutathione in the kidneys and can lead to damage to the kidneys and other body tissues.

Blood sugar imbalances are also a contributing factor in dementia and Alzheimer’s disease and cancer.

Glycation is the process of glucose attaching to proteins in the body resulting in Advanced Glycation End products (AGEs). AGEs are very slow to leave the body and are very inflammatory. High levels of glucose in the blood can buildup AGEs, leading to kidney and heart problems, cataracts and macular degeneration, nerve damage (neuropathy), and connective tissue damage. High levels of AGEs are associated with insulin resistance. When belly fat and AGEs increase inflammation, they turn off adiponectin (a signaling chemical that makes insulin receptors more active). Decreased adiponectin leads to accelerated blood vessel damage and makes the vessels more susceptible to plaque formation.

What leads an individual to the path of type 2 diabetes? Our genetics, diet, stress, intestinal health, environmental toxins (such as chemical preservatives, plastics, and heavy metals), hormonal balance, brain chemistry balance, history of prescribed medications, sleep quality, medical conditions, and exercise regimen all have influences on an individual’s development of insulin resistance and eventually type 2 diabetes. Some of the factors leading to a high fasting glucose level, insulin resistance and type 2 diabetes include:

+ Genetics: There are family studies have revealed that first degree relatives of individuals with type 2 diabetes are about 3 times more likely to develop the disease than individuals without a positive family history of the
Insulin resistance and type 2 diabetes are caused in part by a diet high in carbohydrates, refined sugars, and high fructose corn syrup, which include many of our favorite and frequently eaten foods, such as candy, cereals, muffins, white breads and rolls, pastas, cookies, donuts, and soft drinks. These refined carbohydrates not only raise glucose and insulin to unhealthy levels, but they also are devoid of the many vitamins and minerals our bodies need to properly utilize these foods. In other words, most of us are eating a diet designed for disaster.

High carbohydrate and sugar intake is one of the quickest ways to make your pancreas release too much insulin. Dietary factors, such as long-term consumption of high-glycemic index foods (including white breads and refined sugars, soft drinks), also lead to chronically high oxidative stress and release of stress hormones (cortisol), which start inflammation processes. Modifying the diet can help decrease physical and mental stress, helping balance metabolism. Studies have found that nitrite or nitrate treated meats such as bacon, sausage, smoked foods, and lunch meats increase the risk of developing type 2 diabetes and cancer.

Increased stress: When excessive levels of cortisol are produced over long periods of time, it promotes inflammation, alters blood sugar control (hyperinsulinemia), causes fat storage and weight gain, affects immune and thyroid function, and alters sex hormone production. In type 2 diabetics, high cortisol levels are related to a heightened risk for diabetic complications, such as nerve damage and eyesight problems. Hormonal Imbalances: Hormones have profound influence on blood sugar regulation. In men, for example, low testosterone levels can increase the prevalence of the metabolic syndrome, which includes high cholesterol levels, high blood pressure, erectile dysfunction, insulin resistance and obesity. If the progesterone to estrogen ratio is too high you will store too much fat and tend toward insulin resistance. Fat has actually been reported to produce several hormones in the body that affect weight control, inflammation, immunity, and other biochemical processes that are linked to metabolic syndrome and type 2 diabetes. The more fat we have, the more hormonal imbalances occur, resulting in type 2 diabetes.

Digestive function: Evidence supports the idea that impairment of normal gut barrier function, through environmental stressors (such as heavy metals and chemical preservatives), poor dietary habits (such as diets high in carbohydrates, refined sugars, and high fructose corn syrup), food allergies, and chronic stress, and a wide array of drug therapies result in the loss of the counter-inflammatory flora balance and leads to the expression of uncontrolled inflammation.

Nutrient Deficiencies:
- Chromium - Chromium is known not only to be essential for proper insulin receptor function, it also plays a role in lowering cholesterol. Chromium intakes are usually well under optimal amounts and in addition high sugar diets deplete chromium from the body. These two factors combine to make chromium deficiency a likely culprit in many people with IR and blood sugar imbalances.
- Magnesium - Magnesium is another mineral that plays an important role in carbohydrate metabolism and in preventing Metabolic Syndrome. Magnesium influences the release and activity of insulin and help balance glucose levels. Low levels of magnesium are frequently seen in individuals with Type 2 diabetes, and can increase insulin resistance. Several clinical studies have reported that magnesium supplementation is beneficial in reducing blood glucose levels, improving insulin control, and stabilizing the Metabolic Syndrome cascade. Low magnesium intake is also associated with an increase in inflammatory markers, such as C-reactive protein (CRP).
- Vitamin D - Vitamin D deficiency is found in both Type 1 and Type 2 Diabetes. A good level of vitamin D helps insulin work better. Vitamin D deficiency is associated with obesity as well, Vitamin D is deposited
Vitamin D also helps improve immunity and has anti-inflammatory effects that may indirectly help improve insulin sensitivity. Blood sugar control in people with type 2 diabetes has a seasonal variation, being worse in the winter, in part explained by variation in exposure to sunlight and vitamin D levels. Vitamin D levels are lower in obese individuals.

- Zinc – Zinc is a very important nutrient for maintaining healthy metabolism. Zinc plays a key role in the synthesis and action of insulin and a big role in insulin resistance. High levels of blood sugar can cause depletion of zinc from the body, leading to an increase in insulin resistance and related complications of diabetes such as oxidative stress on the body.

Other Causes: Lack of quality sleep (7-8 hours a night, uninterrupted), heavy metal or pesticide contamination, sleep disorders, thyroid imbalances, autoimmunity and a host of other metabolic imbalances can lead to an increase in inflammatory compounds and free radical damage that can lead to IR and blood sugar imbalances. Adults who suffer from obstructive sleep apnea are three times more likely to have type 2 diabetes. Even restricted sleep (only 4 - 5 hours a night) can induce insulin resistance and progression toward type 2 diabetes. Low-level lead exposure is linked to developing metabolic syndrome. Some medications can also lead to increased insulin levels, including corticosteroids (like prednisones, hydrocortisone), diuretics and mood stabilizers.

The progression of type 2 diabetes and its metabolic consequences has been linked with the development of cancer. Cancer cells consume more glucose than normal cells, so increases in blood sugar levels can fuel cancer tumor cells to grow.

Although elevated blood sugar levels can go undetected for many years, high levels eventually will produce symptoms. Symptoms of hyperglycemia (high blood sugar levels) include:

- Increased thirst
- Increased urination
- Fatigue
- Blurred vision
- Slow-healing infections

Drugs that can increase blood glucose measurements include the following:

- Atypical antipsychotics, including quetiapine (Seroquel), aripiprazole (Abilify), risperdone (Risperdal), ziprasidone (Geodon) and especially olanzapine (Zyprexa).
- Corticosteroids, including prednisone and hydrocortisone
- Diuretics, including furosemide (Lasix), hydrochlorothiazide and triamterene (Dyazide)
- Epinephrine (Adrenalin)
- Estrogens
- Glucagon
- Lithium
- Phenothiazines, including thioridazine (Mellaril), chlorpromazine (Thorazine) and prochlorperazine (Compazine)
- Phenytoin (Dilantin)
- Salicylates (Aspirin)
- Tricyclic antidepressants, including amitriptylline (Elavil), imipramine (Tofranil)
- Oral contraceptives – can cause slight increases
Drugs that may increase urine glucose measurements include:

+ Cephalosporins, including cephalexin (Keflex)
+ Chloral hydrate
+ Chloramphenicol
+ Diuretics (loop and thiazides)
+ Estrogens
+ Levodopa (L-dopa, carbidopa)
+ Lithium
+ Nicotinic acid

What are steps you can take for a high Blood Glucose level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which initiates the inflammatory signaling pathways. Modifying the diet can help decrease physical and mental stress, helping balance metabolism.
+ Increase your intake of lean, high-quality proteins in the diet, including fish, turkey, bison and ostrich.
+ Avoid animal protein that has been raised with hormones whenever possible. Chicken should also be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your hormone receptors to function appropriately.
+ You can increase your protein also by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with almond milk or quality water.
+ Increase your intake of fruits, vegetables. Standard rule 3 veggies to every 1 fruit.
+ Choose fruit that is low in glycemic load like berries, pears, peaches, apples — grapefruit are best.
+ Increase trace minerals such as chromium, zinc and vanadium in the diet.
+ Good chromium food sources include lean meats, cheeses, and some condiments, such as black pepper and thyme. Brewer’s yeast is also rich in chromium.
+ The best dietary sources of zinc are lean meats, liver, eggs, and seafood (especially oysters).
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are consumed in adequate amounts it lowers health risks, especially for heart disease, and new studies are suggesting that adequate intakes may even help prevent obesity.
+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day.
+ Avoid common food allergens, including wheat, dairy, soy.
+ Avoid heating the oil, but it’s great on salads and sprayed on foods.
Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and inflammation. Modifying the diet can help decrease inflammation, physical and mental stress, all helping to balance metabolism.

The diet should also limit other inflammatory foods, such as processed meats, chemical preservatives, and food additives. Studies have found that nitrite or nitrate treated meats such as bacon, sausage, smoked foods, and lunch meats increase the risk of cancer. High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketchup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such as liver imbalance.

High-fructose foods, including flax seed, fresh vegetables, and beans should be part of the diet. These foods should supply the 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar. Eat meals at regular times each day. It’s best not to eat after 7 pm.

Inappropriate dietary fat intake, excessive intake of soft drinks (due to high fructose corn syrup), insulin resistance caused by eating too much refined sugar and carbohydrates and increased oxidative stress due to a poor diet combine to increase IR.

Once a day have a little over a half of a teaspoonful of cinnamon (3gm) on your food. Using cinnamon has been reported to lower blood sugar, or consider taking a standardized extract of cinnamon.

Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.

Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance metabolism.

Limit sports and energy drinks — they have very high simple carbohydrate levels, including fructose and sucrose. Many of them also contain artificial and chemical ingredients that can further imbalance your metabolism.

Avoid overeating, as this creates too much demand on your insulin levels and your digestive tract.

Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours, suggesting that chronic insomnia is a disorder of sustained excitation of the body’s stress response system.

Lose weight. Excess weight is a main contributor to IR, and vice versa. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.

Regular exercise helps balance metabolism, including improving cardio-respiratory endurance, insulin sensitivity, blood sugar levels, weight control, and HDL cholesterol (high density lipoprotein — the “good” cholesterol) levels, while decreasing LDL cholesterol (low density lipoprotein — the “bad” cholesterol) levels.
### Supplements

<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5-HTP Plus</strong></td>
<td>1-2 capsules daily, between meals</td>
<td>+ 5-HTP Plus™ contains natural L-5-hydroxytryptophan (5-HTP), together with pyridoxal-5-phosphate and 50 mg of a proprietary blend of the neurotransmitters L-tyrosine and L-glutamine. + Helps improve serotonin levels, decrease food cravings.</td>
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<tr>
<td><em>Use if cravings are present</em></td>
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<tr>
<td><strong>Glukokine</strong></td>
<td>1 tablet 2 times daily</td>
<td>+ Glukokine® contains bitter melon extract (10% Charantin), chromium and the antioxidant glutathione, blended together to support healthy blood sugar levels through improved glucose metabolism.</td>
</tr>
<tr>
<td><strong>Life Time Fitness FastFuel Complete</strong></td>
<td>4 scoops (approx. 65gm) in the morning as part of a healthy beverage</td>
<td>+ Contains whey protein concentrate &amp; isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend. + Helps support digestive function.</td>
</tr>
<tr>
<td><strong>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</strong></td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.</td>
</tr>
<tr>
<td><strong>Life Time Fitness Omega-3 Fish Oil</strong></td>
<td>1-2 capsules, 2 times daily</td>
<td>+ Helps decrease inflammation and the consequences it has on your metabolism. + Helps support heart and blood vessel health. + Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction.</td>
</tr>
<tr>
<td><strong>Multi-Probiotic 4000</strong></td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health. + Supports vitamin B and K metabolism. + Helps improve absorption of nutrients from foods.</td>
</tr>
<tr>
<td><strong>Perfusia SR</strong></td>
<td>2 capsules 2 times daily; each cap contains 1,000mg time release L-arginine + Perfusia SR contains sustained-release L-arginine, an amino acid which helps support vascular health by improving nitric oxide production and use. Individuals with a known herpes infection should not take L-arginine without also taking lysine (500-1,000mg daily), as L-arginine alone has been noted to cause herpes eruptions in susceptible individuals.</td>
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<tr>
<td><strong>Vitamin D 1000</strong></td>
<td>1-5 capsules (1,000 – 5,000 IU) daily, depending on vitamin D3 lab value. If lab value 30 ng/ml or less, then take 5,000 IU daily; if 30-40 ng/ml, then take 1,000 IU daily both in addition to your multivit; retest in a month + Bone support + Treatment of vitamin D deficiency improves bone mineral density</td>
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</table>
HEMATOCRIT (HCT)

Hematocrit is a blood test that measures the percentage of blood in the body that is made up of red blood cells (RBCs), and depends on the number and size of RBCs.

Red blood cells (RBCs or erythrocytes) are made in the bone marrow of large bones and are the most commonly found cell in the blood. Erythropoiesis is a term for the development of RBCs in the bone marrow. About 2 million RBCs are produced every second in the average adult and each cell matures in about 7 days.

RBCs deliver oxygen to tissues and support life. They also carry carbon dioxide (CO2, as bicarbonate) from the cells back to the lungs for expiration. RBCs are rich in hemoglobin, the iron-containing molecule that transports oxygen. Hemoglobin is what gives red blood cells their color (red) and shape. Temperature of the body and pH are critical for the binding of hemoglobin to oxygen. If there is a reduction or alteration in RBCs or hemoglobin, then anemia can develop. Anemia is a reduction or alteration in RBCs resulting in the inability of hemoglobin to carry oxygen to the tissues.

The heme portion of hemoglobin contains four atoms of iron. Iron picks up the oxygen in the lungs where the concentration is high. Iron binds the oxygen and then transports it to the tissues and releases it wherever oxygen is needed. Only a small amount of the iron in your body is increased or decreased daily. Much of the body’s iron is recycled when old RBCs are removed from the blood and destroyed.

After the oxygen is used by the tissues, CO2 is produced. CO2 is then picked up by the hemoglobin in RBCs and taken back to the lungs for exhalation into the air. RBCs contain an enzyme called carbonic anhydrase, which metabolizes CO2 into bicarbonate. Bicarbonate helps control the pH in your blood and it is later excreted either via your lungs or your kidneys. Some CO2 is dissolved directly into the blood directly and a small amount is actually carried on the hemoglobin molecules. However, most CO2 is converted to bicarbonate.

As RBCs age and less able to carry oxygen, they become susceptible to destruction by cells of the immune system, which then take the unusable RBCs to the liver, spleen and bone marrow. This process is usually in balance with the creation of new RBCs in the bone marrow. Some parts of the RBCs are recycled, including iron and biliverdin (a metabolized part of part of the hemoglobin molecule). The iron is picked up by the carrier protein transferrin and taken other parts of the body for use. In the liver, biliverdin is changed into bilirubin, a yellow, toxic breakdown product of hemoglobin (see LTF Bilirubin Panel).

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HEMATOCRIT

Reference Values
Hematocrit Blood Level
(as a percentage = %)

<table>
<thead>
<tr>
<th>Normal Range (Adult Male)</th>
<th>36 – 50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Range (Adult Female)</td>
<td>34 - 44%</td>
</tr>
</tbody>
</table>

Why is a Hematocrit level needed?
A Hematocrit level is part of your comprehensive metabolic panel (CMP). A hematocrit test determines the amount of blood volume occupied by red blood cells (RBCs). This helps determine how well your body is taking oxygen to the tissues and if anemia or nutrient deficiencies are present. Usually, a hematocrit test is performed along with RBCs, white blood cells (WBCs), hemoglobin, platelets, mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), mean corpuscular volume (MCV) and red cell distribution weight (RDW).

What Life Time Fitness Lab Tests Report a Hematocrit value?
+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

What does a low Hematocrit value mean?
A low hematocrit % indicates low red blood cells or too much fluid in the body. Low RBC levels can mean the ability of the RBC to carry oxygen to tissues is decreased. Since the major function of RBCs are to use iron for oxygen transport by hemoglobin, low RBC levels mean low iron levels, which can result in anemia, or a reduction or alteration in RBCs resulting in the inability of hemoglobin to carry oxygen to the tissues. Anemia can result in fatigue, headaches, shortness of breath, dizziness and other symptoms. Anemias can also lead to chronic inflammation, nutrient deficiencies and heart problems. A decrease in red blood cells are normally seen during pregnancy, generally due to excess fluid which dilutes RBC testing results.

There are 3 major classifications of anemia, including microcytic, macrocytic and normocytic anemias. Microcytic anemia is caused by smaller than normal RBCs. This can result from low hemoglobin, iron, lead poisoning or vitamin B6 (pyridoxine). Macrocytic anemia is when the RBCs are larger than normal. This can result from low hemoglobin, low RBC numbers, low thyroid hormones, alcohol abuse, drugs like chemotherapy, heavy metal toxicity and nutrient deficiencies like folate and B12. Normocytic anemia is when the number of RBCs are low, but their size is normal. This can be due to blood loss, chronic diseases or bone marrow failure.

There are many types of anemias under these 3 major classifications that can be present if RBCs or hemoglobin are not functioning properly, have size alterations or are decreased in number. Some of these include:

+ Iron deficiency anemia – the most common form of anemia that occurs when the dietary intake or absorption of iron is low, leading to a decrease in the formation of oxygen carrying hemoglobin
Sickle-cell anemia – a genetic problem that causes abnormal hemoglobin molecules to be formed. The RBCs are rigid and shaped like a sickle, causing damage to blood vessels that can lead to strokes, pain, and tissue damage.

Thalassemia – a genetic problem that results in a low production of hemoglobin.

Spherocytosis – a genetic problem that causes defects in the RBC cell wall, leading to small, sphere-shaped and fragile RBCs that cannot carry oxygen efficiently.

Pernicious anemia – an autoimmune condition in which the body lacks intrinsic factor, which is required to absorb vitamin B12 from foods. B12 is necessary in hemoglobin production and in metabolism of homocysteine.

Aplastic anemia – caused by the inability of bone marrow to produce RBCs.

Pure red cell aplasia – caused by the inability of bone marrow to produce other cells like white blood cells but not RBCs.

Hemolytic anemia – the uncontrolled destruction of RBCs by the immune system.

Low levels of hematocrit can be found in the following conditions:

+ Anemia
+ Kidney or liver problems
+ Heavy metal toxicity (lead)
+ Trauma/burns
+ Bleeding (hemorrhage)
+ Bleeding ulcer
+ Frequent blood donation
+ Nutritional deficiencies, including iron, copper, folate, vitamin B12 and B6.
+ Pregnancy
+ Menstruation
+ Overhydration
+ Bone marrow disorders like leukemia or from radiation/chemotherapy
+ Chronic inflammation

Drugs that can decrease hematocrit levels include:

+ Chemotherapy drugs
+ Chloramphenicol
+ Phenytoin (Dilantin)
+ Quinidine

What are steps you can take for a low Hematocrit value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Make sure to take a Life Time Fitness Men and Women’s AM/PM Multivit/mineral to make sure you are getting the right nutrients.
+ Increase vitamin B12 containing foods. Vitamin B12 is produced by microbial synthesis in the digestive tract of animals. Therefore, animal protein products are the source of this nutrient. Organ meats are the best source of vitamin B12, followed by clams, oysters, beef, eggs, milk, chicken, and cheese. If you are eating meat, buy organic and all natural meat. Do not buy processed meats, packaged meats, deli meats unless the meat does not have chemical additives. Choose lean meats from quality sources, skinless poultry, and nonfat or low-fat or nonfat dairy products. Red meat should always be organic grass-fed when eaten and free of hormones and antibiotics. Get the rest of protein from a variety of sources like beans, fish, chicken, turkey, buffalo/bison, and seafood.

+ Increase folic acid containing foods. Folic acid occurs in a wide variety of foods, including dark green leafy vegetables, brewer’s yeast, liver, and eggs. Other good sources are beets, broccoli, Brussels sprouts, asparagus, orange juice, cabbage, cauliflower, cantaloupe, kidney and lima beans, wheat germ, and whole grain cereals and breads. Limit your breads though, as high carbohydrate diets can lead to insulin resistance, hormonal imbalances and weight gain.

+ Increase vitamin B6 (pyridoxine) containing foods. The best sources of pyridoxine are brewer’s yeast, wheat germ, organ meats (especially liver), peanuts, legumes, potatoes, and bananas.

+ Increase your consumption of animal proteins, including meats and seafood. Liver is by far the richest iron-containing food. Other good sources of iron-rich foods include organ meats, fish, and poultry. Dried beans and vegetables are the best plant sources, followed by dried fruits, nuts, and whole grain breads and cereals. Fortification of cereals, flours, and bread with iron has contributed significantly to daily dietary iron consumption.

+ Avoid animal protein that has been raised with hormones whenever possible. Chicken should also be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation and help your hormone receptors to function appropriately.

+ The diet should limit inflammatory foods, such as processed meats, chemical preservatives, and food additives. Studies have found that nitrite or nitrate treated meats such as bacon, sausage, smoked foods, and lunch meats increase the risk of cancer. High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketchup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such as imbalances in the probiotic flora in your intestines.

+ Eat green leafy vegetables, including broccoli, kale and spinach, on a regular basis. Iron in vegetables is not as quickly or readily absorbed as iron from animal sources, but it is still valuable. Other vegetable sources of iron include beans and peas.

+ Decrease citrus fruits and tea/coffee because they contain chemicals that can bind to iron and decrease it’s absorption. Citrus fruits contain ascorbate and citrate and teas/coffee contains tannins, both reported to lower iron levels.

+ Dried beans are also a good source of iron, followed by dried fruits (watch sugar content), nuts, and whole grain breads and cereals. Fortification of juices, cereals, flours, and bread with iron has contributed significantly to daily dietary iron consumption, although watch your carbohydrate intake

+ Decrease using antacids and OTC medications for ulcers (like Zantac, Tagamet and Pepcid) that lower the stomach acid. Lower acid production will lead to low iron levels.

+ Increase your protein by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with almond milk or quality water.
+ Stop smoking.
+ The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods should be eliminated. These contaminants can lower your immunity and can alter RBCs. Buy organic foods where possible.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.
+ Exercise in moderation. Athletes can be more susceptible to iron loss, and over-exercising can actually cause deformities in the RBCs and make them clump together, leading to less oxygen available. Swimming, aerobics, yoga and dancing are also good activities to help decrease stress and have less impact on the body.

### Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Usage</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Aller DMG                                 | 1 tablet, 1-2 times daily                       | + Contains antioxidant nutrients, including quercetin, vitamin C, grape seed extract and polyphenols.  
+ Also contains DMG (dimethylglycine) which supports immune function |
| Life Time Fitness FastFuel Complete       | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber\textsuperscript{TM} medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function\textsuperscript{961,962}  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.\textsuperscript{963} |
| Life Time Fitness Peak Performance Whey Protein Isolate | 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source.\textsuperscript{964}  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).\textsuperscript{965}  
+ Provides 22gm protein per 2 scoops (30gm) |
| Multi-Probiotic 4000                       | 1 capsule, 1-3 times daily                      | + Supports gastrointestinal health\textsuperscript{966}  
+ Supports vitamin B and K metabolism\textsuperscript{967}  
+ Helps improve absorption of nutrients from foods |
**Time Release Iron**  
*Use if iron levels are low*  
2 tablets daily with meals  
+ Specially designed to provide 54 mg of carbonyl iron (Ferronyl®) per serving for a 6-to 8-hour period.  
+ Use with caution in men

**Ultra-D Tox**  
1-2 capsules 2 times daily; use for 2-3 weeks  
+ Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C.  
+ Helps support digestive function and detoxification processes

---

**What does a high Hematocrit value mean?**

A high hematocrit % means an increased number of red blood cells (RBCs) in the blood.

High Hematocrit levels can be caused by:

+ Living at high altitudes due to your body responding to the decrease in oxygen available  
+ Smoking  
+ Heart, kidney or lung problems  
+ Dehydration  
+ Polycythemia vera – a condition of excess RBCs generally due to bone marrow problems

Drugs that can increase hematocrit levels include:

+ Metyldopa (Aldomet)  
+ Erythropoietin (EPO)  
+ Anabolic Steroids, including testosterone

**What are steps you can take for a high Hematocrit level?**

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Do not take iron supplements. Make sure your multivitamin/mineral supplement DOES NOT contain iron, especially if you are a man. Use Life Time Fitness Men and Women’s AM/PM Multivit/mineral to make sure you are getting the right nutrients.  
+ Decrease meat consumption.  
+ Several foods contain high amounts of iron. You may want to avoid vitamin and mineral supplements that contain iron, especially if you are a man. Also avoid iron-fortified foods such as juices, some breakfast cereals, and especially avoid beef, liver, and pork.  
+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.  
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. Fatty acid balance improves immunity.868
+ The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods should be eliminated. Buy organic foods where possible.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.969
+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli), garlic, onions
+ Stop smoking. Heavy smokers have higher than normal hemoglobin levels.
+ Drink more quality, filtered water – at least 2 liters daily.
+ Do not drink alcohol
+ Substitute green tea for your morning coffee and increase your citrus fruit consumption. Both contain chemicals that can decrease iron absorption and lower its level.

### Supplements

<table>
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<tr>
<th>Supplement</th>
<th>Dose/Usage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alpha lipoic acid</strong></td>
<td>500mg 2 times daily</td>
<td>+ Antioxidant[970] &lt;br&gt; + Helps improve energy production and regulate blood glucose levels[971]</td>
</tr>
<tr>
<td><strong>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</strong></td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.972</td>
</tr>
<tr>
<td><strong>Life Time Fitness Peak Performance Whey Protein Isolate</strong></td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>+ Easily digestible, high-quality protein source[973] &lt;br&gt; + Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH),[974] &lt;br&gt; + Provides 22gm protein per 2 scoops (30gm)</td>
</tr>
<tr>
<td><strong>Multi-Probiotic 4000</strong></td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health[975] &lt;br&gt; + Supports vitamin B and K metabolism[976] &lt;br&gt; + Helps improve absorption of nutrients from foods</td>
</tr>
</tbody>
</table>
HEMOGLOBIN (HB)

Hemoglobin is a protein that is carried by the red blood cells (RBCs) in the blood. Hemoglobin, along with the help of iron and cobalt, picks up oxygen in the lungs and delivers it to the tissues and organs. RBCs are rich in hemoglobin. Hemoglobin is what gives red blood cells their color (red) and their shape.

The heme portion of hemoglobin contains four atoms of iron. Iron picks up the oxygen in the lungs where the concentration is high. Iron binds the oxygen and then transports it to the tissues and releases it wherever oxygen is needed. Only a small amount of the iron in your body is increased or decreased daily. Much of the body’s iron is recycled when old RBCs are removed from the blood and destroyed.

Temperature of the body and pH are critical for the binding of hemoglobin to oxygen. If there is a reduction or alteration in RBCs or hemoglobin, then anemia can develop. Anemia is a reduction or alteration in RBCs resulting in the inability of hemoglobin to carry oxygen to the tissues.

After the oxygen is used by the tissues, CO2 is produced. CO2 is then picked up by the hemoglobin in RBCs and taken back to the lungs for exhalation into the air. RBCs contain an enzyme called carbonic anhydrase, which metabolizes CO2 into bicarbonate. Bicarbonate helps control the pH in your blood and it later excreted either via your lungs or your kidneys. Some CO2 is dissolved directly into the blood directly and a small amount is actually carried on the hemoglobin molecules. However, most CO2 is converted to bicarbonate.
HEMOGLOBIN

Reference Values
Hemoglobin Blood Level
(In grams per deciliter = g/dL)

<table>
<thead>
<tr>
<th>Normal Range (Adult Male)</th>
<th>12.5 – 17.0 g/dL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Range (Adult Female):</td>
<td>11.5 – 15.0 g/dL</td>
</tr>
</tbody>
</table>

* Note = A hemoglobin less than 10 g/dL and a hemoglobin greater than 18 g/dL should be discussed with your doctor.

Why is a Hematocrit level needed?
A Hemoglobin level is part of your comprehensive metabolic panel (CMP). Hemoglobin levels indicate the availability of oxygen to the tissues and can help indicate if anemia or nutrient deficiencies are present. Usually, a hemoglobin test is performed along with RBCs, white blood cells (WBCs), hematocrit, platelets, mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC) and mean corpuscular volume (MCV).

What Life Time Fitness Lab Tests Report a hemoglobin range?

+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

What does a low Hemoglobin value mean?
A low hemoglobin value indicates anemia and the decreased ability of the RBCs to carry oxygen to tissues. Anemia can result in fatigue, headaches, shortness of breath, dizziness and other symptoms. Anemias can also lead to chronic inflammation, nutrient deficiencies and heart problems. A decrease in hemoglobin can be normally seen during pregnancy, generally due to excess fluid that dilutes RBC testing results, and menstruation.

There are 3 major classifications of anemia, including microcytic, macrocytic and normocytic anemias. Microcytic anemia is caused by smaller than normal RBCs. This can result from low hemoglobin, iron, lead poisoning or vitamin B6 (pyridoxine). Macrocytic anemia is when the RBCs are larger than normal. This can result from low hemoglobin, low RBC numbers, low thyroid hormones, alcohol abuse, drugs like chemotherapy, heavy metal toxicity and nutrient deficiencies like folate and B12. Normocytic anemia is when the number of RBCs are low, but their size is normal. This can be due to blood loss, chronic diseases or bone marrow failure.

There are many types of anemias under these 3 major classifications that can be present if RBCs and hemoglobin are not functioning properly, have size alterations or are decreased in number. Some of these include:
+ Iron deficiency anemia – the most common form of anemia that occurs when the dietary intake or absorption of iron is low, leading to a decrease in the formation of oxygen carrying hemoglobin
+ Sickle-cell anemia – a genetic problem that causes abnormal hemoglobin molecules to be formed. The RBCs are rigid and shaped like a sickle, causing damage to blood vessels that can lead to strokes, pain, and tissue damage.
+ Thalassemia – a genetic problem that results in a low production of hemoglobin
+ Spherocytosis – a genetic problem that causes defects in the RBC cell wall, leading to small, sphere-shaped and fragile RBCs that cannot carry oxygen efficiently.
+ Pernicious anemia – an autoimmune condition in which the body lacks intrinsic factor, which is required to absorb vitamin B12 from foods. B12 is necessary in hemoglobin production and in metabolism of homocysteine (see LTF Vitamin B12 and Homocysteine Panels).
+ Aplastic anemia – caused by the inability of bone marrow to produce RBCs.
+ Pure red cell aplasia – caused by the inability of bone marrow to produce other cells like white blood cells but not RBCs.
+ Hemolytic anemia – the uncontrolled destruction of RBCs

Low levels of hemoglobin can be found in the following conditions:
+ Anemia
+ Kidney or liver problems
+ Heavy metal toxicity (lead)
+ Trauma/burns
+ Bleeding (hemorrhage)
+ Bleeding ulcer
+ Frequent blood donation
+ Nutritional deficiencies, including iron, copper, folate, vitamin B12 and B6.
+ Pregnancy
+ Menstruation
+ Overhydration
+ Bone marrow disorders like leukemia or from radiation/chemotherapy
+ Chronic inflammation

Drugs that can decrease hemoglobin levels include:
+ Chemotherapy drugs
+ Chloramphenicol
+ Phenytoin (Dilantin)
+ Quinidine

What are steps you can take for a low Hemoglobin value?

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**
+ Make sure to take a Life Time Fitness Men and Women’s AM/PM Multivit/mineral to make sure you are getting the right nutrients.
+ Increase vitamin B12 containing foods. Vitamin B12 is produced by microbial synthesis in the digestive tract of animals. Therefore, animal protein products are the source of this nutrient. Organ meats are the best source of vitamin B12, followed by clams, oysters, beef, eggs, milk, chicken, and cheese. If you are eating meat, buy organic and all natural meat. Do not buy processed meats, packaged meats, deli meats unless the meat does not have chemical additives. Choose lean meats from quality sources, skinless poultry, and nonfat or low-fat or nonfat dairy products. Red meat should always be organic grass-fed when eaten and free of hormones and antibiotics. Get the rest of protein from a variety of sources like beans, fish, chicken, turkey, buffalo/bison, and seafood.

+ Increase folic acid containing foods. Folic acid occurs in a wide variety of foods, including dark green leafy vegetables, brewer’s yeast, liver, and eggs. Other good sources are beets, broccoli, Brussels sprouts, asparagus, orange juice, cabbage, cauliflower, cantaloupe, kidney and lima beans, wheat germ, and whole grain cereals and breads. Limit your breads though, as high carbohydrate diets can lead to insulin resistance, hormonal imbalances and weight gain.

+ Increase vitamin B6 (pyridoxine) containing foods. The best sources of pyridoxine are brewer’s yeast, wheat germ, organ meats (especially liver), peanuts, legumes, potatoes, and bananas.

+ Increase your consumption of animal proteins, including meats and seafood. Liver is by far the richest iron-containing food. Other good sources of iron-rich foods include organ meats, fish, and poultry. Dried beans and vegetables are the best plant sources, followed by dried fruits, nuts, and whole grain breads and cereals. Fortification of cereals, flours, and bread with iron has contributed significantly to daily dietary iron consumption.

+ Avoid animal protein that has been raised with hormones whenever possible. Chicken should also be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation and help your hormone receptors to function appropriately.

+ The diet should limit inflammatory foods, such as processed meats, chemical preservatives, and food additives. Studies have found that nitrite or nitrate treated meats such as bacon, sausage, smoked foods, and lunch meats increase the risk of cancer. High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketsup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such imbalances in the probiotic flora in your intestines.

+ Eat green leafy vegetables, including broccoli, kale and spinach, on a regular basis. Iron in vegetables is not as quickly or readily absorbed as iron from animal sources, but it is still valuable. Other vegetable sources of iron include beans and peas.

+ Decrease citrus fruits and tea/coffee because they contain chemicals that can bind to iron and decrease its absorption. Citrus fruits contain ascorbate and citrate and teas/coffee contains tannins, both reported to lower iron levels.

+ Dried beans are also a good source of iron, followed by dried fruits (watch sugar content), nuts, and whole grain breads and cereals. Fortification of juices, cereals, flours, and bread with iron has contributed significantly to daily dietary iron consumption, although watch your carbohydrate intake

+ Decrease using antacids and OTC medications for ulcers (like Zantac, Tagamet and Pepcid) that lower the stomach acid. Lower acid production will lead to low iron levels.

+ Increase your protein by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with almond milk or quality water.
+ Stop smoking.
+ The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods should be eliminated. These contaminants can lower your immunity and can alter RBCs.983 Buy organic foods where possible.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.984
+ Exercise in moderation. Athletes can be more susceptible to iron loss, and over-exercising can actually cause deformities in the RBCs and make them clump together, leading to less oxygen available.985 Swimming, aerobics, yoga and dancing are also good activities to help decrease stress and have less impact on the body.

**Supportive Supplements**

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<tr>
<th>Product</th>
<th>Serving Size/Instructions</th>
<th>Benefits</th>
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| Life Time Fitness FastFuel Complete          | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage                     | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function986,987  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| Life Time Fitness Men's or Women's Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner.                     | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.988 |
| Life Time Fitness Peak Performance Whey Protein Isolate | 2 scoops in favorite beverage, mix and drink daily                                        | + Easily digestible, high-quality protein source989  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).990  
+ Provides 22gm protein per 2 scoops (30gm) |
| Multi-Probiotic 4000                         | 1 capsule, 1-3 times daily                                                                | + Supports gastrointestinal health991  
+ Supports vitamin B and K metabolism992  
+ Helps improve absorption of nutrients from foods |
| Time Release Iron                            | 2 tablets daily with meals                                                                 | + Specially designed to provide 54 mg of carbonyl iron (Ferronyl®) per serving for a 6-to 8-hour period.  
+ Use with caution in men |
Ultra-D Tox

1-2 capsules 2 times daily; use for 2-3 weeks
+ Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C.
+ Helps support digestive function and detoxification processes

What does a high Hemoglobin value mean?
A high hemoglobin level can lead to heart problems, like clots.

High levels of Hemoglobin can be caused by:
+ Living at high altitudes due to your body responding to the decrease in oxygen available
+ Smoking
+ Heart, kidney or lung problems
+ Dehydration

Drugs that can increase Hemoglobin levels include:
+ Methyldopa (Aldomet)
+ Erythropoietin (EPO)
+ Anabolic Steroids, including testosterone

What are steps you can take for a high Hemoglobin level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Do not take iron supplements. Make sure your multivitamin/mineral supplement DOES NOT contain iron, especially if you are a man. Use Life Time Fitness Men and Women’s AM/PM Multivit/mineral to make sure you are getting the right nutrients.
+ Decrease meat consumption.
+ When eating protein, use high-quality protein, like lean meats, bison, fish, chicken, turkey or ostrich.
+ There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana (limit this due to high glycemic index), or other fruit in a blender with rice milk or quality water.
+ Several foods contain high amounts of iron. You may want to avoid vitamin and mineral supplements that contain iron, especially if you are a man. Also avoid iron-fortified foods such as juices, some breakfast cereals, and especially avoid beef, liver, and pork.
+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. Fatty acid balance improves immunity.993
+ The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods should be eliminated. Buy organic foods where possible.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.994
+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli), garlic, onions
+ Stop smoking. Heavy smokers have higher than normal hemoglobin levels.
+ Drink more quality, filtered water – at least 2 liters daily.
+ Limit alcohol intake
+ Substitute green tea for your morning coffee and increase your citrus fruit consumption. Both contain chemicals that can decrease iron absorption and lower its level.

**Supplements**

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| Alpha lipoic acid                                    | 500mg 2 times daily                                                           | + Antioxidant995
+ Helps improve energy production and regulate blood glucose levels996                                                                                                                   |
| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner.          | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.997 |
| Life Time Fitness Peak Performance Whey Protein Isolate | 2 scoops in favorite beverage, mix and drink daily                            | + Easily digestible, high-quality protein source998
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).999
+ Provides 22gm protein per 2 scoops (30gm)                                                              |
| Multi-Probiotic 4000                                  | 1 capsule, 1-3 times daily                                                    | + Supports gastrointestinal health1000
+ Supports vitamin B and K metabolism1001
+ Helps improve absorption of nutrients from foods                                                       |
HOMOCYSTEINE
(HCY)

Homocysteine is a chemical normally found in the blood and produced when the amino acid (the building block of protein) methionine is broken down in the body. Homocysteine is recycled into methionine or converted into cysteine with the help of B-vitamins. Excess homocysteine can sometimes form during the breakdown of dietary proteins, and an elevated homocysteine level in the blood is a risk factor for cardiovascular disease.\textsuperscript{1002}

Homocysteine is metabolized in the body into chemical derivatives methionine and cysteine with the help of vitamins B6 (pyridoxine), B2 (riboflavin), B12 and folic acid. Deficiencies of these vitamins are reported to lead to increased homocysteine levels, while supplementing the diet with these vitamins is reported to lower homocysteine levels.\textsuperscript{1003,1004} Choline (also a B vitamin) also plays a role in homocysteine methylation and detoxification.\textsuperscript{1005}

Individuals with a genetic MTHFR (methylene-tetrahyrofolate-reductase) defect cannot metabolize homocysteine properly, and subsequently levels of homocysteine increase.\textsuperscript{1006} About 10\% of the world population has the genetic defect affecting MTHFR.\textsuperscript{1007} Riboflavin has actually been found to lower blood pressure in individuals with heart disease due to the genetic defect in MTHFR.\textsuperscript{1008}

Pages 210-215
HOMOCYSTEINE

Reference Values

Blood Level
(in micromoles/liter or µmol/L)

| Normal Range (adults, male and female) | 0.00 - 15 µmol/L |

Cardiovascular Risk Association:

| Desirable level | Less than 11 µmol/L |
| Intermediate Risk | 11 – 14 µmol/L |
| High Risk | 15 – 29 µmol/L |
| Very High Risk | Greater than 29 µmol/L |

Why is a Homocysteine level needed?

Testing for homocysteine helps determine if you are at increased risk for heart problems, such as high blood pressure, atherosclerosis or stroke.

Excess homocysteine in the body leads to imbalances in metabolism, including an increase in unhealthy oxidized LDL cholesterol, inflammation, insulin resistance and blood sugar imbalances, sleep disturbances, weight gain and lower cognitive function. It is estimated that approximately 5-10% of the population have homocysteine levels that are high.

What Life Time Fitness Lab Tests Report a homocysteine level?

+ Cardio Metabolic Risk Profile
+ Cardio Metabolic Risk Profile Premium Profile
+ Men's Longevity and Vitality Premium Profile
+ Women's Longevity and Vitality Premium Profile

What does a low homocysteine value mean?

Since elevated homocysteine is a marker for vitamin deficiencies, heart disease risk and other metabolic imbalances in the body, a low reading will not be discussed.

What does an elevated homocysteine value mean?

An elevated homocysteine level can be caused by vitamin deficiencies, including vitamin B6 (pyridoxine), vitamin B2 (riboflavin), vitamin B12 (cyanocobalamin) and vitamin B9 (folic acid or folate). The diet can cause these deficiencies, as can some prescription and non-prescription medications. People with a genetic mutation called methylenetetrahydrofolate reductase (MTHFR) that impairs their ability to process folic acid, leads to increased homocysteine as well. Homocysteine levels are generally lower in women than in men, but women's concentrations usually increase after menopause.
Excess homocysteine can result in cholesterol imbalances, including an increase in oxidized low density lipoproteins (LDL, or the “bad” cholesterol), a decrease in high density lipoproteins (HDL, the “good” cholesterol), which can increase the risk of atherosclerosis (hardening of the arteries), and can also cause the blood to clot more easily (which can lead to stroke or heart attack).  

Elevated homocysteine levels can also indicate blood sugar regulation problems, an increased risk for bone disorders, depression and Alzheimer’s disease, kidney problems, thyroid imbalances and inflammatory conditions like autoimmunity.  

Human studies have found that supplementing the diet with vitamins B6, B2, B12 and folic acid is important in lowering homocysteine levels. Homocysteine is a test performed to determine heart health, generally in conjunction with other tests for the heart, including cholesterol and triglyceride profiles and C-reactive protein (CRP-hs). Since homocysteine is an amino acid that folic acid and other B vitamins help break down, the test also determines if you are folate-deficient or B12-deficient. Medications that deplete B6, B2, B12 and folic acid leading to deficiencies that can increase homocysteine levels include:

+ Magnesium and aluminum antacids
+ Sulfur drugs including sulfamethoxazole/trimethoprim (Bactrim)
+ Anticonvulsants, including carbamazepine (Tegretol), phenytoin (Dilantin), primidone (Mysoline), valproic acid (Depakene, Depakote), Zonisamide (Zonegran)
+ Metformin (Glucophage)
+ Aspirin
+ NSAIDs (non-steroidal anti-inflammatory drugs), including ibuprofen (Advil, Motrin), naproxen (Aleve, Naprosyn)
+ Corticosteroids, including dexamethasone (Decadron), methylprednisolone (Medrol), hydrocortisone
+ Antiretroviral drugs
+ Diuretics
+ Cholesterol-lowering drugs, including the bile acid sequestrants cholestyramine (Questran) and colestipol (Colestid, Welchol)
+ Estrogen replacement therapy
+ Phenothiazine drugs, including chlorpromazine (Thorazine), thioridazine (Mellaril), promethazine (Phenergan)
+ Oral contraceptives
+ Anti-ulcer drugs, including H2 blockers (cimetidine or Tagamet; ranitidine or Zantac; famotidine or Pepcid), proton pump inhibitors (lansoprazole or Prevacid; omeprazole or Prilosec; esomeprazole or Nexium)
+ Timed Release Potassium

**What are steps you can take for a low Hemoglobin value?**

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ There have been studies that report increasing the intake of B vitamins and folate improve homocysteine levels.  
+ Increase vitamin B12 containing foods. Vitamin B12 is produced by microbial synthesis in the digestive tract of animals. Therefore, animal protein products are the source of this nutrient. Organ meats are the best source of vitamin B12, followed by clams, oysters, beef, eggs, milk, chicken, and cheese. If you are eating meat, buy organic and all natural meat. Do not buy processed meats, packaged meats, deli meats unless the meat does not have chemical additives. Choose lean meats from quality sources, skinless poultry, and nonfat or low-fat or nonfat dairy products. Red meat should always be organic grass-fed when eaten and free of hormones and
antibiotics. Get the rest of protein from a variety of sources like beans, fish, chicken, turkey, buffalo/bison, and seafood.
+ Increase vitamin B6 (pyridoxine) containing foods. The best sources of pyridoxine are brewer’s yeast, wheat germ, organ meats (especially liver), peanuts, legumes, potatoes, and bananas.
+ Increase folic acid containing foods. Folic acid occurs in a wide variety of foods, including dark green leafy vegetables, brewer’s yeast, liver, and eggs. Other good sources are beets, broccoli, Brussels sprouts, asparagus, orange juice, cabbage, cauliflower, cantaloupe, kidney and lima beans, wheat germ, and whole grain cereals and breads. Limit your breads though, as high carbohydrate diets can lead to insulin resistance, hormonal imbalances and weight gain.
+ The best sources of vitamin B2 are liver, milk, and dairy products. Moderate sources include meats, dark green vegetables, eggs, avocados, oysters, mushrooms, and fish (especially salmon and tuna).
+ Magnesium levels may be decreased in individuals with high homocysteine levels. Magnesium from nuts and seeds to help control blood pressure and reduce blood vessel spasm
+ The probiotic “friendly” intestinal bacteria also synthesize B vitamins and folic acid.
+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day.
+ Avoid heating the oil, but it’s great on salads and sprayed on foods.
+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), lead to chronic oxidative stress and inflammation. Modifying the diet can help decrease inflammation, physical and mental stress, all helping to balance metabolism.
+ Avoid overheating, as this creates stress on the digestive tract.
+ Eat meals at regular times each day. It’s best not to eat after 7 pm.
+ Remember to chew your food. Saliva begins the process of digestion — it tells your stomach that food is coming. Chewing your food thoroughly, rather than bolting it, is the first step in healthy digestion.
+ The diet should limit inflammatory foods, such as processed meats, chemical preservatives, and food additives. Studies have found that nitrite or nitrate treated meats such as bacon, sausage, smoked foods, and lunch meats increase the risk of cancer. High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketchup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such imbalances in the probiotic flora in your intestines.
+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible.
+ High-fiber foods, including fresh vegetables, and beans should be a large part of the diet. These foods should supply the 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar. Such foods also provide important benefits, such as antioxidant vitamins, minerals, and phytochemicals. Make sure to include green, orange, and yellow fruits and vegetables - such as broccoli, carrots, cantaloupe, and citrus fruits. The antioxidants and other nutrients in these foods may help protect against inflammatory chemistry including lowering homocysteine levels and also help regulate immune function.
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.
+ Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of oxidative stress and homocysteine levels than those that get regular sleep.\(^{1027}\)

+ Exercise and other physical activity are essential in managing stress and maintaining a healthy weight. At least 30 minutes of exercise daily, 5 days a week is recommended. Elevations in homocysteine levels are associated with a high BMI (>30).\(^{1028}\)

+ Decrease caffeine intake (coffee, tea); increases in homocysteine levels are reported with caffeine containing products.\(^{1029}\)

+ Quit smoking or tobacco use. Tobacco use is reported to increase inflammation.\(^{1030}\)

+ Moderate alcohol intake, especially from red wine, also lowers cardiovascular disease risk — but don’t drink to excess because that can have very negative effects on your metabolism.

### Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Time Fitness FastFuel Complete</td>
<td>4 scoops (approx. 65gm) in the morning as part of a healthy beverage</td>
<td>+ Contains whey protein concentrate &amp; isolate, Sunfiber(^{TM}) medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend. + Helps support digestive function.(^{1031,1032}) + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses.</td>
</tr>
<tr>
<td>Aller DMG</td>
<td>1 tablet, 1-2 times daily</td>
<td>+ Contains antioxidant nutrients, including quercetin, vitamin C, grape seed extract and polyphenols. + Also contains DMG (dimethylglycine) which supports immune function.(^{1033})</td>
</tr>
<tr>
<td>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.(^{1034})</td>
</tr>
<tr>
<td>Life Time Fitness Omega-3 Fish Oil</td>
<td>1-2 capsules, 2 times daily</td>
<td>+ Helps decrease inflammation and the consequences it has on your metabolism.(^{1035}) + Helps support heart and blood vessel health.(^{1036,1037}) + Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction.(^{1038})</td>
</tr>
</tbody>
</table>
| **Methyl-Guard** | 1 capsule 2 times daily | + Helps regulate homocysteine levels  
+ Supplies vitamin B12, Vitamin B6 and folate along with trimethylglycine (betaine) |
|-------------------|-------------------------|----------------------------------------------------------------------------------|
| **Multi-Probiotic 4000** | 1 capsule, 1-3 times daily | + Supports gastrointestinal health  
+ Supports vitamin B and K metabolism  
+ Helps improve absorption of nutrients from foods  
+ Helps decrease inflammation |
| **Perfusia SR** | 2 capsules 2 times daily; each cap contains 1,000mg time release L-arginine | + Perfusia SR® contains sustained-release L-arginine, an amino acid which helps support vascular health by improving nitric oxide production and use.  
+ Individuals with a known herpes infection should not take L-arginine without also taking lysine (500-1,000mg daily), as L-arginine alone has been noted to cause herpes eruptions in susceptible individuals. |
IGF-1

IGF-1 (insulin-like growth factor-1), or Somatomedin C, is a hormone made by the liver when stimulated by growth hormone (GH). IGF-1 is produced throughout your life, with the highest levels occurring during the pubertal growth spurt. The lowest levels occur in infancy and old age. IGF-1 is structurally related to insulin, and is even capable of binding the insulin receptor, albeit at lower affinity than insulin. Nearly every cell in the body is affected by IGF-1, including bone, cartilage, kidney, liver, lungs, muscle, nerves and skin.

Growth hormone is secreted by the pituitary gland to help fuel growth during childhood and to help maintain your tissues and organs throughout life. Deficiencies in growth hormone have been linked to an increase in cardiovascular risks and cancer. After about the age of 30, the secretion of growth hormone by the pituitary gland tends to decline. Diet can also affect GH levels, since consuming high glycemic foods stimulates the release of insulin, which contributes to a reduction in GH.

Since natural growth hormone is difficult to measure in humans, the level of IGF-1 can be used to determine if growth hormone levels are adequate. Blood IGF-1 concentrations decline with advancing age in healthy adults.

Pages 216-223
IGF-1

Reference Values
Normal values, blood
(in nanograms per milliliter = ng/mL)

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>Blood level ng/mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>193-731</td>
</tr>
<tr>
<td>18</td>
<td>163-584</td>
</tr>
<tr>
<td>19</td>
<td>141-483</td>
</tr>
<tr>
<td>20</td>
<td>127-424</td>
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<tr>
<td>21-25</td>
<td>116-358</td>
</tr>
<tr>
<td>26-30</td>
<td>117-329</td>
</tr>
<tr>
<td>31-35</td>
<td>115-307</td>
</tr>
<tr>
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<td>41-45</td>
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<td>81-225</td>
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<td>75-212</td>
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<td>66-70</td>
<td>69-200</td>
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<td>71-75</td>
<td>64-188</td>
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<tr>
<td>76-80</td>
<td>59-177</td>
</tr>
<tr>
<td>81-85</td>
<td>55-166</td>
</tr>
</tbody>
</table>

Why is an IGF-1 level needed?
IGF-1 levels are used to determine if growth hormone (GH) is produced in sufficient amounts if the pituitary gland is functioning properly. Reduced pituitary function may be due to a genetic defect or can be the result of pituitary damage following conditions such as trauma, infections, and chronic inflammation. In children, IGF-1 levels may help determine if growth abnormalities are present. In adults, an IGF-1 level helps determine risk for developing age-related health problems, like autoimmunity, diabetes and insulin resistance, heart disease and the Metabolic Syndrome.

What Life Time Fitness Lab Tests Report an IGF-1 value?
+ Women’s Longevity and Vitality
+ Women’s Longevity and Vitality Premium
+ Men’s Longevity and Vitality
+ Men’s Longevity and Vitality Premium

Better health & performance start here.
What does a Low IGF-1 value mean?

A low level of IGF-1 generally means there is a pituitary problem that can lead to a deficiency of growth hormone (GH) or a lack of GH sensitivity in the body. Low levels of IGF-1 are found in liver or kidney problems, nutritional deficiencies, low GH and high doses of estrogen. In children, low IGF-1 can lead to stunted growth and delayed development. In adults, low IGF-1 and subsequent low GH are associated with:

- Changes in cholesterol levels
- Chronic fatigue/fibromyalgia
- Chronic inflammation/autoimmune conditions
- Decreased bone density
- Depression
- Heart problems
- Insulin resistance/diabetes
- Male pattern baldness
- Memory problems
- Poor wound healing
- Reduced exercise tolerance
- Reduced strength and stamina
- Weight gain; increased “belly” fat

What are steps you can take for low IGF-1 levels?

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

- Avoid common food allergens, including wheat, dairy, soy. Food allergies can cause inflammation, which can lead to metabolic imbalances.\(^{1049}\)
- Try to buy organic foods when possible. The use of chemical additives, hormones, pesticides and antibiotics in our food supply can lead to imbalances in hormones and the immune system.
- Foods that you should avoid include processed meats, frozen dinners, preserved meats like hot dogs or bacon, fast foods, artificial ingredients and sweeteners, anything with MSG or monosodium glutamate.
- Avoid inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy. These foods can imbalance immunity.
- Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. Fatty acid balance improves immunity.\(^{1050}\)
- Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day. Avoid heating the oil, but it’s great on salads and sprayed on foods.
- Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
- The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods should be eliminated. These contaminants can lower your immunity.\(^{1051}\) Buy organic foods where possible.
- Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that
has been purified by reverse osmosis your drink of choice whenever possible.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.\(^{1052}\)
+ Do not microwave food in plastic containers or covered in plastic.
+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain chemical ingredients like phthalates.
+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult.
+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.
+ Decrease stress — take a walk, garden, do Yoga or Tai Chi.
+ Stop smoking.
+ Drink in moderation.

### Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage/Directions</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Cal/Mag 1001                              | 1 tablet, 2 times daily                                                            | + Bone support  
+ Contains highly absorbable calcium, magnesium, vitamin D3, vitamin C, boron and glutamic acid.  
+ A meta analysis of 29 randomized trials showed that supplementation with calcium and vitamin D3 reduces risk of bone fractures by 24 % and significantly reduces loss of bone mass.\(^{1053}\) |
| Dual-Source Chromium as chromium polynicotinate and chromium picolinate | 1 capsule (300mcg chromium) daily                                                 | + Improves insulin regulation and glucose tolerance\(^{1054}\)  
+ Helps support serotonin levels \(^{1055}\) |
| L-glutamine                               | 1-4 capsules (500mg-2 grams) daily in divided doses                               | + Supports digestive tract tissue and immune function\(^{1056}\)  
+ Supports growth hormone regulation         |
| Life Time Fitness Men's or Women's Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner.             | + The Life Time Fitness Men's and Women's Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.\(^{1057}\) |
| Life Time Fitness Peak Performance Whey Protein Isolate | 2 scoops in favorite beverage, mix and drink daily                              | + Easily digestible, high-quality protein source\(^{1058}\)  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).\(^{1059}\)  
+ Provides 22gm protein per 2 scoops (30gm) |
<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage</th>
<th>Benefits</th>
<th>Notes</th>
</tr>
</thead>
</table>
| **Moducare**     | 1-2 capsules, 1-2 times daily | + Helps control inflammation  
+ A mixture of plant sterols/sterolins  
+ Helps support immunity by balancing immune components[1060] |                                                                      |
| **Multi-Probiotic 4000** | 1 capsule, 1-3 times daily | + Supports gastrointestinal health[1061]  
+ Supports vitamin B and K metabolism[1062]  
+ Helps improve absorption of nutrients from foods |                                                                      |
| **Perfusia SR**  | 2 capsules 2 times daily; each cap contains 1,000mg time release L-arginine | + Perfusia SR<sup>®</sup> contains sustained-release L-arginine, an amino acid which helps support vascular health by improving nitric oxide production and use.[1063]  
+ Supports growth hormone regulation.[1064]  
+ Individuals with a known herpes infection should not take L-arginine without also taking lysine (500-1,000mg daily), as L-arginine alone has been noted to cause herpes eruptions in susceptible individuals. |                                                                      |
| **T.A.P.S**      | 1 capsule, 3 times daily      | + Contains liver-supportive herbs, including milk thistle, picrorhiza, artichoke and curcumin  
+ Helps improve liver detoxification processes and provides antioxidant support for the liver[1065] |                                                                      |
| **Life Time Fitness LeanSource™ Weight Loss** | 4 caplques daily, 2 with breakfast and 2 with dinner | + LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat][1066][1067]  
+ LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements |                                                                      |
| **Sleep Solve 24/7** | 1 capsule daily, 1 hour before bedtime | + Improves sleep/wake cycles  
+ Melatonin decreased with low GH levels[1068] |                                                                      |
What does a high IGF-1 value mean?
A high IGF-1 level generally indicates elevated levels of growth hormone (GH). Increased levels of IGF-1 and GH are found normally during puberty and pregnancy and can be an indicator of a pituitary tumor if levels are very high. Trends of high IGF-1 levels can lead to heart problems and high blood pressure, autoimmune conditions, sleep apnea, type 2 diabetes and uterine fibroids. Elevated blood IGF-1 levels has also been linked to an increase the risk for cancer including colon, prostate and breast. Some individuals with elevated GH may experience fatigue, joint pain, headaches, erectile dysfunction, snoring, menstrual irregularities, increased sweating and body odor, body disfigurement (like larger nose, more prominent jaw, thicker lips) and enlargement of organs.

What are steps you can take for a high IGF-1 level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations
+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.
+ Avoid common food allergens, including wheat, dairy, soy. Food allergies can cause inflammation, which can lead to metabolic imbalances.
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are consumed in adequate amounts it lowers health risks, especially for heart disease, and studies report it improves immunity.
+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day. Avoid heating the oil, but it’s great on salads and sprayed on foods.
+ The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods should be eliminated. These contaminants can lower your immunity. Buy organic foods where possible.
+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ Increase antioxidant-containing foods like green, orange, and yellow fruits and vegetables - such as green leafy vegetables, broccoli, peppers, carrots, cantaloupe, and citrus fruits (although fruit sugars should be limited). Polyphenols in these foods are reported to improve immune function.
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.
+ Do not microwave food in plastic containers or covered in plastic.
+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates.
+ Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult.
+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily,
5 days a week is recommended.
+ Decrease stress — take a walk, garden, do Yoga or Tai Chi.
+ Stop smoking.
+ Drink in moderation.

### Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dose and Frequency</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| L-glutamine         | 500mg – 2 grams daily in divided doses | + Gastrointestinal support  
+ Supports digestive tract tissue and immune function |
| Life Time Fitness Omega-3 Fish Oil | 1-2 capsules, 2 times daily | + Helps decrease inflammation and the consequences it has on your metabolism.  
+ Helps support heart and blood vessel health and immunity.  
+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction. |
| Moducare     | 1-2 capsules, 2 times daily | + Moducare™ is a proprietary extract of plant sterols and sterolins that helps balance the immune system and decreases autoimmune reactions.  
Moducare™ also helps balance thyroid function. |
| Multi-Probiotic 4000 | 1 capsule, 1-3 times daily | + Supports gastrointestinal health and immunity  
+ Supports vitamin B and K metabolism  
+ Helps improve absorption of nutrients from foods  
+ Helps decrease inflammation including CRP levels |
| **Relora Plex** | **2 capsules, 1-2 times daily** | + Used for stress reduction  
+ Relora® is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (Magnolia officinalis) and Phellodendron bark (Phelodendron amurense).  
+ Relora Plex also contains B-vitamins, which help in stress and nervous system balance  
+ Useful in stress and decreasing cortisol levels Relora can increase salivary DHEA and decreases salivary morning cortisol levels  
+ Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals. |

* Use if chronic stress is present
INSULIN, FASTING

Insulin is the hormone that is made in the pancreas in response to eating a meal. Insulin helps in the absorption of glucose from the blood by causing it to be stored in the liver or transported to tissues of the body for metabolism or storage. Insulin levels rise and fall in accordance with the foods you eat. The higher the carbohydrate content of the meal — specifically glucose and fructose — the more insulin will be produced. Insulin is needed to stimulate protein synthesis inside cells and therefore helps to signal protein building for growth and maintenance of our tissues. Insulin also promotes the breakdown of glucose and fats for energy production. Glucose is used by the cells use to create energy in the form of ATP (adenosine triphosphate).

The highest blood levels of insulin are reached after about one hour after eating a meal. A rapid fall in insulin level then will follow, allowing for reduced uptake of blood sugar (glucose) in skeletal muscles and fat tissue, allowing stabilization of blood glucose levels. When diabetes occurs, glucose uptake into the muscle and fat is decreased due to a decrease in insulin production and function. The liver also helps regulate glucose levels by storing glucose in the form of glycogen.

When insulin is functioning well, energy levels are increased, the glucose gets removed from the bloodstream, and insulin levels rise and fall normally. High carbohydrate and sugar intake is one of the fastest ways to make your pancreas release too much insulin. Even when your body has not yet become resistant to insulin, high levels in the blood just in response to meals can start to trigger problems. Excessive insulin production causes you to release inflammatory hormones like cortisol (the stress hormone) and store visceral fat. When insulin is continually released, it becomes less and less effective at binding to blood sugar and lowering the levels. This is called Insulin Resistance. Insulin Resistance is also known by other names, such as Metabolic Syndrome, Syndrome X, Hyperinsulinemia and Pre-diabetes. It refers to the inability to efficiently use insulin.

Pages 224-231
INSULIN, FASTING

Reference Values

Blood
(In micro International Units per milliliter = uIU/ml)

<table>
<thead>
<tr>
<th>Normal Range (Adults)</th>
<th>0.0 – 24.9 uIU/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal Range (Adults)</td>
<td>2 – 8 uIU/ml</td>
</tr>
</tbody>
</table>

Why is a Fasting Insulin level needed?

A fasting insulin level test can be used to help determine if you have insulin resistance (IR). IR is a major contributor to inflammation, heart disease, weight gain and type 2 diabetes. Fasting insulin levels along with a fasting blood glucose can help determine if your body is processing and using sugar and insulin effectively. Without a doubt, insulin resistance (IR) is the one condition that is most responsible for many of the chronic illnesses that people face today. IR is not only a fast pass to chronic illness, it affects how you feel, think and even how you look.

* Do not eat or drink anything but water for at least 8 hours before your test.

What Life Time Fitness Lab Tests Report a Fasting Insulin level?

+ Energy and Metabolism Premium Profile
+ Cardio Metabolic Risk Profile
+ Cardio Metabolic Risk Profile Premium Profile
+ Men’s Longevity and Vitality Profile
+ Men’s Longevity and Vitality Premium Profile
+ Women’s Longevity and Vitality Profile
+ Women’s Longevity and Vitality Premium Profile

What does a Low Fasting Insulin value mean?

A low fasting insulin level is generally not of concern. Athletes and those who exercise regularly can have low insulin levels. Exercise starts to reactivate insulin receptors on the cells because it promotes the burning of fat and glucose, creating a need for more fuel in the cell. Exercise also helps carry glucose into the cells so it can be used for energy.

What are steps you can take for low Fasting Insulin levels?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Increase your intake of lean, high-quality proteins in the diet, including fish, turkey, bison and ostrich. It is best to use organic, free-range meats that are raised without chemical additives, hormones and antibiotics.
+ There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana (limit this due to high glycemic index), or other fruit in a blender with rice milk or quality water.
Supportive Supplements

<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Multi-Probiotic 4000                                         | 1 capsule, 1-3 times daily                                              | + Supports gastrointestinal health\(^{1092}\)  
+ Supports vitamin B and K metabolism\(^{1093}\)  
+ Helps improve absorption of nutrients from foods |
| Life Time Fitness Peak Performance Whey Protein Isolate      | 2 scoops in favorite beverage, mix and drink daily                     | + Easily digestible, high-quality protein source\(^{1094}\)  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH)\(^{1095}\)  
+ Provides 22gm protein per 2 scoops (30gm)               |
| Life Time Fitness Creatine                                  | 10gm daily in divided doses for 1 week, then 5gm daily                 | + Promotes protein synthesis and enhances muscle mass  
+ Important in exercise and fitness performance\(^{1096}\) |
| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism\(^{1097}\) |

What does a high Fasting Insulin value mean?

A high fasting insulin level indicates that you may have insulin resistance (IR). IR occurs when the insulin receptor on the cells is no longer sensitive or responsive to the insulin that is being released. When insulin doesn’t attach to the receptor effectively, blood sugar (glucose) cannot get into the cells and therefore builds up in the blood, causing the body to continually make insulin to try to decrease the sugar levels. Over time, this sets up damaging processes to the body, like excessive triglyceride and LDL cholesterol formation, which can lead to non-alcoholic fatty liver and an increase in oxidation of low density lipoprotein (LDL, the “bad” cholesterol). Insulin, when released in excess promotes inflammation which then triggers free radical damage. If free radical damage oxidizes LDL cholesterol, it will contribute to plaque build-up in the arteries and can lead to atherosclerosis (hardening of the arteries) and other heart problems.\(^{1098}\) Insulin stimulates smooth muscle growth in your arteries, which compresses them and causes elevations in blood pressure.\(^{1099}\)

IR also leads to the accumulation of belly fat, and in turn, increased belly fat leads to insulin resistance. When insulin is high, visceral (belly) fat storage is promoted in the body, and fat breakdown is blocked.\(^{1100}\) Belly fat is metabolically active, and it is a factory for making several inflammatory chemicals, hormones, enzymes, and signaling substances that actually make insulin receptors more sluggish. Over time the chemicals made from belly fat begin to accumulate and accelerate the march toward chronic illnesses in by disruption of several metabolic pathways.\(^{1101,1102}\)

Glycation is the process of glucose attaching to proteins in the body resulting in Advanced Glycation End products (AGEs). AGEs are very slow to leave the body and are very inflammatory. High levels of glucose in the blood can build up AGEs, leading to kidney and heart problems, cataracts and macular degeneration, nerve damage (neuropathy), and connective tissue damage.\(^{1103}\) High levels of AGEs are associated with insulin resistance.\(^{1104}\) When belly fat and AGEs increase inflammation, they turn off adiponectin (a signaling chemical that makes insulin
receptors more active). Decreased adiponectin leads to accelerated blood vessel damage and makes the vessels more susceptible to plaque formation. IR also affects the kidneys by producing a byproduct of increased insulin called insulin growth factor -1 (IGF-1). IGF-1 can lead to increased blood flow through the kidneys, putting stress on their normal function. IR also leads to kidney damage by depleting the antioxidant, glutathione, which is one of your principle cellular protectors. Glutathione helps detoxify substances (including drugs, environmental chemicals, metabolic waste products) in the blood that are being filtered through the kidneys. With IR, the increased free radicals and oxidative stress deplete the pool of glutathione in the kidneys and can lead to damage to the kidneys and other body tissues. When you are insulin resistant the kidneys spill magnesium and retain sodium. This causes you to retain water. Even more important is the magnesium loss because magnesium helps to regulate blood pressure as well blood sugar. It is a vicious cycle. Last and most important, excessive insulin leads to the release of excess nor epinephrine and epinephrine (adrenaline and noradrenalin). When this happens blood vessels get constricted and become less pliable. This leads to hypertension which many times starts in the renal arteries.

In summary, IR is a significant contributing factor in:

+ Dementia and Alzheimer’s disease and cancer
+ Diabetes
+ Macular Degeneration and various conditions related to the eyes
+ Peripheral Vascular Disease
+ Autoimmunity
+ Chronic Kidney Disease
+ Obesity

Factors Contributing to IR:

+ Diet: High carbohydrate and sugar intake is one of the quickest ways to make your pancreas release too much insulin.
+ Increased stress: When excessive levels of cortisol are produced over long periods of time, it promotes inflammation, alters blood sugar control (hyperinsulinemia), causes fat storage and weight gain, affects immune and thyroid function, and alters sex hormone production.
+ Hormonal Imbalances: Hormones have profound influence on blood sugar regulation. In men, for example, low testosterone levels can increase the prevalence of the metabolic syndrome, which includes high cholesterol levels, high blood pressure, insulin resistance and obesity. If the progesterone to estrogen ratio is too high you will store too much fat and tend toward insulin resistance.
+ Digestive function: evidence supports the idea that impairment of normal gut barrier function, through environmental stressors (such as heavy metals and chemical preservatives), poor dietary habits (such as diets high in carbohydrates, refined sugars, and fructose), food allergies, and chronic stress, and a wide array of drug therapies result in the loss of the counter-inflammatory flora balance and leads to the expression of uncontrolled inflammation.
+ Nutrient Deficiencies:
  - Chromium - Chromium is known not only to be essential for proper insulin receptor function; it also plays a role in lowering cholesterol. Chromium intakes are usually well under optimal amounts and in addition high sugar diets deplete chromium from the body. These two factors combine to make chromium deficiency a likely culprit in many people with IR.
  - Magnesium - Magnesium is another mineral that plays an important role in carbohydrate metabolism and in preventing Metabolic Syndrome. Magnesium influences the release and activity of insulin and help balance
glucose levels. Low levels of magnesium are frequently seen in individuals with Type 2 diabetes, and can increase insulin resistance. Several clinical studies have reported that magnesium supplementation is beneficial in reducing blood glucose levels, improving insulin control, and stabilizing the Metabolic Syndrome cascade. Low magnesium intake is also associated with an increase in inflammatory markers, such as C-reactive protein (CRP).

- Vitamin D - Vitamin D is needed by your body to help maintain adequate blood levels of insulin. The evidence is pretty strong that vitamin D supplementation can increase insulin levels in some people with type 2 diabetes, and prolonged supplementation might also help reduce blood sugar levels. Vitamin D deficiency can make you more susceptible to developing insulin resistance, and therefore type 2 diabetes.

- Zinc – Zinc is a very important nutrient for maintaining healthy metabolism. Zinc plays a key role in the synthesis and action of insulin and a big role in insulin resistance. High levels of blood sugar can cause depletion of zinc from the body, leading to an increase in insulin resistance and related complications of diabetes such as oxidative stress on the body.

Other Causes: Lack of quality sleep (7-8 hours a night, uninterrupted), heavy metal or pesticide contamination, thyroid imbalances and a host of other metabolic imbalances can lead to an increase in inflammatory compounds and free radical damage that can lead to IR. Some medications can also lead to increased insulin levels, including corticosteroids (like prednisones, hydrocortisone), antibiotics and oral contraceptives.

What are steps you can take for a high Fasting Insulin level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

- Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which initiates the inflammatory signaling pathways. Modifying your diet can help decrease physical and mental stress, helping balance metabolism. Consider going on a modified lower carbohydrate diet that your Life Time Fitness Dietician can personalize for you.
- Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are consumed in adequate amounts it lowers health risks, especially for heart disease, and new studies are suggesting that adequate intakes may even help prevent obesity.
- Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day.
- Avoid heating the oil, but it’s great on salads and sprayed on foods.
- Avoid common food allergens, including gluten, dairy, soy.
- Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and inflammation. Modifying the diet can help decrease inflammation, physical and mental stress, all helping to balance metabolism.
- The diet should also limit other inflammatory foods, such as processed meats, chemical preservatives, and food additives. Studies have found that nitrite or nitrate treated meats such as bacon, sausage, smoked foods, and lunch meats increase the risk of cancer. High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketchup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such as liver imbalance.
+ High-fiber foods, including flax seed, fresh vegetables, and beans should be part of the diet. These foods should supply the 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar. Eat meals at regular times each day. It’s best not to eat after 7 pm.

+ Increase consumption of high-quality protein, like lean meats, bison, fish, chicken, turkey or ostrich.

+ There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana (limit this due to high glycemic index), or other fruit in a blender with rice milk or quality water.

+ Inappropriate dietary fat intake, excessive intake of soft drinks (due to high fructose corn syrup), insulin resistance caused by eating too many refined sugar and carbohydrates and increased oxidative stress due to a poor diet combine to increase IR.

+ Once a day have a little over a half of a teaspoonful of cinnamon (3gm) on your food. Using cinnamon has been reported to lower blood sugar\textsuperscript{1135}, or consider taking a standardized extract of cinnamon.

+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.

+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance metabolism.\textsuperscript{1136}

+ Limit sports and energy drinks that are high in sugar content, including fructose and sucrose.

+ Avoid overeating, as this creates too much demand on your insulin levels and your digestive tract.

+ Get adequate rest and manage stress — about 7-8 hours of interrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, which elevates blood sugar. Poor sleep is associated with the development of diabetes. Additionally, elevated day time cortisol will tend to elevate blood sugar and cause a rise in insulin secretion over time.

+ Lose weight. Excess weight is a main contributor to IR, and vice versa. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.

+ Exercise 20 minutes a day at least 3 days a week. It helps to decrease cortisol (stress hormone) levels, improve sex hormone levels and reduce insulin resistance.

+ Get out in the sun to increase your vitamin D levels.

**Supplements**

<table>
<thead>
<tr>
<th>Alpha lipoic acid</th>
<th>500mg 2 times daily</th>
<th>+ Antioxidant\textsuperscript{1137}</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>+ Helps improve energy production and regulate blood glucose levels\textsuperscript{1138}</td>
</tr>
<tr>
<td>Supplement</td>
<td>Dosage/Directions</td>
<td>Benefits</td>
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<tr>
<td>Cal/Mag 1001</td>
<td>Take 1 tablet 2 times daily with food</td>
<td>+ Magnesium plays an essential role in a wide range of fundamental cellular reactions.</td>
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<td></td>
<td></td>
<td>+ Magnesium is involved in maintaining already normal heart function and blood pressure.</td>
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<td></td>
<td></td>
<td>+ Supplies 150mg of elemental magnesium from bioavailable magnesium citrate in each capsule.</td>
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<tr>
<td>Dual-Source Chromium as</td>
<td>1 capsules (300mcg chromium) daily</td>
<td>+ Improves insulin regulation and glucose tolerance.</td>
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<td>chromium polynicotinate and</td>
<td></td>
<td>+ Helps support serotonin levels.</td>
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<tr>
<td>chromium picolinate</td>
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<tr>
<td>Glukokine</td>
<td>1 tablet 2 times daily</td>
<td>+ Glukokine® contains bitter melon extract (10% Charantin), chromium and the antioxidant</td>
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<td></td>
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<td>glutathione, blended together to support healthy blood sugar levels through improved glucose</td>
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<td></td>
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<td>metabolism.</td>
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<tr>
<td>Life Time Fitness FastFuel</td>
<td>4 scoops (approx. 65gm) in the morning as part of a healthy</td>
<td>+ Contains whey protein concentrate &amp; isolate, Sunfiber™ medium chain triglycerides, a</td>
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<tr>
<td>Complete</td>
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<td>proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and</td>
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<tr>
<td></td>
<td></td>
<td>a proprietary fruit and vegetable complex blend.</td>
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<td></td>
<td></td>
<td>+ Helps support digestive function.</td>
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<tr>
<td>Life Time Fitness Men’s or Women’s</td>
<td>3 capsules in the morning after breakfast and 3 capsules</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are</td>
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<tr>
<td>Women’s Performance Daily</td>
<td>with dinner.</td>
<td>formulated to provide the body with key nutrients needed for proper metabolism.</td>
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<td>Multivitamin AM/PM</td>
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<tr>
<td>Life Time Fitness Peak Performance</td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>+ Easily digestible, high-quality protein source.</td>
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<tr>
<td>Whey Protein Isolate</td>
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<td>+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione</td>
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<td></td>
<td></td>
<td>(GSH).</td>
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<td>+ Provides 22gm protein per 2 scoops (30gm).</td>
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<tr>
<td>Multi-Probiotic 4000</td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health.</td>
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<td>+ Supports vitamin B and K metabolism.</td>
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<td>+ Helps improve absorption of nutrients from foods.</td>
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<tr>
<td>Supplement</td>
<td>Dosage</td>
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| Perfusia SR    | 2 capsules 2 times daily; each cap contains 1,000mg time release L-arginine | + Perfusia SR<sup>®</sup> contains sustained-release L-arginine, an amino acid which helps support vascular health by improving nitric oxide production and use.<sup>1150</sup>  
+ Individuals with a known herpes infection should not take L-arginine without also taking lysine (500-1,000mg daily), as L-arginine alone has been noted to cause herpes eruptions in susceptible individuals. |
| Relora Plex    | 2 capsules, 1-2 times daily | + Relora<sup>®</sup> is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (Magnolia officinalis) and Phellodendron bark (Phelodendron amurense).  
+ Relora Plex also contains B-vitamins, which help in stress and nervous system balance  
+ Useful in stress and decreasing cortisol levels<sup>1151</sup> Relora can increase salivary DHEA and decreases salivary morning cortisol levels<sup>1152</sup>  
+ Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals. |
| Vitamin D 1000 | + 1-5 capsules (1,000 – 5,000 IU) daily, depending on vitamin D3 lab value  
+ If lab value 30 ng/ml or less, then take 5,000 IU daily; if 30-40 ng/ml, then take 1,000 IU daily both in addition to your multivit; retest in a month | + Bone support  
+ Treatment of vitamin D deficiency improves bone mineral density<sup>1153</sup> |
A food allergy is an abnormal immune system reaction that happens after you eat a particular food - even a very small amount. There are seven foods that are reported to make up 90% of all food allergies: peanuts, tree nuts like walnuts or almonds, shellfish, soybeans, eggs, wheat, and cow’s milk. Corn and tomatoes are other common allergenic foods. Food allergies can even be life threatening in some individuals. In adults, the most common food allergens (substances causing the allergic reaction) include fish and shellfish (including shrimp, lobster, crab), peanuts, tree nuts like almonds and walnuts, and eggs.

Two additional types of immune reactions to foods occur as well. One is called food intolerance and the other is called food sensitivity. Food intolerance is when a person is incapable of digesting or absorbing a certain substance like lactose or fructose due to inherited conditions resulting in enzyme deficiencies. A food sensitivity means that your immune system is being called to defend against a particular food or food component, usually due to imbalances in digestive health. Food sensitivities can also be due to stress, contaminated foods with bacteria, fungi, additives or pesticides, or compounds naturally found in foods like salicylates (aspirin-like compounds).

The types of reactions your body has against foods, either a true allergy or a food sensitivity, are based on two types of proteins produced by your immune system called antibodies. These antibodies include immunoglobulin E (IgE) and immunoglobulin G (IgG). Food allergies occur when the immune system activates IgE, and food sensitivities occur when the immune system activates IgG. Immune reactions to foods involving IgE are obvious and almost immediate, due to release of histamine and inflammatory molecules that cause constriction of the airways (asthma-type reaction), redness and swelling of the skin, itching, increased mucous production (runny nose), and even anaphylactic shock. Those related to the antibody IgG, are called delayed and are not immediate. These occur due to your body’s sensitivity to foods and are based on individual chemistry, your digestive health, stress level and imbalances in metabolism. The IgE food allergy affects an estimated 6-8 percent of children under age 3, and about 4 percent of adults, while the IgG food sensitivity is related to approximately 95% of all food reactions.
IGG FOOD SENSITIVITY PANEL

Food Sensitivity Panel References
IgG Allergens (24 panel), positive or negative test:

- Blue Cheese Mold
- Chicken
- Chili Pepper
- Chocolate/Cocoa
- Coffee
- Corn
- Milk (Cow)
- Egg, Whole
- Green Bean
- Haddock
- Lamb
- Oat
- Onions
- Peanut
- Pork
- Potato, White
- Rye
- Shrimp
- Soybean
- Cane Sugar
- Tomato
- Wheat
- Baker’s Yeast
- Brewer’s Yeast

Why is a Food Sensitivity Panel needed?
The IgG Food Sensitivity Test measures the release of the antibody IgG in response to foods listed on the panel. This can help identify those foods that may be causing health problems.
Your digestive tract does a lot more than simply process the food you eat. In fact, it influences many areas of overall health. Poor digestive health can influence many areas of health, including mood, joints, glands like the thyroid and adrenal glands, the liver, autoimmune conditions like rheumatoid arthritis and weight gain. More and more people are suffering from food sensitivities and other immune responses to foods, which begin in the digestive tract. These allergies in turn disrupt other bodily processes that directly contribute to weight gain.

The main area of concern in a food allergy/intolerance/sensitivity is with the balance of the intestinal microflora (“probiotics”). You coexist in a mutually beneficial relationship with many bacteria that resides in the intestines – called the microflora or “probiotic flora”. More than 400 separate bacterial species have been identified as part of the normal human gut flora, including Lactobacillus acidophilus, Bifidobacterium sp., and others. A healthy intestinal tract not only allows absorption of nutrients from food, but also acts as a barrier that protects against potentially damaging foods, bacteria, and fungi.

The digestive tract houses nearly 70% of the immune system and helps to ensure a strong, balanced immune response that is neither over- nor under-active. Cells in the digestive tract provide a physical barrier to entry into the bloodstream by foreign substances, like bacteria and yeast, undigested proteins and environmental toxins. They do this by forming “tight junctions” and by producing mucus. When these cells are damaged (called “gut permeability”) by toxins released by “bad” bugs like bacteria and yeast, environmental stressors (like as heavy metals and chemical preservatives), poor dietary habits (such as high sugar, high refined carbohydrate diets, preservatives), psychological or physical stress, and some drug therapies (including antibiotics), imbalances in your normal flora can result. Lack of beneficial flora and overgrowth of intestinal yeast can lead to an array of problems, including allergies. For example, studies have reported that when beneficial flora are lacking, seasonal allergies develop more easily. Other studies have reported that people with food allergies have different intestinal flora with a higher number of “bad” bacteria and yeast. Other problems such as headaches, fatigue, gas/bloating, ulcers, lack of ability to concentrate, nerve pain, skin rashes, joint pain, and decreased immune function can occur.

The damaged cells in the digestive tract produce chemicals involved in inflammation called cytokines. Increases in cytokines can cause uncontrolled inflammation and poor metabolism. The imbalance of your bacterial flora and the subsequent overgrowth of “bad” bacteria and yeast is termed dysbiosis. A diet full of carbohydrates, sugars, dietary lectins (a type of protein found in foods such in wheat gluten and milk), and high-fructose corn syrup (commonly found in sweetened beverages) can be a major factor in the development of intestinal imbalances by promoting the growth and spread of yeast. The single most important factor by far in intestinal breakdown is the lack of beneficial flora in the digestive tract. Chronic stress is a main culprit in this regard. Eventually, dysbiosis can lead to other metabolic imbalances, like weight gain, impaired immunity, insulin resistance and symptoms of type 2 diabetes, hormonal imbalances, nutrient deficiencies (like calcium, vitamin B12, folate, vitamin B6 and others), sleep disturbances, heart problems and even cancer.

When you have adequate beneficial flora it keeps yeast and bad bacteria under control and provides a number of benefits for health. Beneficial flora has a direct effect on the production of proteins that keep a proper barrier between the bloodstream and intestinal contents, helps the body digest foods and absorb nutrients for cellular energy, actually produce some nutrients, decrease toxins in the intestines and support a healthy immune system.

Food allergies and sensitivities can lead to weight gain. Food allergies and sensitivities cause immune cells to go into action and produce inflammatory substances that are a source of internal inflammation. Chronic inflammation can damage insulin receptors and cause insulin resistance, a primary cause of weight gain. Food reactions may also contribute to weight gain by causing the body to produce more stress hormones, which can also contribute to insulin resistance and midsection weight gain or belly fat. The overproduction of stress hormones can also negatively influence the production of thyroid hormones. In addition food allergies can lead to autoimmunity, which can imbalance your thyroid gland (the “master” gland of metabolism). Food allergies can also cause food
cravings and unbalanced eating habits.\textsuperscript{1180} And finally, if your intestinal tract is being compromised by lack of beneficial flora and overgrowth of yeast, it can greatly reduce the proper absorption of nutrients, many of which are key to weight management.\textsuperscript{1181}

An unhealthy gut can also send signals to the brain, causing neurochemical imbalances that lead to memory problems, mood swings, anxiety, depression, and cravings. To show you how intimately the gut and the brain are connected, parents of autistic children have reported significant improvements in the behavior of their autistic children when they modified the child’s diet by eliminating dairy and wheat products.\textsuperscript{1182}

Anyone can have food allergies or sensitivities, which have been linked to seasonal allergies, headaches, joint and other arthritis pain, autoimmune conditions, thyroid problems, and a host of other metabolic imbalances.\textsuperscript{1183,1184}\textsuperscript{1182} If diet and exercise just don’t seem to get the pounds off, then food allergies, sensitivities or intolerances may be the reason why.

The bottom line is that food allergies, sensitivities and intolerances can lead to imbalances in your probiotic flora and result in digestive problems like gas, bloating, decreased ability to absorb nutrients, immune imbalances and uncontrolled inflammation in the intestines which can lead to further, more serious health consequences.

**What Life Time Fitness Lab Test Reports Food Sensitivities?**

+ IgG Food Sensitivity

**What does a Positive Food Sensitivity Test mean?**

A positive test to a food on the IgG Food Sensitivity Panel means IgG antibodies are being produced in response to a health consequence caused by the food in question, such as inflammation and imbalances in your intestinal microflora. This can lead to a variety of symptoms and health conditions, including:

+ Abdominal pain
+ ADD/ADHD
+ Asthma
+ Autism
+ Autoimmune conditions
+ Bedwetting
+ Bloating
+ Canker sores
+ Chronic inflammation
+ Constipation
+ Depression
+ Diarrhea
+ Fatigue
+ Fevers
+ Food intolerances
+ Inflammatory bowel disease
+ Insulin resistance/type 2 diabetes
+ Irritable bowel syndrome
+ Joint and muscle aches/pains
+ Memory and cognitive decline
+ Migraine
Better health & performance start here.

What are steps you can take for a positive food sensitivity?

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

To help achieve a beneficial outcome more readily when you test positive, it is recommended to use an elimination diet. An elimination diet is just what it says – eliminate the food you test positive for on the allergy panel. When your results confirm an IgG reaction to a particular food, you should stop eating that food for at least 3-4 weeks. Common signs of a food sensitivity include:

+ gas and bloating
+ digestive discomfort
+ runny or stuffy nose
+ joint aches
+ rash
+ headaches
+ fatigue or tiredness
+ mood changes
+ increased heart rate

Wheat and dairy tend to be the two most problematic foods, by far. Because traces of wheat and dairy products can often be found in a lot of other foods, it is helpful to remove most processed foods during an elimination diet. Eat as many whole unprocessed foods as possible. Fresh fish, poultry, meats, and fruits and vegetables should be the mainstay of your diet. For instance, do not eat deli lunchmeats because many of them contain a number of different food additives. When you reintroduce the foods, test one food at a time. Eat a normal-sized portion of the food and then watch over the next 24 to 48 hours for any signs of intolerance.

The symptoms of a food sensitivity may appear fairly rapidly after eating the food, or in the case of fatigue, joint aches, or congestion, they may take up to 24 hours to appear. So once you have eaten the foods, if you have no immediate symptoms, remember to continue to observe yourself for any onset of symptoms the whole next day. It is helpful to keep a log of the foods you have eaten and have a place to write any symptoms you get, next to the foods.

If re-introducing the food(s), after using diet and lifestyle changes along with dietary supplements during the elimination phase, leads to symptoms of food sensitivities, then stop eating the food(s) for at least 6 months. During this time, it is very important to support digestive function and immunity with diet and lifestyle changes along with dietary supplements (e.g. probiotics). Sometimes you will find that the sensitivity goes away and other times it never goes completely away (although the symptoms may be lessened).
General Dietary and Lifestyle Recommendations

+ The goals of diet and lifestyle recommendations for food allergies and sensitivities include improving immunity, digestive health and decreasing inflammation.
+ Elimination Diet - Avoid the food allergen if you have a positive test for at least 3-4 weeks. Re-introduce and evaluate if symptoms of food sensitivity occur. If so, stop for 6 months and then retry eating the food. *See above
+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which can imbalance immunity. Modifying the diet can help decrease physical and mental stress, helping balance metabolism. Limit your intake of these foods significantly, especially sugar.
+ Increase antioxidant-containing foods like green, orange, and yellow fruits and vegetables - such as green leafy vegetables, broccoli, peppers, carrots, cantaloupe, and citrus fruits (although fruit sugars should be limited). Polyphenols in these foods are reported to improve immune function and decrease inflammation.
+ When you eat foods, try to buy organic when possible. The use of chemical additives, hormones, pesticides and antibiotics in our food supply can lead to imbalances in digestive health and the immune system. Foods that you should avoid include processed meats, frozen dinners, preserved meats like hot dogs or bacon, fast foods, artificial ingredients and anything with MSG or monosodium glutamate.
+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy. These foods can imbalance digestive health and affect immunity.
+ Stay away from artificial sweeteners, like aspartame (Nutrasweet), sucralose (Splenda). Splenda contains a chlorine molecule that displaces iodine in the thyroid. Use stevia or if necessary, saccharine. Artificial sweeteners have been linked to loss of concentration, headaches, immune and thyroid imbalances, weight gain, blood sugar imbalances and even cancer.
+ Stay away from fermented foods, fungi (mushrooms) and yeast until the food sensitivities are resolved
+ Lose weight. Studies report digestive imbalances when you are overweight or obese. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. Fatty acid balance improves immunity.
+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day. Avoid heating the oil, but it’s great on salads and sprayed on foods.
+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ Eat meals at regular times each day. It’s best not to eat after 7 pm.
+ Remember to chew your food. Saliva begins the process of digestion — it tells your stomach that food is coming. Chewing your food thoroughly, rather than bolting it, is the first step in healthy digestion.
+ Your protein requirements increase when you’re under ongoing stress — especially physical stress and illness. If you have a food sensitivity, your body probably needs some extra protein to heal the hidden damage metabolic imbalances have done to your intestines. You may want to consider adding a protein drink to your diet.
There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible and low allergenic protein. You can mix the protein powder with a cup of fresh berries, a banana, or other fruit in a blender with rice milk or quality water.

The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods should be eliminated. These contaminants can lower your immunity and cause digestive imbalances. Buy organic foods where possible.

Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.

Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.

Do not microwave food in plastic containers or covered in plastic.

Avoid using personal care items such as face creams, shampoos, and toiletries that contain chemical ingredients like phthalates.

Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.

Decrease stress – take a walk, garden, do Yoga or Tai Chi.

Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours. Lack of sleep can cause immune imbalances.

Stop smoking. Immunity is affected with tobacco smoke.

Drink in moderation.

Other Life Time Fitness Panels recommended when testing for food sensitivities include:

- Men’s or Women’s Core Health
- Stress and Resilience
- Men’s or Women’s Longevity and Vitality Premium

Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Use</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aller DMG</td>
<td>1 tablet, 2-3 times daily; use for 2-3 weeks</td>
<td>+ Contains antioxidant nutrients, including quercetin, vitamin C, grape seed extract and polyphenols. + Also contains DMG (dimethylglycine) which supports immune function</td>
</tr>
<tr>
<td>Cat’s claw MAX V</td>
<td>1 capsule 2 times daily; use for 2 weeks</td>
<td>+ Used to support immune and digestive health + Antiinflammatory + Contains standardized cat’s claw plus non-standardized</td>
</tr>
<tr>
<td>Product Name</td>
<td>Dosage</td>
<td>Ingredients</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Life Time Fitness FastFuel Complete        | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage   | + Contains whey protein concentrate & isolate, Sunfiber™️ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function\textsuperscript{1198,1199}  
+ Whey is high in cysteine and branched-chain amino acids (leucine, isoleucine, and valine).  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |                                                                         |
| Life Time Fitness Joint Maintenance Formula| 2 tablets, 2 times daily                                                | + Contains glucosamine and chondroitin sulfate with the protective ability of calcium, MSM (methylsulfonylmethane) and hyaluronic acid, along with the anti-inflammatory properties of bromelain, for nutritional support of healthy bones, joints and connective tissue.\textsuperscript{1200} |                                                                         |
| *Use if pain or inflammation in joints present |                                                                       |                                                                             |                                                                         |
| Life Time Fitness LeanSource™️ Weight Loss | 4 capliques daily, 2 with breakfast and 2 with dinner                   | + LeanSource™️ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat \textsuperscript{1201,1202} all promoting and sustaining weight loss.  
+ LeanSource™️ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements |                                                                         |
<p>| * Use if BMI 25 or &gt;                       |                                                                       |                                                                             |                                                                         |
| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner.  | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.\textsuperscript{1203} |                                                                         |</p>
<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **Life Time Fitness Omega-3 Fish Oil**      | 1-2 capsules, 2 times daily                 | + Helps decrease inflammation and the consequences it has on your metabolism.  
+ Helps support heart and blood vessel health and immunity.  
+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction. |
| **Life Time Fitness Peak Performance Whey Protein Isolate** | 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source  
+ Whey is high in cysteine and branched-chain amino acids (leucine, isoleucine, and valine).  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).  
+ Provides 22gm protein per 2 scoops (30gm) |
| **Moducare**                                | 1-2 capsules 2 times daily                 | + Moducare™ is a proprietary extract of plant sterols and sterolins that helps balance the immune system and decreases autoimmune reactions.  
Moducare™ also helps balance thyroid function. |
| **Multi-Probiotic 4000**                     | 1 capsule, 1-3 times daily                  | + Supports gastrointestinal health and immunity  
+ Supports vitamin B and K metabolism  
+ Helps improve absorption of nutrients from foods  
+ Helps decrease inflammation including CRP levels |
<table>
<thead>
<tr>
<th>Product</th>
<th>Usage</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **Relora Plex** | * Use if chronic stress is present | 2 capsules, 1-2 times daily                                                                  | + Used for stress reduction  
+ Relora® is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (Magnolia officinalis) and Phellodendron bark (Phellodendron amurense).  
+ Relora Plex also contains B-vitamins, which help in stress and nervous system balance  
+ Useful in stress and decreasing cortisol levels Relora can increase salivary DHEA and decreases salivary morning cortisol levels, which can both help balance DHT and testosterone  
+ Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals. |
| **Sleep Solve 24/7** | * Use if ability to fall or stay asleep is a problem | 1 capsule daily, 1 hour before bedtime                                                   | + Improves sleep/wake cycles  
+ Melatonin decreased with increased cortisol levels |
| **Ultra-D Tox** | 1-2 capsules 2 times daily; use for 2-3 weeks                                                                 | + Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C.  
+ Helps support digestive function and detoxification processes |
Iron plays a role in many biochemical pathways. The major function of iron is for oxygen transport by hemoglobin. Hemoglobin is the oxygen-carrying protein in red blood cells. The heme portion of hemoglobin contains four atoms of iron. Iron picks up the oxygen in the lungs where the concentration is high. Iron binds the oxygen and then transports it to the tissues and releases it wherever oxygen is needed. Iron is also a part of many enzymes that are involved with making new cells, liver detoxification, energy production, amino acid and fatty acid metabolism, immunity and hormone and brain chemical (neurotransmitter) levels.

Iron exists in various forms in the body: in functional forms (in hemoglobin and in enzymes) and in transport and storage forms (ferritin, transferrin, and hemosiderin). Bound iron is iron that is attached to one of these proteins. Bound iron is the iron held by a protein such as transferrin or ferritin. These proteins make sure the iron you absorb from foods goes to the right place or is stored for future use. Bound iron is determined by measuring TIBC (total iron binding capacity). If iron storage is low, then the body makes more transferrin to collect more iron from foods and use it more efficiently. If there is too much iron coming from foods in the digestive tract, the body will decrease production of transferrin so that less of the iron is taken up and transported around the body. To calculate the percentage of transferrin binding to iron, a fasting serum iron must also be measured. A fasting serum iron divided by TIBC shows the percentage of transferrin left to bind up free iron.

Free iron is iron that is not bound and because iron creates free radicals, it’s the most dangerous kind of iron because it increases oxidative stress in the body which can lead to tissue and organ damage.

Briefly, free radicals are highly unstable and highly reactive molecules (usually oxygen molecules gone haywire) in the body. Free radicals are formed as a result of the normal energy production that goes on in all the cells of our body. If free radicals are not quickly neutralized after being produced, they bounce around in the body and can damage our cell membranes and organs in the body, leading to imbalances in metabolism. This is called oxidative stress. Think of oxidative stress like rusting – it occurs naturally as a normal by-product of metabolism. If toxins are not eliminated, then excessive free-radical damage can occur, leading to chronic health problems and at the very least accelerated aging. Increased oxidative stress is linked to most imbalances in metabolism, including hormonal (thyroid, adrenal, sex), neurochemistry (brain chemicals), weight gain, gastrointestinal, blood sugar regulation, heart and blood vessel, kidney, liver and cancer.

Only a small amount of the iron in your body is increased or decreased daily. Much of the body's iron is recycled when old red blood cells (RBCs) are removed from the blood and destroyed.
IRON

Reference Values
Iron Blood Level
(In micrograms per deciliter = mcg/dl)

| Normal Range (Adult Male) | 40 - 155 mcg/dL |
| Normal Range (Adult Female) | 35 – 155 mcg/dL |

Why is an Iron level needed?
An iron blood test is used to determine the level of iron in your body. Along with the iron blood test, a total iron-binding capacity (TIBC) level is used. This determines how much iron is being carried in the blood. A well-balanced diet contains sufficient iron to meet body requirements, but imbalances, including menstruation, pregnancy, insulin resistance and thyroid hormone imbalances can lead to low levels of iron available for use by the body.\(^2\)

Thyroid hormone, insulin and insulin growth factor-1 are involved in the control of ferritin. Ferritin and iron balance can cause many disorders, including problems with iron absorption, transport and storage (called hemochromatosis) as well as in atherosclerosis, Parkinson’s disease, Alzheimer disease, and restless leg syndrome.\(^2\)

** If you take iron or vitamins containing iron, stop at least 3-4 days before testing

What Life Time Fitness Lab Tests Report an Iron range?

+ Women’s Sex Hormone Profile (if menstruating)

What does a low Iron value mean?
Since the major function of iron is for oxygen transport by hemoglobin, low iron levels can result in anemia, or the inability of hemoglobin to carry oxygen to the tissues. This can result in fatigue, headaches, shortness of breath, dizziness and other symptoms. Some symptoms of low iron in the body:

+ Anemia
+ Labored breathing after exertion
+ Spooning of fingernails and brittle nails
+ Greater susceptibility to infections
+ Fatigue and weakness
+ Dizziness
+ Headaches
+ Irritability
+ Loss of libido or sex drive
+ Pale skin
+ Sore mouth corners
+ Burning sensation of the tongue
+ Urge to eat mud or chalk (geophagy)
A loss of blood (including menstruation in women or gastric ulcers), pregnancy or a diet poor in iron can lead to low iron levels. Menstrual bleeding is the most common cause of iron deficiency. About 80% of the iron in the body is in the blood, so iron loss is greatest whenever blood is lost. Menstruating women require approximately twice as much iron intake as men to replace their monthly losses. Individuals at risk include infants, adolescent girls, pregnant women, menstruating women, people with bleeding ulcers, and vegetarians. Iron deficiency anemia is a condition where red blood cells contain less hemoglobin and consequently carry less oxygen.

Overuse of drugs that can lead to ulcers can also cause low iron levels, including anti-inflammatory drugs like ibuprofen (Motrin, Advil), naproxen (Naprosyn, Aleve), indomethacin (Indocin) and others. Certain cancers, such as colon cancer, can lead to low iron levels.

If you have low thyroid hormone levels, this will lead to less energy and also decrease the amount of acid in your stomach, leading to problems absorbing nutrients from foods including iron. Iron needs acid to be absorbed from the foods we eat, so low thyroid and acid leads to low iron levels. Eating an unhealthy diet, high in refined carbohydrates and sugars, full of high fructose corn syrup and chemical additives can also lead to thyroid imbalances.

Low iron levels also decrease deiodinase activity, which slows down the conversion of T4 to T3 (the active thyroid hormone).

Drugs that can cause a low iron level include:

- Aspirin and salicylates
- Cholestyramine
- Colestipol
- H-2 receptor antagonists including cimetidine, famotidine, nizatidine, and ranitidine
- Indomethacin
- Levothyroxine
- Quinolone antibiotics, including Levaquin and Cipro
- Tetracyclines

What are steps you can take for a low Iron value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

- Increase your consumption of animal proteins, including meats and seafood. Liver is by far the richest iron-containing food. Other good sources of iron-rich foods include organ meats, fish, and poultry. Dried beans and vegetables are the best plant sources, followed by dried fruits, nuts, and whole grain breads and cereals. Fortification of cereals, flours, and bread with iron has contributed significantly to daily dietary iron consumption.
- Avoid animal protein that has been raised with hormones whenever possible. Chicken should also be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your hormone receptors to function appropriately.
- There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana (limit this due to high glycemic index), or other fruit in a blender with rice milk or quality water.
+ Eat green leafy vegetables, including broccoli, kale and spinach, on a regular basis. Iron in vegetables is not as quickly or readily absorbed as iron from animal sources, but it is still valuable. Other vegetable sources of iron include beans and peas.
+ Decrease citrus fruits and tea/coffee because they contain chemicals that can bind to iron and decrease its absorption. Citrus fruits contain ascorbate and citrate and teas/coffee contains tannins, both reported to lower iron levels.\textsuperscript{1228}
+ Dried beans are also a good source of iron, followed by dried fruits (watch sugar content), nuts, and whole grain breads and cereals. Fortification of juices, cereals, flours, and bread with iron has contributed significantly to daily dietary iron consumption, although watch your carbohydrate intake
+ Decrease using antacids and OTC medications for ulcers (like Zantac, Tagamet and Pepcid) that lower the stomach acid. Lower acid production will lead to low iron levels.
+ Stop smoking.
+ Exercise in moderation. Athletes can be more susceptible to iron loss. Swimming, aerobics, yoga and dancing are also good activities to help decrease stress and have less impact on the body.

**Supportive Supplements**

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Quantity &amp; Method</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Life Time Fitness FastFuel Complete               | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage              | + Contains whey protein concentrate & isolate, Sunfiber\textsuperscript{TM} medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function\textsuperscript{1229,1230}  
+ If gas or bloating occurs, change to l-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner.              | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.\textsuperscript{1231} |
| Life Time Fitness Peak Performance Whey Protein Isolate | 2 scoops in favorite beverage, mix and drink daily                                | + Easily digestible, high-quality protein source\textsuperscript{1232}  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH)\textsuperscript{1233}  
+ Provides 22gm protein per 2 scoops (30gm)                                                |
| Multi-Probiotic 4000                              | 1 capsule, 1-3 times daily                                                        | + Supports gastrointestinal health\textsuperscript{1234}  
+ Supports vitamin B and K metabolism\textsuperscript{1235}  
+ Helps improve absorption of nutrients from foods                                            |
<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage Information</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thyro Mend</td>
<td>1 capsule, 2 times daily with food</td>
<td>+ Thyro-Mend™ is a proprietary combination of iodine from seaweeds and synergistic herbs that support thyroid function. + Thyro-Mend™ helps maintain proper iodine levels necessary for an increase in thyroid hormone production.</td>
</tr>
<tr>
<td>Time Release Iron</td>
<td>2 tablets daily with meals</td>
<td>+ Specially designed to provide 54 mg of carbonyl iron (Ferronyl®) per serving for a 6-to 8-hour period. + Use with caution in men</td>
</tr>
</tbody>
</table>

**What does a high Iron value mean?**

High levels of iron (called iron overload or hemochromatosis) is associated with an increase in oxidative stress which increases the risk for cancer (including prostate and breast), heart problems, and other illnesses such as endocrine problems, autoimmunity, bone and joint problems, insulin resistance and type 2 diabetes and liver problems.\(^{1236,1237,1238,1239,1240}\)

**What are steps you can take for a high Iron level?**

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Do not take iron supplements. Make sure your multivitamin/mineral supplement DOES NOT contain iron, especially if you are a man. Use Life Time Fitness Men and Women’s AM/PM Multivit/mineral to make sure you are getting the right nutrients.
+ Several foods contain high amounts of iron. You may want to avoid vitamin and mineral supplements that contain iron, especially if you are a man. Also avoid iron-fortified foods such as juices, some breakfast cereals, and especially avoid beef, liver, and pork.
+ Decrease protein intake from meat; increase protein from beans.
+ Nonalcoholic fatty liver disease (NAFLD) is a common condition associated with obesity and metabolic syndrome.\(^{1241}\) Inappropriate dietary fat intake, excessive intake of soft drinks (due to high fructose corn syrup), insulin resistance caused by eating too much refined sugar and carbohydrates and increased oxidative stress due to a poor diet combine to increase fat in the liver.
+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. Fatty acid balance improves immunity.\(^{1242}\)
+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli), garlic, onions
+ Increase water intake – stay hydrated; a minimum of 2 liters of filtered water daily is recommended
+ Substitute green tea for your morning coffee and increase your citrus fruit consumption. Both contain chemicals that can decrease iron absorption and lower its level.

### Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Alpha lipoic acid                               | 500mg 2 times daily | + Antioxidant<sup>1243</sup>  
+ Helps improve energy production and regulate blood glucose levels<sup>1244</sup> |
| Dual-Source Chromium as chromium polynicotinate and chromium picolinate | 1 capsule (300mcg chromium) daily | + Improves insulin regulation and glucose tolerance<sup>1245</sup>  
+ Helps support serotonin levels<sup>1246</sup> |
| L-glutamine                                     | 1-4 capsules (500mg-2 grams) daily in divided doses | + Supports digestive tract tissue and immune function<sup>1247</sup> |
| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.<sup>1248</sup> |
| N-acetyl cysteine (NAC)                         | 500 - 750mg, 1-2 times daily | + Liver support  
+ Improves glutathione (antioxidant) stores in the liver<sup>1249</sup> |
| T.A.P.S                                         | 1 capsule, 2 times daily | + Contains liver supportive herbs, including milk thistle, picorrhiza, artichoke and curcumin  
+ Helps improve liver detoxification processes and provide antioxidant support for the liver.<sup>1145</sup> |
LIPID PANEL (INCLUDING VAP)

Lipids are waxy, fatty substances produced by your liver that includes cholesterol and triglycerides. Cholesterol is the building block substance used to make hormones, including sex hormones like testosterone and estrogen and the stress hormone (cortisol). Our cell membranes, and a protective nerve covering called myelin, are both made from cholesterol. Cholesterol is also a component of bile, an important aid to fat digestion, and it is the substance from which vitamin D is made.

Cholesterol is often discussed along with triglycerides (the chemical name for fats) as they exist in foods and in the body. There are 3 major components of cholesterol, Very-low-density lipoprotein (VLDL), high-density lipoprotein (HDL) cholesterol, and low-density lipoprotein (LDL) cholesterol. Each type contains a mixture of cholesterol, proteins and triglycerides, but in varying amounts. LDL contains the highest amount of cholesterol. HDL contains the highest amount of protein. VLDL contains the highest amount of triglyceride.

Maintaining healthy cholesterol and triglycerides, weight, blood sugar and insulin levels, as well as balancing hormones and the digestive system, decreasing stress, inflammation and exposure to environmental toxins are all critical for the heart and blood vessels.

Pages 248-257
## INSULIN, FASTING

### Reference Values

Lipid Panel

Blood Lipid Levels  
*(in milligrams per deciliter = mg/dL)*

### Total cholesterol (Adults):

<table>
<thead>
<tr>
<th>Level</th>
<th>Reference Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal</td>
<td>&lt; 200 mg/dL</td>
</tr>
<tr>
<td>Borderline high</td>
<td>200 - 239 mg/dL</td>
</tr>
<tr>
<td>High</td>
<td>&gt; 240 mg/dL</td>
</tr>
</tbody>
</table>

### HDL cholesterol (Adults):

<table>
<thead>
<tr>
<th>Level</th>
<th>Reference Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>&lt; 40 mg/dL</td>
</tr>
<tr>
<td>Optimal</td>
<td>&gt; 40 mg/dL</td>
</tr>
</tbody>
</table>

### LDL cholesterol (Adults):

<table>
<thead>
<tr>
<th>Level</th>
<th>Reference Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal</td>
<td>&lt; 100 mg/dL (&lt; 70 if high risk*)</td>
</tr>
<tr>
<td>Near optimal</td>
<td>100 - 129 mg/dL</td>
</tr>
<tr>
<td>Borderline high</td>
<td>130 - 159 mg/dL</td>
</tr>
<tr>
<td>High</td>
<td>160 - 189 mg/dL</td>
</tr>
<tr>
<td>Very high</td>
<td>&gt; 190 mg/dL</td>
</tr>
</tbody>
</table>

### VLDL cholesterol (Adults):

<table>
<thead>
<tr>
<th>Level</th>
<th>Reference Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal</td>
<td>5 - 40 mg/dL</td>
</tr>
</tbody>
</table>

### Fasting triglycerides (Adults):

<table>
<thead>
<tr>
<th>Level</th>
<th>Reference Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal</td>
<td>&lt; 150 mg/dL</td>
</tr>
<tr>
<td>Borderline high</td>
<td>150 – 199 mg/dL</td>
</tr>
<tr>
<td>High</td>
<td>200 – 499 mg/dL</td>
</tr>
<tr>
<td>Very high</td>
<td>&gt; 500 mg/dL</td>
</tr>
</tbody>
</table>
VAP Panel
Blood Lipid Analysis
(in milligrams per deciliter = mg/dL)

Includes above values plus:

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non HDL cholesterol (LDL + VLDL)</td>
<td>&lt; 160 mg/dL</td>
</tr>
<tr>
<td>ApoB100 calc.</td>
<td>&lt; 109 mg/dL</td>
</tr>
<tr>
<td>LDL-R (real)</td>
<td>&lt; 100 mg/dL</td>
</tr>
<tr>
<td>Lp(a)</td>
<td>&lt; 10 mg/dL</td>
</tr>
<tr>
<td>IDL cholesterol</td>
<td>&lt; 20 mg/dL</td>
</tr>
<tr>
<td>Remnant Lipoprotein (IDL + VLDL3)</td>
<td>&lt; 30 mg/dL</td>
</tr>
<tr>
<td>HDL-2 (more protective)</td>
<td>&gt; 10 mg/dL</td>
</tr>
<tr>
<td>HDL-3 (less protective)</td>
<td>&gt; 30 mg/dL</td>
</tr>
<tr>
<td>VLDL-3 (higher risk of metabolic disorders)</td>
<td>&lt; 10 mg/dL</td>
</tr>
</tbody>
</table>

LDL Patterns (the presence of and amount in mg/dL)

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDL1</td>
<td>Pattern A (lower risk of metabolic disorders)</td>
</tr>
<tr>
<td>LDL2</td>
<td>Pattern A (lower risk of metabolic disorders)</td>
</tr>
<tr>
<td>LDL3</td>
<td>Pattern B (higher risk of metabolic disorders)</td>
</tr>
<tr>
<td>LDL4</td>
<td>Pattern B (higher risk of metabolic disorders)</td>
</tr>
<tr>
<td>LDL Density Pattern</td>
<td>(A, B or A/B)</td>
</tr>
</tbody>
</table>

* High risks are those with heart problems, kidney/liver problems, diabetes.

Why is a Lipid Panel needed?

A lipid panel is a group of blood tests that can measure the amount of cholesterol and triglycerides in your blood. A lipid panel can help determine if you are at risk for heart problems, like high blood pressure, stroke, atherosclerosis or heart attack. According to the American Heart Association, in the United States alone more than 70 million people have some form of heart problems, which can include high blood pressure, atherosclerosis, blood vessel damage, angina (“chest pain”), stroke and heart attack. A lipid panel also is part of testing for the risk of metabolic syndrome (MeS). MeS is a cluster of health conditions, including increased inflammation, high blood pressure, increased cholesterol, insulin resistance and blood sugar regulation problems, increased weight (“belly” fat) and increased BMI (body mass index – measures your fat %). If you are over 50, you have a better than 1 in 3 chance of developing MeS.

The VAP®, or vertical auto profile test, directly measures cholesterol components, including total cholesterol, LDL, HDL, VLDL, and lipoprotein subclasses not included in the conventional Lipid panel. Additional lipoprotein information can be helpful in selecting the most appropriate therapy, including choice of drugs and the intensity of risk-reduction therapy. The VAP test includes: HDL subfraction cholesterol (HDL2 and HDL3); LDL cholesterol; LDL subclass pattern (pattern A, B, A/B); lipid and metabolic syndrome assessment; Lp(a) cholesterol; quantitative measurement of total HDL cholesterol, total LDL cholesterol, total VLDL cholesterol, total cholesterol, and triglycerides (indirect measurement); VLDL subfraction cholesterol (VLDL 1+2 and VLDL3); apoB100; LDL-R(Real).
The VAP gives you information about your cholesterol similar to the conventional lipid panel, as well as additional information useful for further CHD risk assessment evaluation and identifies lipid-associated risk for the Metabolic Syndrome.

** You should be on a stable diet for 2-3 weeks prior to blood collection; you should also fast (no food or drink except water) for 12-14 hours before collection of the blood specimen.

**What Life Time Fitness Lab Tests Report a Lipid Panel?**

- Cardio Metabolic Risk Profile
- Cardio Metabolic Risk Premium Profile (VAP panel)
- Men’s Longevity and Vitality Profile
- Men’s Longevity and Vitality Premium Profile (VAP panel)
- Women’s Longevity and Vitality Profile
- Women’s Longevity and Vitality Premium Profile (VAP panel)

**What do Lipid Panel Values mean?**

A number of studies on the benefits of reducing lipid levels for those without heart problems have reported a 31% reduction in the risk of death due to heart problems and a 22% reduction in all causes of death. Those with a total cholesterol level of 240 mg/dL or more generally have twice the risk of heart problems as people whose cholesterol level is desirable (< 200 mg/dL).

There are both “good” and “bad” forms of cholesterol – LDL and HDL. LDL cholesterol is the major cholesterol carrier in the blood, and cells and hormones need cholesterol in order to function appropriately. However, under “oxidative stress,” increased amounts of LDL cholesterol are oxidized, meaning they are broken down into a form your body can’t use. Free radicals (which are usually oxygen molecules gone haywire) that cause the damage to LDL are formed as a result of chronic stress, drugs or exposure to environmental toxins, including cigarette smoke, heavy metals, or chemicals in food. They can also be caused by poor dietary choices, including a diet high in refined sugars, high carbohydrates, high fructose corn syrup (found in soft drinks and condiments like ketchup), saturated fats (animal fats), highly processed foods (fast foods), foods loaded with preservatives (boxed foods, prepackaged), and diets deficient in fresh vegetables. All of these factors can lead to atherosclerosis, a condition in which plaque builds up on the insides of your arteries.

LDL particle size is analyzed with the VAP test. Small, dense LDL particles easily oxidized and are thought of as being a greater risk factor for developing atherosclerosis (hardening of the arteries) as compared to larger, less dense LDL particles. Oxidized LDL has been associated with erectile dysfunction, high blood pressure, increases in blood clots, memory disorders and development of the Metabolic Syndrome. Oxidized LDL can lead to a decrease in collagen production and an increase collagen destruction, which increases our aging processes like skin wrinkling and also brittle blood vessels which can rupture in the eyes, the legs, the brain and the heart.

The VAP test takes the LDL particles and separates them out according to size and density. Each LDL particle is classified into one of three patterns as follows: Pattern A, predominately large, buoyant LDL (considered lower risk); Pattern B, predominately small, dense LDL (considered a highrisk subclass); Pattern A/B, large, buoyant LDL and small, dense LDL present in roughly equal amounts (an intermediate pattern).

The VAP also measures apo B-100, which is an essential protein that makes up LDL and VLDL cholesterol. Apolipoprotein B helps provide shape and structure to LDL and VLDL, and helps transport particles like cholesterol and triglycerides as part of the LDL or VLDL compound.

The VAP test includes Lp(a) or lipoprotein A. Lp(a) is a genetic variation of LDL found in the blood. A high level of Lp(a) is an important risk factor, and a new marker examined by physicians, for developing atherosclerosis...
(hardening of the arteries) early. How an increased Lp(a) contributes to heart disease isn’t clear. The lesions in artery walls contain substances that may interact with Lp(a), leading to the buildup of fatty deposits.

The "good" form of cholesterol is known as high-density lipoprotein (HDL). If the HDL is low (< 40mg/dL), this can predispose a person to heart problems. Low HDL occur in smokers, overweight or obese individuals, and those that lack any form of exercise. Progesterone, anabolic steroids and male sex hormones (testosterone) also lower HDL cholesterol levels, while female sex hormones (estradiol) raise HDL cholesterol levels. HDL helps decrease damage to LDL cholesterol.

In the VAP panel, the HDL is broken into subfractions, including HDL2 and HDL3. The larger and more buoyant HDL2 subfraction is associated with protecting against heart disease that the small, dense HDL3.

VLDL contains the highest amount of triglycerides, and is a blood fat that can be used for energy or stored as fat. VLDL cholesterol is considered a type of “bad” cholesterol - elevated levels are associated with an increased risk of coronary artery disease and also with insulin resistance. It is important to keep triglycerides as low as possible in the blood because elevated levels of triglycerides and high VLDL levels are associated with an increased risk of coronary artery disease. One of the primary factors increasing triglycerides and therefore VLDL is increased intake of sugars, especially if that intake goes on to cause insulin resistance.

The VAP test separates out VLDL particles and measures the amount of the subfractions VLDL3-C and VLDL1+2-C. VLDL particles vary according to size and density, with small, remnant VLDL particles (VLDL3) being a stronger predictor of heart disease and Metabolic Syndrom risk than the large, buoyant VLDL1+2.

A VAP test also includes intermediate-density lipoprotein (IDL). IDL is a VLDL remnant particle, meaning it is generated during the breakdown of VLDL. IDL has been linked to having a high risk for atherosclerosis.

Cholesterol is influenced by important aspects of an individual's health, creating complex and sometimes harmful conditions to the vascular system, heart and brain, beyond elevated cholesterol alone. Some of these factors include:

Diet – Foods high in sugar and refined carbohydrates, like white breads and pastas, and processed foods, like lunchmeats, can lead to a whole host of problems that go on to contribute to impaired immunity, inflammation, obesity (notably increased belly fat), and high levels of oxidized LDL cholesterol. This happens because insulin resistance and inflammation develops from eating these kinds of foods. Insulin resistance triggers the accumulation of visceral (belly) fat. Increased belly fat is associated with more health problems than fat deposited in other areas of the body, like on the hips or thighs.

Blood Sugar Regulation Problems – Type 2 diabetes is reported to increase the manufacture of cholesterol in the body, indicating that insulin resistance may be a link between glucose and cholesterol metabolism. Diabetes, for instance, elevates glucose (sugar) levels in the blood. This increase in sugar can enhance the glycation (when sugar binds to cholesterol or protein to form a product with oxidative properties) and increase the inflammatory properties of oxidized LDL cholesterol. Insulin resistance and type 2 diabetes are also reported to be associated with high triglyceride and low HDL-cholesterol levels. This is in agreement with findings that obese individuals and those with type 2 diabetes actually make more cholesterol than those who are not obese.

Intestinal Balance – We coexist in mutually beneficial relationship with a complex array of bacterial flora that reside in the intestines. The healthy intestine not only allows absorption of nutrients from our foods, but also acts as a barrier that protects us against potentially damaging foods, bacteria, and yeast. Impairment of the normal intestinal barrier, through environmental stressors (such as heavy metals and chemical preservatives), poor dietary habits, food allergies, chronic stress, and a wide array of drug therapies result in the loss of the flora balance and will lead to the expression of uncontrolled inflammation – called dysbiosis. The chronic inflammation associated with dysbiosis can increase oxidative stress and lead to lipid imbalances and other problems associated with metabolic syndrome.
Homocysteine – Homocysteine is an amino acid normally found in the body in small amounts. That’s because it’s quickly converted to other harmless amino acids such as methionine and cysteine. Excess homocysteine can sometimes form during the breakdown of dietary proteins, and elevated homocysteine levels in the blood are one of the most serious risk factors for heart disease.\(^{1277}\) Researchers have discovered that too much homocysteine can lead to an increase in oxidized (LDL) cholesterol, may increase the risk of atherosclerosis (hardening of the arteries), and may also cause the blood to clot more easily (which can lead to stroke or heart attack).\(^{1278}\) High levels of homocysteine may also be a risk factor in developing Alzheimer’s disease, Parkinson’s disease, kidney disease and cancer.\(^{1279}\) Certain B vitamins (folic acid, vitamin B6, B2 and vitamin B12) are necessary to convert homocysteine into its harmless derivatives, and several studies have reported that supplementing with these B vitamins significantly lowers homocysteine levels in the blood.\(^{1280}\) B vitamins are part of Life Time Fitness Men and Women’s AM/PM multivitamin/mineral supplement, and you should take these vitamins daily.

Stress – Chronic stress leads to oxidative stress and oxidized LDL. When excessive levels of cortisol (the stress hormone) are produced over long periods of time, it promotes inflammation. Chronic inflammation due to stress can lead to increased oxidative stress and cholesterol imbalances.\(^{1281}\) Stress hormones raise glucose (blood sugar) and insulin levels, reduce the production and activity of thyroid hormones, increase body weight, impair immune balance, and cause imbalances in sex hormones.\(^{1282}\) Stress hormones raise glucose (blood sugar) and insulin levels, reduce the production and activity of thyroid hormones, increase body weight, impair immune balance, and cause imbalances in sex hormones.\(^{1282}\) Sex Hormone Imbalances – Studies report that men with the lowest levels testosterone have the highest risk for atherosclerosis. On the other hand, men with the highest levels of testosterone were most protected against atherosclerosis.\(^{1283}\) It’s also been reported that men with low testosterone levels can increase the prevalence of metabolic syndrome, which includes imbalances in cholesterol levels, weight gain, high blood pressure, erectile dysfunction, insulin resistance, and obesity.\(^{1284}\) As men age and testosterone declines, their body composition takes on more visceral fat (belly fat), which leads to more estrogen being produced (yes, men and women make the same sex hormones, just in different amounts). As estrogen levels increase in men, their ability to dissolve blood clots decreases. Balance in estrogens is also of importance in maintaining cholesterol at appropriate levels and heart health. There is evidence that beneficial estrogens (called 2-hydroxyestrone) may prevent plaque formation in the arteries and act as powerful antioxidants to reduce oxidation of LDL cholesterol.\(^{1285}\) These estrogens can be formed by eating a healthy diet high in insoluble dietary fibers such as lignins found in flaxseeds, bran, beans, and seeds.\(^{1286}\) Second, dietary fiber improves the composition of intestinal bacteria, which is critical in estrogen metabolism. Dietary fiber intake increases serum concentrations of serum hormone binding globulin (SHBG), a protein that binds to estrogen.\(^{1287}\) This helps to reduce levels of free estrogens and the chance of developing estrogen receptor positive cancers like most breast cancer. Dietary fiber also decreases the conversion of testosterone into estrogens in fat and breast cells.

Environmental Factors – Exposure to environmental chemicals (heavy metals, pesticides, chemicals used in manufacturing and found in foods) may disrupt the balances of our nervous system, endocrine (hormonal) system, and immune system and increase oxidative stress. This leads to an increase in inflammatory signaling, which then leads to changes in metabolism and eventually to Metabolic Syndrome and Type 2 diabetes.\(^{1288}\) This increased oxidation in the body can lead to cholesterol problems, especially oxidized LDL (the “bad” cholesterol). Endocrine (hormonal) disruptors include chemicals found in everyday products such as plastic bottles, metal food cans, detergents, flame retardants, paints and sealants, food, toys, cosmetics, shampoos, and pesticides.\(^{1289}\) Thyroid Imbalances – A slightly under-active thyroid called subclinical hypothyroidism, and is a major risk factor in heart disease. In the Rotterdam Study cited above, researchers found that older women with no obvious signs of low thyroid activity were almost twice as likely to have blockages in their arteries by cholesterol as women without this condition. And, they were also twice as likely to have had heart attacks.\(^{1290}\)
Low thyroid hormone levels have been linked to increased oxidized (“bad”) LDL cholesterol and cardiovascular risks. \(^{1291}\) As part of our normal metabolism, the burning of oxygen and glucose causes free radicals. When thyroid function is too low or too high, excessive free radical production takes place, more free radicals are produced, which can oxidize LDL cholesterol and initiate plaque formation – all contributing to increases in cardiovascular diseases like stroke and heart attack. Thyroid hormones also help regulate insulin and also signal the liver to increase the breakdown of cholesterol. \(^{1292}\) When thyroid hormones are low, carbohydrates and fats become stored as body fat. This fat storage happens because the cells are not being directed to burn them for energy, and cholesterol is broken down normally.

Sleep Problems – It is known that restricted sleep, such as only 4 or 5 hours nightly, contributes to the development of insulin resistance, which can lead to weight gain and chronic inflammation. \(^{1293}\) A lack of sleep can also affect cholesterol levels, causing an increase in the oxidation of LDL cholesterol and the resulting complications that follow over time. A small study found that the effect of 5-day sleep deprivation had a profound negative effect on cholesterol metabolism. \(^{1294}\) Other studies have found that sleep apnea (also called obstructive sleep apnea or OSA) increases oxidation, causing and increase in triglycerides. \(^{1295}\) Taking 3-6mg of melatonin one hour before bedtime can help regulate sleep cycles.

Drug Use – Prescription medications for lowering cholesterol such as the “statin” drugs like simvastatin (Zocor®) and lovastatin (Lipitor®) can deplete coenzyme Q10 (CoQ10) from the body. \(^{1296}\) CoQ10 is a nutrient that is very important for your body, and most especially for your heart. \(^{1297}\) The body naturally produces CoQ10, which is necessary for cells to produce energy from the food. CoQ10 is also an important antioxidant that decreases damage from free radicals. \(^{1298}\) If you’re taking a “statin” drug to lower your cholesterol levels — something millions are doing - then you should also be taking a CoQ10 supplement to compensate for its depletion (100-150mg at bedtime).

What are steps you can take to improve Lipid values?

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Make sure to take the Life Time Fitness Men or Women’s AM/PM Multivitamin.
+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to high oxidative stress and release of stress hormones (such as cortisol), which initiates the inflammatory signaling pathways. \(^{1299,1300}\) Modifying the diet can help decrease physical and mental stress, helping balance metabolism.
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in cold-water fish like halibut and salmon, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are consumed in adequate amounts it lowers health risks, especially for heart disease, and new studies are suggesting that adequate intakes may even help prevent obesity. \(^{1301,1302}\) If you eat fish such as tuna, there may be a concern over heavy metal contamination. The Center of Science and the Public Interest (CSPI), a nutrition advocacy organization in Washington, D.C., issued a warning that pregnant women should not eat more than two 6-ounce servings of canned tuna per month since tuna contains high levels of mercury. \(^{1303}\) Avoid eating tuna more than once a month — especially fresh tuna steaks —in addition to other fish particularly high in mercury such as pike, swordfish, shark, and walleye.
+ The diet should limit inflammatory foods, such as processed meats, chemical preservatives, and food additives. Studies have found that nitrite or nitrate treated meats such as bacon, sausage, smoked foods, and lunch meats increase the risk of cancer. \(^{1304,1305}\) High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketsup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to
increase inflammation in the intestinal tract and lead to problems such imbalances in the probiotic flora in your intestines. The probiotic “friendly” intestinal bacteria also synthesize B vitamins and folic acid, important for the heart.

+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ Magnesium from nuts and seeds to help control blood pressure and reduce blood vessel spasm
+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day.
+ Avoid heating the oil, but it’s great on salads and sprayed on foods.
+ Eat meals at regular times each day. It’s best not to eat after 7 pm.
+ Remember to chew your food. Saliva begins the process of digestion — it tells your stomach that food is coming. Chewing your food thoroughly, rather than bolting it, is the first step in healthy digestion.
+ Trans-fats should be eliminated from the diet. Trans-fats are supplied by hydrogenated vegetable oils used in most processed foods in the supermarket and in many fast foods.
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.
+ Moderate alcohol intake, especially from red wine, also lowers cardiovascular disease risk — but don’t drink to excess because that can have very negative effects on your metabolism. Alcohol can also raise your triglycerides substantially, so if you drink the night before a Lipid Panel, more than likely your triglycerides will be high.
+ Lose weight. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.
+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of oxidative stress than those that get regular sleep.
+ Quit smoking or tobacco use. Tobacco use is reported to increase inflammation.
+ Exercise also decreases your risk of developing heart disease. Regular exercise helps balance metabolism and improves cardio-respiratory endurance, insulin sensitivity, blood sugar levels, weight control, and HDL cholesterol (high-density lipoprotein, the “good” cholesterol) levels — while decreasing LDL cholesterol (low-density lipoprotein, the “bad” cholesterol) levels. At a minimum, most of us should be exercising at least 30 minutes daily, 3-5 days a week, if tolerable. It is best to combine cardio training — some form of exercise that safely increases your heart rate — with weight training — to help build muscle mass — in order to maximize insulin receptor function and glucose control. Find a knowledgeable certified trainer or physical therapist to evaluate you if you haven’t exercised in a long time. It is better to find out what your weak spots are than to just jump in like a “weekend warrior,” and end up injured and unable to exercise at all!

### Supportive Supplements

| Alpha lipoic acid | 500mg 2 times daily | + Antioxidant
+ Helps improve energy production and regulate blood glucose levels |
| **Choleast** | 1 capsule 3 times daily | + Choleast™ is a combination of red yeast rice and coenzyme Q10.  
+ Choleast™ helps support cardiovascular function by improving blood lipid levels and replenishing the antioxidant nutrient coenzyme Q10.1314 |
| **Kyolic Reserve** | 1 capsule (600mg), 1-3 times daily | + Aged garlic is an antioxidant and helps improve the antioxidant glutathione levels in the liver and detoxification of the liver1315  
+ Aged garlic also helps with immunity, protects against heart disease and may decrease the risk for certain cancers1316  
+ Aged garlic has been reported not to interact with blood-thinning medicines, such as aspirin or warfarin (Coumadin).1317 However, if you take blood-thinning medications, you should be under the supervision of a doctor before taking any supplement. |
| **Life Time Fitness FastFuel Complete** | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function1318,1319  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.1320 |
| **Life Time Fitness Omega-3 Fish Oil** | 1-2 capsules, 2 times daily | + Helps decrease inflammation and the consequences it has on your metabolism.1321  
+ Helps support heart and blood vessel health.1322,1323  
+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction.1324 |
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<th>Product</th>
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<tr>
<td><strong>Multi-Probiotic 4000</strong></td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health[^325]</td>
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<td></td>
<td></td>
<td>+ Supports vitamin B and K metabolism[^326]</td>
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<td>+ Helps improve absorption of nutrients from foods</td>
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<tr>
<td><strong>Life Time Fitness LeanSource™ Weight Loss</strong></td>
<td>4 capliques daily, 2 with breakfast and 2 with dinner</td>
<td>+ LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat - all promoting and sustaining weight loss.</td>
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<td>* Use if BMI 25 or &gt;</td>
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<td>+ LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements[^1327,1328]</td>
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PLATELET COUNT

Platelets, also called thrombocytes, are formed from cells in the bone marrow called megakaryocytes. Platelets are part of the clotting (blood coagulation) system of the body. They are activated at the first sign of injury to a blood vessel or tissue. Platelets are “sticky” and can clump together, or aggregate, to form a blood clot, which can stop the flow of blood in a damaged area. Platelets are the smallest blood cell and the lightest, allowing them to be pushed by blood flow into the blood vessel wall.

Platelets carry certain compounds in the bloodstream, including serotonin (the “calming” brain chemical). Approximately 2% of serotonin is stored in platelets. Platelets also carry L-tryptophan, the amino acid that helps make serotonin, melatonin and niacin. Platelets mediate inflammation, by secreting cytokines, or chemicals that increase inflammation.

Platelet defects can be considered either as a decreased number of platelets (thrombocytopenia), as increased (thrombocytosis) or as defective platelets. One of the most common causes of platelet disorders is the use of aspirin. Aspirin blocks thromboxane, one of the steps required for platelets to stick together, which is why aspirin is used in those with the tendency to form blood clots that can lead to heart and blood vessel problems.

Pages 258-265
PLATELET COUNT

Reference Values
Platelet Count

| Normal Range (Adult) | 140.0 – 415.0 \(10^{13}/uL\) |

Why is a Platelet Count needed?
Measuring Platelets is part of your comprehensive metabolic panel (CMP). The test assesses the number of platelets in your body. A platelet count can help determine if you have blood clotting problems, a bleeding disorder, or a bone marrow problem. Platelet counts can vary throughout the day, with levels highest at midday.

What Life Time Fitness Lab Tests Report Platelet Count ranges?
+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

What does a low Platelet Count mean?
A low level of platelets is also called thrombocytopenia. Internal bleeding can occur when a platelet count falls below 10,000 platelets/uL. A low platelet count can be caused by:

+ Long-term bleeding problems, like stomach ulcers
+ Anemia
+ Chronic infections (can lead to bone marrow problems)
+ Autoimmune disorders like lupus, rheumatoid arthritis or idiopathic thrombocytopenia purpura (ITP)
+ Kidney problems
+ Spleen problems (leads to accumulation of platelets in the spleen and decreases platelets in the blood)
+ Nutrient deficiencies, including vitamin B12 and folate
+ Immune imbalances
+ Environmental toxins like heavy metals (lead, mercury)
+ Heavy alcohol consumption
+ Cancer, including leukemia (leads to bone marrow problems)
+ Pregnancy
+ Blood transfusion
+ Incorrect blood collection by the laboratory can cause platelets to clump and falsely appear to be low in number.
+ Genetic disorders, including Willebrand’s disease (leads to less “sticky” platelets)
+ Some medications, including
  • Acetaminophen (Tylenol)
  • Aspirin
  • NSAIDs (non-steroidal anti-inflammatory drugs), including ibuprofen (Advil, Motrin), naproxen (Naprosyn, Aleve), indomethacin (Indocin)
  • Quinidine
• Anticonvulsants drugs, including phenytoin (Dilantin), carbamazepine (Tegretol), valproic acid (Depakene, Depakote)
• Thiazide diuretics (including hydrochlorothiazide)
• Digoxin (Lanoxin)
• Sulfonylurea antidiabetic drugs, including chlorpropamide (Diabenese) and glipizide (Glucotrol) and glyburide (Diabeta, Micronase)
• Antibiotics, including vancomycin, cephalosporins (cephalexin or Keflex), penicillins and sulfa drugs (sulfamethoxazole/trimethoprim or Bactrim)
• H2 blockers, including cimetidine (Tagamet), ranitidine (Zantac) and famotidine (Pepcid)
• PPI (proton pump inhibitors) including nizatidine (Axid), omeprazole (Prilosec), lansoprazole (Prevacid), rebeprazole (Aciphex), pantoprazole (Protonix) and esomeprazole (Nexium, the “purple” pill)
• Ticlodipine (Ticlid)
• Warfarin (Coumadin)
• Clopidogrel (Plavix)
• Cyclosporine (Sandimmune)
• Diazepam (valium)
• Nitroglycerine (Nitrostat)
• Chemotherapy

Symptoms of a low platelet count include:

+ Easy bruising
+ Bleeding into the skin that appears as a rash of pinpoint-sized reddish-purple spots (petechiae), usually on the lower legs
+ Increased and prolonged bleeding from cuts, gums, nose
+ Blood in urine or stools
+ Unusually heavy menstruation (menorrhagia)
+ Excess bleeding during surgery or dental procedures

Many over-the-counter (OTC) and prescription drugs contain aspirin and should only be used under the supervision of a doctor if you have low platelet numbers. Aspirin-containing drugs include:

+ Alka Seltzer
+ Anacin
+ ASA
+ Bufferin
+ Ecotrin
+ Excedrin
+ Fiorinal
+ Percodan

What are steps you can take for a low Platelet Count?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Decrease foods high in vitamin K that could lead to an increase in bleeding if platelets are low. The major
source of Vitamin K is green, leafy, vegetables — kale, collards, spinach, and turnip greens are the highest. Foods low in vitamin K include roots, bulbs, tubers, some fruits and fruit juices. Cereals, grains and other milled products are also low in vitamin K, but watch your carbohydrate intake.

+ Make sure to take a Life Time Fitness Men and Women’s AM/PM Multivitamin/mineral to make sure you are getting the right nutrients.

+ Increase your consumption of animal proteins, including meats and seafood. Liver is by far the richest iron-containing food. Other good sources of iron-rich foods include organ meats, fish, and poultry. Dried beans and vegetables are the best plant sources, followed by dried fruits, nuts, and whole grain breads and cereals. Fortification of cereals, flours, and bread with iron has contributed significantly to daily dietary iron consumption.

+ Avoid animal protein that has been raised with hormones whenever possible. Chickens should also be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that reduce inflammation.

+ Increase vitamin B12 containing foods. Vitamin B12 is produced by microbial synthesis in the digestive tract of animals. Therefore, animal protein products are the source of this nutrient. Organ meats are the best source of vitamin B12, followed by clams, oysters, beef, eggs, milk, chicken, and cheese. If you are eating meat, buy organic and all natural meat. Do not buy processed meats, packaged meats, deli meats unless the meat does not have chemical additives. Choose lean meats from quality sources, skinless poultry, and nonfat or low-fat or nonfat dairy products. Red meat should always be organic grass-fed when eaten and free of hormones and antibiotics. Get the rest of protein from a variety of sources like beans, fish, chicken, turkey, buffalo/bison, and seafood.

+ Increase vitamin B6 (pyridoxine) containing foods. The best sources of pyridoxine are brewer’s yeast, wheat germ, organ meats (especially liver), peanuts, legumes, potatoes, and bananas.

+ Increase folic acid containing foods. Folic acid occurs in a wide variety of foods, including dark green leafy vegetables, brewer’s yeast, liver, and eggs. Other good sources are beets, broccoli, Brussels sprouts, asparagus, orange juice, cabbage, cauliflower, cantaloupe, kidney and lima beans, wheat germ, and whole grain cereals and breads. Limit your breads though, as high carbohydrate diets can lead to insulin resistance, hormonal imbalances and weight gain.

+ The probiotic “friendly” intestinal bacteria also synthesize B vitamins and folic acid.

+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day.

+ Avoid heating the oil, but it’s great on salads and sprayed on foods.

+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), lead to chronic oxidative stress and inflammation. Modifying the diet can help decrease inflammation, physical and mental stress, all helping to balance metabolism.

+ The diet should limit inflammatory foods, such as processed meats, chemical preservatives, and food additives. Studies have found that nitrite or nitrate treated meats such as bacon, sausage, smoked foods, and lunch meats increase the risk of cancer. High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketsup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such imbalances in the probiotic flora in your intestines.

+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible.
+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli), garlic, onions
+ Decrease citrus fruits and tea/coffee because they contain chemicals that can bind to iron and decrease it’s absorption. Citrus fruits contain ascorbate and citrate and teas/coffee contains tannins, both reported to lower iron levels.\textsuperscript{1335}
+ Dried beans are also a good source of iron, followed by dried fruits (watch sugar content), nuts, and whole grain breads and cereals. Fortification of juices, cereals, flours, and bread with iron has contributed significantly to daily dietary iron consumption, although watch your carbohydrate intake
+ Decrease using antacids and OTC medications for ulcers (like Zantac, Tagamet and Pepcid) that lower the stomach acid. Lower acid production can lead to low iron levels and lower vitamin B12 and folate.
+ Increase your protein by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with almond milk or quality water.
+ Stop smoking and do not drink alcohol.
+ The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods should be eliminated. These contaminants can lower your immunity and can alter platelets.\textsuperscript{1336} Buy organic foods where possible.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.\textsuperscript{1337}
+ Substitute green tea for your morning coffee and increase your citrus fruit consumption. Both contain chemicals that can decrease iron absorption and lower its level.
+ Exercise in moderation. Exercise can help increase the body’s clotting mechanisms.\textsuperscript{1338}
+ Do not take over-the-counter (OTC) pain relievers that contain aspirin, ibuprofen (Advil) or naproxen (Aleve). Decrease acetaminophen intake also if you take Tylenol containing products.

### Supportive Supplements

<table>
<thead>
<tr>
<th>5-HTP Plus</th>
<th>1-2 capsules daily, between meals</th>
</tr>
</thead>
<tbody>
<tr>
<td>* If cravings are present</td>
<td>+ 5-HTP Plus\textsuperscript{TM} contains natural L-5-hydroxytryptophan (5-HTP), together with pyridoxal-5-phosphate and 50 mg of a proprietary blend of the neurotransmitters L-tyrosine and L-glutamine. + Helps improve serotonin levels, decrease food cravings\textsuperscript{1339}</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</th>
<th>3 capsules in the morning after breakfast and 3 capsules with dinner.</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.\textsuperscript{1340}</td>
<td></td>
</tr>
</tbody>
</table>
| **Life Time Fitness Peak Performance Whey Protein Isolate** | 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source\textsuperscript{1341}  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH)\textsuperscript{1342}  
+ Provides 22gm protein per 2 scoops (30gm) |
| **Multi-Probiotic 4000** | 1 capsule, 1-3 times daily | + Supports gastrointestinal health\textsuperscript{1343}  
+ Supports vitamin B and K metabolism\textsuperscript{1344}  
+ Helps improve absorption of nutrients from foods |
| **Time Release Iron** | 2 tablets daily with meals | + Specially designed to provide 54 mg of carbonyl iron (Ferronyl\textsuperscript{®}) per serving for a 6-to 8-hour period.  
+ Use with caution in men |

**What does a high Platelet Count mean?**

A high platelet count is also called thrombocytosis. High platelet counts may have no symptoms, but can lead to blood clots in the brain and heart if not addressed. Conditions that can lead to a high platelet count include:

+ Living in high altitudes  
+ Strenuous exercise  
+ Spleen disorders  
+ Post-partum  
+ Bone marrow abnormalities – can lead to both low and high platelet counts  
+ Blood loss – can lead to both low and high platelet counts  
+ Infections – can lead to both low and high platelet counts  
+ Chronic inflammation – can lead to both low and high platelet counts  
+ Autoimmune diseases – can lead to both low and high platelet counts  
+ High red blood cell counts (Polycythemia vera)  
+ Low iron - can lead to both low and high platelet counts\textsuperscript{1345}  
+ High homocysteine and c-reactive protein (CRP) levels\textsuperscript{1346}  
+ Cancer, including bowel cancer  
+ Drugs like erythropoietin (EPO), estrogen, steroids and oral contraceptives

**What are steps you can take for a high Platelet Count?**

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Use Life Time Fitness Men and Women's AM/PM Multivit/mineral to make sure you are getting the right nutrients.  
+ Increase foods high in vitamin K. The major source of Vitamin K is green, leafy, vegetables - kale, collards, spinach, and turnip greens are the highest.
Increase vitamin B12 containing foods. Vitamin B12 is produced by microbial synthesis in the digestive tract of animals. Therefore, animal protein products are the source of this nutrient. Organ meats are the best source of vitamin B12, followed by clams, oysters, beef, eggs, milk, chicken, and cheese. If you are eating meat, buy organic and all natural meat. Do not buy processed meats, packaged meats, deli meats unless the meat does not have chemical additives. Choose lean meats from quality sources, skinless poultry, and nonfat or low-fat or nonfat dairy products. Red meat should always be organic grass-fed when eaten and free of hormones and antibiotics. Get the rest of protein from a variety of sources like beans, fish, chicken, turkey, buffalo/bison, and seafood.

Increase folic acid containing foods. Folic acid occurs in a wide variety of foods, including dark green leafy vegetables, brewer’s yeast, liver, and eggs. Other good sources are beets, broccoli, Brussels sprouts, asparagus, orange juice, cabbage, cauliflower, cantaloupe, kidney and lima beans, wheat germ, and whole grain cereals and breads. Limit your breads though, as high carbohydrate diets can lead to insulin resistance, hormonal imbalances and weight gain.

Increase your protein by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with almond milk or quality water.

Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. Omega-3 fatty acids reported to decrease platelet thromboxane production. Fatty acid balance improves immunity.

Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.

The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods should be eliminated. Buy organic foods where possible.

Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.

Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli), garlic, onions

Increase water intake – stay hydrated; a minimum of 2 liters of filtered water daily is recommended

Don’t drink alcohol or smoke.

Exercise in moderation. Even moderate exercise can increase pro-clotting factors in the body, including platelets, and lead to increased blood clotting.
### Supplements

<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Time Fitness Men's or Women's Performance Daily Multivitamin AM/PM</td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men's and Women's Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism. 1351</td>
</tr>
<tr>
<td>Life Time Fitness Peak Performance Whey Protein Isolate</td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>+ Easily digestible, high-quality protein source 1352</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH). 1353</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Provides 22gm protein per 2 scoops (30gm)</td>
</tr>
<tr>
<td>Multi-Probiotic 4000’</td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health 1354</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Supports vitamin B and K metabolism 1355</td>
</tr>
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<td>Time Release Iron</td>
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</tr>
<tr>
<td>* If iron levels are low</td>
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</tbody>
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Better health & performance start here.
POTASSIUM

Potassium is one of the body’s three major electrolytes (the other two being sodium and chloride) that are required in fluid balance. Potassium is the primary electrolyte functioning inside cells throughout the body. Potassium and other electrolyte balance is performed with the hormones of the adrenal glands and the anterior pituitary gland. Potassium is readily absorbed through the intestinal tract, and excess is excreted in the urine with the kidneys. Potassium in the body is important for:

+ Acid/Base Balance: Potassium is one of the main electrolytes that helps control pH levels in body fluids.
+ Blood Pressure: In part regulated by potassium. Low potassium levels are associated with elevated blood pressure.
+ Electrical Activity: Potassium helps regulate electrical activity, which in turn, regulates the activity of muscle and nerve cells and the beating of the heart.
+ Glucose: Conversion of glucose (sugar) to glycogen (the stored form of sugar in the liver) requires potassium.
+ Osmotic Pressure and Water Balance: Potassium is one of the electrolytes that control these functions through the activity of the sodium-potassium pump.
POTASSIUM

Reference Values
Blood Potassium
(in millimoles per liter = mmol/L)

| Normal Range (Adult) | 3.5 – 5.2 mmol/L |

Why is a Potassium blood level needed?
A potassium level is tested routinely as part of your complete metabolic panel (CMP). A potassium level is important in evaluating heart, kidney, adrenal gland, muscle, and digestive system balance.

What Life Time Fitness Lab Test(s) Report a Potassium range?
+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

What does a low potassium value mean?
A low level of potassium is also called hypokalemia. Low potassium can be caused by:

+ Chronic stress can alter potassium levels and create imbalances.
+ A diet high in sodium
+ Dehydration (lack of fluids)
+ Kidney problems
+ Drug depletion, including
  + Use of the herb licorice (Glycyrrhiza glabra) – a component of licorice, called glycyrrhizin, can cause pseudohyperaldosteronism, which leads to increased blood pressure, potassium loss, weakness and fluid build-up (edema).1356

Symptoms associated with potassium deficiency include:

+ Irregular heartbeat (arrhythmia)
+ Poor reflexes
+ Muscle weakness
+ Fatigue
+ Dehydration
+ Fluid build-up (edema)
+ Constipation
+ Dizziness
+ Mental confusion
+ Nervous disorders

Better health & performance start here.
Drugs that can lower potassium levels include:

+ Albuterol (Ventolin, Proventil)
+ Salicylates, including aspirin
+ Bisacodyl
+ Colchicine
+ Corticosteroids, including prednisone, hydrocortisone
+ Levodopa (L-dopa, Sinemet)
+ Loop Diuretics, including furosemide (Lasix)
+ Calcium Channel Blockers, including verapamil (Calan)
+ Penicillins
+ Sodium Bicarbonate
+ Terbutaline (Brethine)
+ Thiazide Diuretics, including hydrochlorothiazide
+ Magnesium
+ Vitamin C
+ ACE inhibitors, including lisinopril (Zestril, Prinivil), captopril (Capoten), benazepril (Lotensin) and enalapril (Vasotec)
+ Angiotensin II Receptor Blockers (ARBs), including candesartan (Atacand), eprosartan (Teveten), irbesartan (Avapro), telmisartan (Micardis), valsartan (Diovan), losartan (Cozaar), and olmesartan (Benicar).

What are steps you can take for a low potassium value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Potassium is plentiful in the diet. Potassium-rich foods include fresh fruits and vegetables, nuts, meat, and dairy. A baked potato with the skin left on is very high in potassium. A vegetarian diet can lead to potassium deficiency.
+ Salt substitutes contain potassium, but they can lead to iodine deficiency. Make sure the salt substitute has iodine added.
+ Avoid foods high in sodium, like pre-packaged foods, fast foods, smoked and pickled foods, canned meats, lunchmeats and chips.
+ Low-sodium foods are eggplant, tomatoes, peanuts, onions, mushrooms, garlic, raisins and artichokes.
+ Increase your intake of fruits, vegetables. Standard rule 3 veggies to every 1 fruit.
+ Choose fruit that is low in glycemic load like berries, pears, peaches, apples — grapefruit are best.
+ Soft drinks, even artificially sweetened ones, contain high levels of phosphoric acid. Phosphoric acid in the drinks can deplete calcium from the body, leading to bone loss.¹³⁵⁷
+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which initiates the inflammatory signaling pathways.¹³⁵⁸,¹³⁵⁹ Modifying the diet can help decrease physical and mental stress, helping balance metabolism.
+ Eat meals at regular times each day. It’s best not to eat after 7 pm.
+ Remember to chew your food. Saliva begins the process of digestion — it tells your stomach that food is coming. Chewing your food thoroughly, rather than bolting it, is the first step in healthy digestion.
+ Your protein requirements increase when you’re under ongoing stress — especially physical stress and illness.
And even if you don’t feel ill, your body probably still needs some extra protein to heal the hidden damage metabolic imbalances have done to your intestines and other especially vulnerable areas of your body. You may want to consider adding a protein drink to your diet.

+ There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana, or other fruit in a blender with rice milk or quality water.

+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.

+ Avoid overeating, as this creates too much demand on your body and your digestive tract.

+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours, suggesting that chronic insomnia is a disorder of sustained excitation of the body’s stress response system.  

+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended. If you are sweating a lot, use electrolyte replacement drinks. However, you have to watch the sugar content and the chemical preservatives and sweeteners in these.

### Supportive Supplements

| Life Time Fitness FastFuel Complete | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, SunfiberÔ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function | 1361,1362 |
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Life Time Fitness Creatine</td>
<td>10gm daily in divided doses for 1 week, then 5gm daily</td>
<td>+ Promotes protein synthesis and enhances muscle mass</td>
<td>+ Important in exercise and fitness performance</td>
</tr>
<tr>
<td>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.</td>
<td>1364</td>
</tr>
<tr>
<td>Product</td>
<td>Dosage</td>
<td>Benefits</td>
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<td>---------------------------------</td>
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<td></td>
</tr>
</tbody>
</table>
| Life Time Fitness Peak          | 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source\(^{1365}\)  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).\(^{1366}\)  
+ Provides 22gm protein per 2 scoops (30gm) |
| Performance Whey Protein        |                               |                                                                           |
| Isolate                         |                               |                                                                           |
| Multi-Probiotic 4000            | 1 capsule, 1-3 times daily    | + Supports gastrointestinal health\(^{1367}\)  
+ Supports vitamin B and K metabolism\(^{1368}\)  
+ Helps improve absorption of nutrients from foods |
| Relora Plex                     | 2 capsules, 1-2 times daily   | + Relora\(^{®}\) is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (Magnolia officinalis) and Phellodendron bark (Phelodendron amurense).  
+ Relora Plex also contains B-vitamins, which help in stress and nervous system balance  
+ Useful in stress and decreasing cortisol levels\(^{1369}\)  
Relora can increase salivary DHEA and decreases salivary morning cortisol levels\(^{1370}\)  
+ Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals. |
|                                 |                               |                                                                           |

**What does a high Potassium value mean?**

A high potassium level is called hyperkalemia. High potassium usually occurs due to a drug interaction. In most individuals, excess potassium intake is either excreted or stored in the intestines as a reservoir for future use. However, potassium toxicity (hyperkalemia) can result from kidney problems, in which case serum levels rise because the kidneys cannot adequately excrete potassium. Imbalanced adrenal glands can also cause hyperkalemia. The symptoms of hyperkalemia include mental confusion, numbness of the extremities, labored breathing and deteriorating cardiac activity.

Symptoms of high potassium levels include:

+ Irregular heartbeat (arrhythmia)  
+ Nausea  
+ Fatigue  
+ Numbness/tingling  
+ Increase breathing (respiration)  
+ Muscle aches, weakness  
+ Kidney problems
What are steps you can take for a high potassium level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Decrease potassium-containing foods, like bananas, raisins, prunes, apricots, dates, dairy (milk, cheese, yogurt), strawberries, watermelon, citrus fruits, juices (including tomato, orange, grapefruit), spinach, greens, mushrooms (especially portabella), soy products, pumpkin, nuts (pistachio, almonds, peanuts), beets, beans, turkey, fish (such as salmon and cod) and beef.
+ Decrease phosphorus-containing food, like soft drinks, many snack foods, processed foods like processed cheeses and meats and fish sticks. Watch labels for sodium monophosphate and other names. Other foods high in phosphorus include beefalo, veal, clams, dairy products, bran cereal and almonds.
+ Foods low in potassium include apples, grapes, lemon, blueberries, carrots, and cruciferous vegetables (cabbage, broccoli, cauliflower)
+ Decrease protein intake from meats; increase protein from beans.
+ You can increase your protein also by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with almond milk or quality water.
+ Increase foods that help detoxify the kidneys, including asparagus, artichoke, melons, parsley
+ Do not use a salt substitute. These contain potassium and can increase your level of potassium.
+ Stop smoking and drinking alcohol.
+ Increase water intake – stay hydrated; a minimum of 2 liters of filtered water daily is recommended.
+ Exercise appropriately, 30 minutes daily at least 3 times a week. Swimming, yoga and dancing are also good activities to help decrease stress.

**Supplements**

<table>
<thead>
<tr>
<th>Life Time Fitness FastFuel Complete</th>
<th>4 scoops (approx. 65gm) in the morning as part of a healthy beverage</th>
<th>+ Contains whey protein concentrate &amp; isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend. + Helps support digestive function<strong>1371,1372</strong> + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.<strong>1373</strong></td>
</tr>
<tr>
<td>Product</td>
<td>Dosage</td>
<td>Benefits</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Life Time Fitness Peak Performance Whey Protein Isolate | 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source \(^{1374}\)  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH) \(^{1375}\)  
+ Provides 22gm protein per 2 scoops (30gm) |
| Multi-Probiotic 4000                     | 1 capsule, 1-3 times daily    | + Supports gastrointestinal health \(^{1376}\)  
+ Supports vitamin B and K metabolism \(^{1377}\)  
+ Helps improve absorption of nutrients from foods |
PROGESTERONE

Progesterone is a steroid sex hormone made from cholesterol. Progesterone works in conjunction with estrogen as the main sex hormones responsible for the menstrual cycle in women and helps prepare the body for pregnancy. Progesterone levels rise during the middle of the cycle, while estrogen increases in the first half of a menstrual cycle. Progesterone helps to prepare the uterus for implantation with a healthy fertilized egg and supports pregnancy in its early stages. If no implantation occurs, progesterone levels drop, and another cycle begins.

Progesterone serves as a precursor not only to DHEA, testosterone and estrogen, but also to cortisol, the stress hormone. Progesterone receptors are also found in high concentrations in the brain, where it acts to protect nerve cells and supports the myelin sheath that covers neurons. It also helps to relax the nervous system and improve sleep. In addition, because progesterone stimulates bone growth, it can help to maintain bone health, which is very important in aging women and men.

Pages 273-282
**PROGESTERONE**

**Reference Values**

Blood progesterone values

(Measured in nanograms per milliliter = ng/mL)

**Men**

| Normal Range | 0.2 – 1.4 ng/mL |

**Women**

| Premenopausal Follicular | 0.2 – 1.5 ng/mL |
| Premenopausal Luteal | 1.7 – 27.0 ng/mL |
| Premenopausal Ovulation | 0.8 – 3.0 ng/mL |
| Pregnant (1st trimester) | 8.8 – 48.6 ng/mL |
| Pregnant (2nd trimester) | 12.4 – 75.8 ng/mL |
| Pregnant (3rd trimester) | 58.5 – 222.3 ng/mL |
| Postmenopausal | 0.1 – 0.8 ng/mL |

**Why is a Progesterone level needed?**

Progesterone levels are used to help determine sex hormone balance. The relationship between progesterone, estrogen (estradiol and estrone), DHEA and testosterone is very important in a balanced metabolism. Progesterone levels in ovulating women change naturally during the monthly cycle, increasing after ovulation.

Note: If you are taking biotin (vitamin B7) in amounts greater than 5mg daily, you should stop taking the biotin at least 8 hours before testing.

**What Life Time Fitness Lab Tests Report a Progesterone range?**

+ Women’s Sex Hormone Profile
+ Women’s Sex Hormone Premium Profile
+ Women’s Longevity and Vitality Profile
+ Women’s Longevity and Vitality Premium Profile

**What does a low Progesterone value mean?**

Excessive estrogen and deficient progesterone leads to estrogen dominance in both men and women. Too much estrogen has been associated with heart disease, obesity, the development of certain types of cancer, like breast and ovarian, ovarian cysts, PCOS or polycystic ovary disease, fibrocystic disease and uterine fibroids in women. For women in peri-menopause (the transition phase), progesterone levels usually drop faster than estrogen. By naturally increasing 2-OH estrogens (the “good” estrogens) through diet and natural hormonal replacement (where warranted), the ovaries are stimulated to make more progesterone and ease the transition into menopause. Symptoms of low progesterone include:
Chronic stress may decrease progesterone levels and lead to estrogen dominance. The body makes the stress hormone cortisol from progesterone, so higher stress levels leads to more cortisol being produced, which depletes progesterone levels.1381

A similar problem occurs in men with excess stress as well. When cortisol depletes progesterone, men can’t make as much testosterone, since progesterone converts into testosterone as well.

Environmental toxins can also lead to low progesterone. Plastics and some pesticides, called xenoestrogens, can lead to excess estrogen levels and lowered progesterone.1382 These toxins are found in the foods we eat, air and water supply as well as naturally in the environment. Other factors associated with low progesterone levels include insulin resistance, poor dietary habits (like excess carbohydrates and refined sugars), and insufficient exercise.1383

Progesterone production decreases due to low levels of thyroid hormone, the use of antidepressants, chronic stress, deficiencies in the vitamins A, B6, C, or zinc, and a diet high in refined sugar and saturated fat.

What are steps you can take for a low potassium value?

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Increase foods with phytoestrogens, including soy (if no allergy), pomegranate, resveratrol from red wine and flax seed. Phytoestrogens may help reduce the risk of hormonally related health problems, like menopause symptoms, breast cancer, prostate cancer and heart disease along with helping protect against bone loss.1384
+ Healthy foods that can help improve the conversion of estrogen into “good” metabolites and away from “bad” metabolites include insoluble dietary fibers such as lignin found in flaxseeds, bran, beans, and seeds.1385
+ Dietary fiber improves the composition of intestinal bacteria. Dietary fiber intake also increases serum concentrations of SHBG, a protein that binds to estrogen. This helps to reduce levels of free estrogens and the chance of developing estrogen receptor positive cancers like most breast cancer.1386 Dietary fiber also decreases the conversion of testosterone into estrogens in fat and breast cells.
+ Eat more fresh fruits and vegetables. Diets low in fruits (such as apples, grapefruit and oranges) and cruciferous vegetables (such as broccoli, cabbage, and Brussels sprouts) may result in a relative deficiency of calcium-D-glucarate and its metabolites, which help metabolize estrogen into its healthy forms.
+ Increase calcium-containing foods, such as green leafy vegetables and dairy products if you can tolerate dairy. If vitamin D levels are low, increase intake of vitamin D containing foods such as milk and other dairy products. However, make sure to use organic milk and dairy, as hormones found in dairy cows can imbalance hormone levels. Snack on almonds or Brazil nuts.
+ Soft drinks, even artificially sweetened ones, contain high levels of phosphoric acid. Phosphoric acid in the drinks can deplete calcium from the body, leading to bone loss.1387
+ Decrease caffeine intake. Caffeine has been reported to negatively affect vitamin D and bone formation. Caffeine is included in tea, coffee and chocolate.
+ Decrease stress – chronic stress leads to imbalances in metabolism and hormonal imbalances.
+ Buy organic foods where possible. Currently the foods that are on the most-contaminated list are peaches, apples, sweet bell peppers, celery, nectarines, strawberries, cherries, lettuce, imported grapes, pears, spinach, and potatoes.
+ Avoid animal protein that has been raised with hormones whenever possible. Chicken should be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation and help your hormone receptors to function appropriately. Make sure to use organic milk and dairy, as hormones found in dairy cows can disrupt hormone levels.
+ Over-consumption of simple carbohydrates like refined sugars and grains result in adverse influences on sex hormone balance.
+ Excess carbohydrates have also been associated with postmenopausal breast cancer risk among overweight women and women with large waist circumference. Men who are insulin resistant are also more likely to have reduced testosterone secretion.
+ Studies report imbalances in hormone levels when you are overweight or obese. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.
+ The diet should limit inflammatory foods, such as processed meats, chemical preservatives, and food additives. High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketchup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such as hormonal imbalances.
+ Minimize or eliminate fast food completely, or opt for salads with grilled meats now offered in most fast food restaurants.
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal.
+ Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances develop hormonal imbalances and even gain weight.
+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.
+ Limit drinking out of plastic containers. Plastics contain residues, including phthalates and bisphenol A (BPA), that can bind to estrogen receptors and disrupt hormonal balance.
+ Do not microwave food in plastic containers or covered in plastic.
+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates. Phthalates and other chemicals used in plastic have estrogen like binding ability and can cause hormone imbalances.
| **Supportive Supplements** | **DIM** | 2 capsules daily | + DIM™ is a synergistic combination of plant based ingredients including diindolylmethane, curcumin, green tea, and wasabia, which helps support healthy hormone balance by improving estrogen metabolism.  
[1396] |
| --- | --- | --- | --- |
| **Feminine Herbal Balance** | 1-2 capsules daily | + Feminine Herbal Balance™ is a blend of standardized Chasteberry (Angus Castus, Vitex), standardized Black Cohosh and standardized Kudzu root, which help balance female hormonal levels and decrease negative symptoms associated with menopause and PMS.  
+ Black cohosh has positive effects on menopausal symptoms including hot flashes; may decrease risk of breast cancer.  
[1397]  
+ Vitex has both progestogenic- and estrogenic-like activity.  
[1398] |
| **Life Time Fitness FastFuel Complete** | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function  
[1399,1400]  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.  
[1401] |
| **Multi-Probiotic 4000** | 1 capsule, 1-3 times daily | + Supports gastrointestinal health  
[1402]  
+ Supports vitamin B and K metabolism  
[1403]  
+ Helps improve absorption of nutrients from foods |
| **Relora Plex** | 2 capsules, 1-2 times daily | + Relora® is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (Magnolia officinalis) and Phellodendron bark (Phellodendron amurense).
+ Relora Plex also contains B-vitamins, which help in stress and nervous system balance
+ Useful in stress and decreasing cortisol levels¹⁰⁴ Relora can increase salivary DHEA and decreases salivary morning cortisol levels, which can both help balance hormone levels¹⁰⁵
+ Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals. |

* If chronic stress is present
<table>
<thead>
<tr>
<th><strong>TransDermaPro progesterone cream</strong></th>
<th>Apply cream to inner thighs or inner arms. Rotate between sites. + Menstruating (Ovulating) Women: Apply 1/8 tsp. once or twice daily as needed, from day 14 through day 28 where day 1 is the first day of menstrual flow. + Perimenopausal Women: Apply 1/4 tsp. once or twice daily as needed, from day 7 through day 28 where day 1 is the first day of menstrual flow. + Menopausal or Non-Menstruating Women: (30 cycle) Apply 1/4 tsp. once or twice daily for 25 consecutive days.</th>
<th>+ TransDermaPro™ is a cream that contains micronized natural progesterone from wild yam. TransDermaPro™ helps support healthy progesterone levels in women.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ultra-D Tox</strong></td>
<td>1 capsule 2 times daily; take for 2-3 weeks</td>
<td>+ Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C. + Helps support digestive function + Helps clear the body of environmental toxins</td>
</tr>
</tbody>
</table>
Life Time Fitness
LeanSource™ Weight Loss

* Use if BMI 25 or >

4 capliques daily, 2 with breakfast and 2 with dinner

+ LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat - all promoting and sustaining weight loss.

+ LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements

1406,1407

What does a high Progesterone value mean?

Too much progesterone can cause breast tenderness, depression, fatigue, low sex drive, vaginal dryness, and more. High progesterone levels may indicate pregnancy. Synthetic progestins are found in birth-control pills, in hormones given during menopause for replacement therapy, or in medications to correct abnormal bleeding problems during menses. Taking these medications may lead to an increased progesterone level.

If the progesterone to estrogen ratio is too high, you will store fat and tend toward insulin resistance. Too much progesterone can lead to:

+ Elevated cortisol
+ Increased cravings
+ Reduced growth hormone
+ Reduced immune function balance

What are steps you can take for a high Progesterone level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ There are healthy foods that can help improve the conversion of estrogen into “good” metabolites and away from “bad” metabolites. These foods include insoluble dietary fibers such as lignin found in flaxseeds, bran, beans, and seeds.
+ Eat more fresh fruits and vegetables. Diets low in fruits (such as apples, grapefruit and oranges) and cruciferous vegetables (such as broccoli, cabbage, and Brussels sprouts) may result in a relative deficiency of calcium-D-glucarate and its metabolites, which help metabolize estrogen into its healthy forms.
+ Decrease stress – chronic stress leads to imbalances in metabolism and hormones.
+ Buy organic foods where possible. Currently the foods that are on the most-contaminated list are peaches, apples, sweet bell peppers, celery, nectarines, strawberries, cherries, lettuce, imported grapes, pears, spinach, and potatoes.
+ Avoid animal protein that has been raised with hormones whenever possible. Chicken should be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation and help your hormone receptors to function appropriately.
+ Choose other forms of protein, such as beans and soy (if no allergy). Your protein requirements increase when you’re under ongoing stress — especially physical stress and illness. And even if you don’t feel ill, your body probably still needs some extra protein to heal the hidden damage metabolic imbalances have done to your intestines and other especially vulnerable areas of your body. You may want to consider adding a protein drink to your diet.

+ There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana (limit this due to high glycemic index), or other fruit in a blender with rice milk or quality water.

+ Over-consumption of simple carbohydrates like refined sugars and grains results in adverse influences on sex hormone balance.\textsuperscript{1410}

+ Excess carbohydrates have also been associated with postmenopausal breast cancer risk among overweight women and women with large waist circumference.\textsuperscript{1411} Men who are insulin resistant are also more likely to have hormonal imbalances.\textsuperscript{1412}

+ Studies report imbalances in hormone levels when you are overweight or obese.\textsuperscript{1413} If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.

+ The diet should limit inflammatory foods, such as processed meats, chemical preservatives, and food additives. High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketchup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such as hormonal imbalances.\textsuperscript{1414}

+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.

+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.

+ Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have more chances of hormonal imbalances.\textsuperscript{1415}

+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.

+ Limit drinking out of plastic containers. Plastics contain residues, including phthalates and bisphenol A (BPA), that can bind to estrogen receptors and disrupt hormonal balance.\textsuperscript{1416}

+ Do not microwave food in plastic containers or covered in plastic.

+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates. Phthalates and other chemicals used in plastic have estrogen like binding ability and can cause hormone imbalances.
## Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage/Usage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIM</td>
<td>2 capsules daily</td>
<td>+ DIM™ is a synergistic combination of plant based ingredients including diindolylmethane, curcumin, green tea, and wasabia, which helps support healthy hormone balance by improving estrogen metabolism.</td>
</tr>
</tbody>
</table>
| Life Time Fitness FastFuel Complete       | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage       | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
  + Helps support digestive function  
  + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses.                                                                                                                                   |
| Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner.       | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.                                                                                                                                                                                                                       |
| Multi-Probiotic 4000                      | 1 capsule, 1-3 times daily                                                 | + Supports gastrointestinal health  
  + Supports vitamin B and K metabolism  
  + Helps improve absorption of nutrients from foods                                                                                                                                                                                                                                                                          |
| Ultra-D Tox                               | 1 capsule 2 times daily; take for 2-3 weeks                                | + Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C.  
  + Helps support digestive function  
  + Helps clear the body of environmental toxins                                                                                                                                                                                                                                                                           |
| Life Time Fitness LeanSource™ Weight Loss | 4 caplique daily, 2 with breakfast and 2 with dinner                       | + LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat - all promoting and sustaining weight loss.  
  + LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements  |

* Use if BMI 25 or >
Proteins in the blood help transport various compounds in the body, including lipids, hormones (thyroid, sex, stress), vitamins and metals like copper and iron. Proteins also make enzymes and help regulate cellular activity of the immune system. Two proteins, albumin and globulin, are the major proteins found in the blood. Other proteins in the blood include lipoproteins (help transport cholesterol and triglycerides), serum hormone binding globulin (SHBG, transports sex hormones), transferring (transports iron) and prothrombin (involved in blood clotting). Proteins are metabolized in the liver, except for gamma globulin.

Albumin is a protein made in the liver from dietary protein. Albumin makes up about 60% of total blood plasma proteins. It’s functions include helping maintain fluid volume and fluid balance in the body and as an antioxidant. Many substances bind to albumin for transport in the blood, including amino acids, bilirubin, calcium, cortisol, free fatty acids, magnesium, prescription and non-prescription drugs, and the thyroid hormone thyroxin.

Globulins are proteins found in the blood that are the basis for antibodies, glycoproteins (protein-carbohydrate compounds), lipoproteins (proteins involved in fat transport), and clotting factors. Globulins, together with albumin, make up your total protein on the blood test lab results. There are 4 “types” or subsets of globulins – alpha-1, alpha-2, beta and gamma. Both alpha and beta globulins are carrier proteins – they deal with much of the binding of substances in the blood to protein, including lipoproteins, thyroid hormones, sex hormones, drugs, vitamins, minerals and clotting factors. Gamma globulins are part of the immune system.
PROTEIN, TOTAL

Reference Values

Total Protein blood
(in grams per deciliter = g/dL)

| Normal Range (Adult) | 6.0 – 8.5 g/dL |

Why is a Total Protein level needed?

A total protein level is part of your complete metabolic panel (CMP). This test determines the level of proteins (including albumin and globulin) that you have in your blood. Individuals with liver and/or kidney problems, infections and chronic inflammation are at highest risk for developing protein levels that are consistently out of range. In addition, individuals with gastrointestinal disorders who do not absorb nutrients properly or who have chronic diarrhea can develop abnormal protein levels.

What Life Time Fitness Lab Tests Report the Total Protein value?

+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

What does a low Total Protein value mean?

Low total protein level can indicate that you have liver and/or kidney imbalances, stomach or intestinal problems, you’ve been drinking too much water or you may need extra protein in your diet due to poor digestion. Low levels of globulins can mean that your immune system is imbalanced, you are undernourished or you have liver or kidney problems. Some drugs, like anti-ulcer medications, can lead to low acid in the stomach and low protein absorption. Proton pump inhibitors and H2 blockers are the 2nd largest category of drugs being prescribed in the U.S., and many of these drugs are easily available over-the-counter (OTC). Lower protein can have a significant impact on every thing from immune function to maintaining lean muscle mass. These drugs include:

+ Cimetidine (Tagamet)
+ Ranitidine (Zantac)
+ Nizatidine (Axid)
+ Famotidine (Pepcid)
+ Omeprazole (Prilosec)
+ Lansoprazole (Prevacid)
+ Rebeprazole (Aciphex)
+ Pantoprazole (Protonix)
+ Esomeprazole (Nexium, the “purple” pill)
What are steps you can take for a low Total Protein value?

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Increase your intake of lean, high-quality proteins in the diet, including fish, turkey, bison and ostrich. It is best to use organic, free-range meats that are raised without chemical additives, hormones and antibiotics. Use a digestive enzyme to help in breaking down protein and foods for use in the body.
+ Increase your protein by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with almond milk or quality water.
+ Nonalcoholic fatty liver disease (NAFLD) is a common condition associated with obesity and metabolic syndrome. Inappropriate dietary fat intake, excessive intake of soft drinks (due to high fructose corn syrup), insulin resistance caused by eating too much refined sugar and carbohydrates and increased oxidative stress due to a poor diet combine to increase fat in the liver. Losing weight will help improved liver function tests.
+ Increase calcium-containing foods, including green, leafy vegetables and organic milk/cheese
+ Lower the use of antacids like Tums and ulcer medicines like Tagamet, Zantac, Pepcid and Prevacid.
+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli), garlic, onions.

**Supportive Supplements**

<table>
<thead>
<tr>
<th>Product</th>
<th>Usage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Time Fitness Creatine</td>
<td>10gm daily in divided doses for 1 week, then 5gm daily</td>
<td>+ Promotes protein synthesis and enhances muscle mass + Important in exercise and fitness performance</td>
</tr>
<tr>
<td>Life Time Fitness FastFuel Complete</td>
<td>4 scoops (approx. 65gm) in the morning as part of a healthy beverage</td>
<td>+ Contains whey protein concentrate &amp; isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend. + Helps support digestive function + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses.</td>
</tr>
<tr>
<td>Life Time Fitness Men's or Women's Performance Daily Multivitamin AM/PM</td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men's and Women's Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.</td>
</tr>
</tbody>
</table>

Better health & performance start here.
**Life Time Fitness Peak Performance Whey Protein Isolate**

| 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source\(^{1430}\)
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH)\(^{1431}\)
+ Provides 22gm protein per 2 scoops (30gm) |

**Multi-Probiotic 4000**

| 1 capsule, 1-3 times daily | + Supports gastrointestinal health\(^{1432}\)
+ Supports vitamin B and K metabolism\(^{1433}\)
+ Helps improve absorption of nutrients from foods |

**N-acetyl cysteine (NAC)**

| 500 - 750mg, 1-2 times daily | + Liver support
+ Improves glutathione (antioxidant) stores in the liver\(^{1434}\) |

---

**What does a high Total Protein value mean?**

Total protein levels in the higher range may indicate that you have gastrointestinal imbalances, chronic inflammation, liver/kidney problems, dehydration, or a possible vitamin A deficiency. High globulin levels may indicate that your immune system is being overworked, possibly due to a chronic infection, chronic stress and inflammation.

**What are steps you can take for a high Total Protein value?**

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and inflammation\(^{1435,1436}\). Modifying the diet can help decrease inflammation, physical and mental stress, all helping to balance metabolism.
+ The diet should also limit other inflammatory foods, such as processed meats, chemical preservatives, and food additives. Studies have found that nitrite or nitrate treated meats such as bacon, sausage, smoked foods, and lunch meats increase the risk of cancer\(^{1437,1438}\). High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketsup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such as liver imbalance\(^{1439}\).
+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible.
+ High-fiber foods, including fresh vegetables and beans, should be part of the diet. These foods should supply the 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar and inflammation. These foods also provide important benefits, such as antioxidant vitamins, minerals, and phytochemicals. Make sure to include green, orange, and
yellow fruits and vegetables - such as broccoli, carrots, cantaloupe, and citrus fruits. Cocoa is also a significant source of antioxidants - so enjoy some low-sugar dark chocolate. The antioxidants and other nutrients in these foods may help protect against inflammatory chemistry and also help regulate immune function. 

+ Decrease protein intake, including eggs, meats, fish, shellfish, beans; nimal fat (saturated fat), which boosts blood cholesterol levels and leads to inflammatory chemistry, should be minimized. Saturated animal fats from animals exposed to growth hormones may also lead to health conditions, such as hormonal imbalances and cancer. Choose lean meats from quality sources, skinless poultry, and nonfat or low-fat dairy products.

+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are consumed in adequate amounts it lowers health risks, especially for heart disease, and new studies are suggesting that adequate intakes may even help prevent obesity.

+ Improve vegetable intake, especially those high in vitamin A, including:
  - sweet potatoes
  - carrots
  - beets
  - broccoli
  - spinach
  - winter squash
  - kale
  - peas
  - red peppers
  - tomato juice
  - apricots

+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli), garlic, onions

+ Limit alcohol intake.

### Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Alpha lipoic acid                               | 500mg 2 times daily                         | + Antioxidant  
+ Helps improve energy production and regulate blood glucose levels |
| L-glutamine                                     | 500mg – 2 grams daily in divided doses      | + Gastrointestinal support  
+ Supports digestive tract tissue and immune function |
| Life Time Fitness Men's or Women's Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men's and Women's Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism |
PSA

PSA, or prostate-specific antigen, is a protein produced in part by cells in the prostate and ordinarily is found in small amounts in a man’s blood. The prostate is a small gland about the size and shape of a walnut that is below the bladder. The prostate produces and releases the liquid component of semen and helps transport sperm during ejaculation. As men age, problems with the prostate can occur, including an enlarged prostate and prostate cancer. When prostate cells begin to grow and become overcrowded, they produce more and more PSA. PSA acts to suppress the growth of the prostate cells by cutting off blood supply.

Pages 288-294
Reference Values

Blood PSA value
(In nanograms per milliliter = ng/mL)

| Normal Range (Men) | 0.0 – 4.0 ng/mL |

Why is a PSA level needed?

A PSA test determines the level of prostate-specific antigen in the men. PSA testing is generally used to screen for prostate problems. The medical community generally screens for PSA levels in men over 40 to help determine if prostate imbalances are occurring, including infection, benign prostatic hyperplasia (BPH) and prostate cancer. The PSA is generally performed along with a digital rectal exam. Cancerous (malignant) tissue in the prostate will generally produce more PSA than healthy tissue, so high levels of PSA can be of concern. High levels can also occur however, after recent ejaculation and in hormonal imbalances.

What Life Time Fitness Lab Tests Report a PSA level?

- Men’s Sex Hormone Profile
- Men’s Sex Hormone Premium Profile

What does a low PSA value mean?

Men who are obese tend to have lower PSA levels, which is thought to be due to the increased blood volume in these men that leads to a more diluted level of PSA in the blood. Medications to treat an enlarged prostate and some dietary supplements taken for prostate health can lower PSA levels, which may mask the presence of prostate problems. Medications (and supplements) that can decrease PSA levels include:

- Finasteride (Propecia)
- Dutasteride (Avodart)
- Minoxidil (Rogaine)
- Saw palmetto (Serenoa repens)

What are steps you can take for a low PSA value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

- Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.
- Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are
consumed in adequate amounts it lowers health risks, especially for heart disease, and new studies are suggesting that adequate intakes may even help prevent obesity. + Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter which should be limited to 1 to 2 servings a day. Avoid heating the oil, but it’s great on salads and sprayed on foods. + Zinc is important for prostate health. Increase your zinc intake. The best dietary sources of zinc are lean meats, liver, eggs, and seafood (especially oysters, but make sure they are from a good source). Whole grain breads and cereals are also good sources of zinc, but limit your carbohydrate intake as this can lead to insulin resistance, blood sugar imbalances and weight gain. + Selenium is important for prostate health. Increase foods that contain selenium, including seafood, garlic, liver, eggs, dairy products, and some vegetables including cabbage, celery, cucumbers, and radishes. Brazil nuts have the highest amount of selenium. Food processing causes substantial loss of selenium. For example, whole wheat bread has twice the selenium as white bread, and brown rice has 15 times more selenium than white rice. Human breast milk contains six times more selenium than cow’s milk. A cow’s milk diet for infants can contribute to low selenium levels and depressed immune systems in infants. + Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants. + Limit exposure to pesticides or toxic substances that may be present in foods. Buy organic foods where possible. + High-fiber foods, including flax, fresh vegetables, and beans should be part of the diet. These foods should supply the 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar. High-fiber foods help with hormonal balance. Such foods also provide important benefits, such as antioxidant vitamins, minerals, and phytochemicals. Make sure to include green, orange, and yellow fruits and vegetables - such as broccoli, carrots, cantaloupe, and citrus fruits. The antioxidants and other nutrients in these foods may help balance hormone levels. + Avoid animal protein that has been raised with hormones whenever possible. Chicken should also be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your hormone receptors to function appropriately. + Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible. + Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism. + Do not microwave food in plastic containers or covered in plastic. + Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates. + Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours, suggesting that chronic insomnia is a disorder of sustained excitation of the body’s stress response system. This can also imbalance sex hormones. + Exercise and other physical activities are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended. + Drink in moderation.
## Supportive Supplements

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<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Benefits</th>
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</thead>
</table>
| **Life Time Fitness FastFuel Complete**   | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function \(^{1456,1457}\)  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism. \(^{1458}\) |
| **Life Time Fitness Omega-3 Fish Oil**    | 1-2 capsules, 2 times daily                                            | + Helps decrease inflammation and the consequences it has on your metabolism \(^{1459}\)  
+ Helps support heart and blood vessel health \(^{1460,1461}\)  
+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction. \(^{1462}\) |
| **Multi-Probiotic 4000**                  | 1 capsule, 1-3 times daily                                             | + Supports gastrointestinal health \(^{1463}\)  
+ Supports vitamin B and K metabolism \(^{1464}\)  
+ Helps improve absorption of nutrients from foods  
+ Helps decrease inflammation including CRP levels \(^{1465}\) |

### What does a high PSA value mean?

In men, there is an age-related increase in estrogen accumulation in the prostate gland. The higher the levels, the more enlarged the prostate can become. In addition, estrogen accumulation in the tissues can cause PSA to increase. \(^{1466}\) Interestingly, PSA production can be inhibited by 2-methoxy-estradiol, a “good” metabolite of estradiol in men and women. So keeping estrogen levels and estrogen metabolism in balance is important for keeping PSA levels down as men age. Excess estrogen in men can be caused by dietary factors also, such as eating a diet high in refined carbohydrates and sugars and being exposed to pesticides and hormones in foods can lead to hormonal imbalances, insulin resistance and diabetes. \(^{1467}\)
PSA levels can rise due to infection or inflammation of the prostate. Ejaculation can increase PSA levels as well. Testosterone and anabolic steroids can also increase PSA levels.

**What are steps you can take for a high PSA value?**

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiensers, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are consumed in adequate amounts it lowers health risks, especially for heart disease, and new studies are suggesting that adequate intakes may even help prevent obesity.\(^{1468,1469}\)
+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter, which should be limited to 1 to 2 servings a day. Avoid heating the oil, but it’s great on salads and sprayed on foods.
+ Zinc is important for male reproductive health.\(^{1470}\) Increase your zinc intake. The best dietary sources of zinc are lean meats, liver, eggs, and seafood (especially oysters, but make sure they are from a good source). Whole grain breads and cereals are also good sources of zinc, but limit your carbohydrate intake as this can lead to insulin resistance, blood sugar imbalances and weight gain.
+ Selenium is important for male reproductive health.\(^{1471}\) Increase foods that contain selenium, including seafood, garlic, liver, eggs, dairy products, and some vegetables including cabbage, celery, cucumbers, and radishes. Brazil nuts have the highest amount of selenium. Food processing causes substantial loss of selenium. For example, whole wheat bread has twice the selenium as white bread, and brown rice has 15 times more selenium than white rice. Human breast milk contains six times more selenium than cow's milk. A cow's milk diet for infants can contribute to low selenium levels and depressed immune systems in infants.
+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ Exposure to pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible. Currently the foods that are on the most-contaminated list are peaches, apples, sweet bell peppers, celery, nectarines, strawberries, cherries, lettuce, imported grapes, pears, spinach, and potatoes.
+ **Dietary fiber** also decreases the conversion of testosterone into estrogens in fat and breast cells.\(^{1473}\)
+ Over-consumption of simple carbohydrates like refined sugars and grains, causes unfriendly flora to grow in the GI tract. These foods also raise blood glucose and insulin levels, resulting in adverse influences on sex hormone balance.\(^{23}\) High glycemic foods also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which can imbalance hormone levels.\(^{1474,1475}\)
+ Make sure to include green, orange, and yellow fruits and vegetables - such as broccoli, carrots, cantaloupe, and citrus fruits. The antioxidants and other nutrients in these foods may help balance hormone levels.\(^{1476}\)
+ Avoid animal protein that has been raised with hormones whenever possible. Chicken should also be cage-
free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your hormone receptors to function appropriately.

+ Studies report imbalances in hormone levels when you are overweight or obese. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.

+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.

+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance hormone levels.

+ Do not microwave food in plastic containers or covered in plastic.

+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates.

+ Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult.

+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.

+ Drink alcohol in moderation.

**Supplements**

| **Life Time Fitness FastFuel Complete** | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend. + Helps support digestive function

  + If gas or bloating occurs, change to l-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |

| **Life Time Fitness Men's or Women's Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men's and Women's Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism. |

<p>| <strong>Life Time Fitness Omega-3 Fish Oil</strong> | 1-2 capsules, 2 times daily | + Helps decrease inflammation and the consequences it has on your metabolism. + Helps support heart and blood vessel health. + Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction. |</p>
<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage Information</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Multi-Probiotic 4000    | 1 capsule, 1-3 times daily | + Supports gastrointestinal health\(^{1486}\)  
+ Supports vitamin B and K metabolism\(^{1487}\)  
+ Helps improve absorption of nutrients from foods  
+ Helps decrease inflammation including CRP levels\(^{1488}\) |
| Saw Palmetto Max-V™     | For men: 1 capsule 2 times daily. | + Used for prostate problems  
+ Studies indicate that saw palmetto may be able to inhibit the conversion of testosterone to its more active and potentially damaging form, dihydrotestosterone (DHT), via inhibition of alpha-5-reductase.\(^{1489}\) |
RBC INDICES

Including MCV, MCH, MCHC and RDW

RBCs deliver oxygen to tissues and support life. They also carry carbon dioxide (CO2, as bicarbonate) from the cells back to the lungs for expiration. RBCs are rich in hemoglobin, the iron-containing molecule that transports oxygen. Hemoglobin is what gives red blood cells their color (red). Red blood cell indices are tests used to give information about the hemoglobin (oxygen carrying molecules) and the size of the red blood cells (RBCs). Usually, these tests are performed as part of a CBC or complete blood count, which includes RBCs, white blood cells (WBCs), hemoglobin, hematocrit, platelets, mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), mean corpuscular volume (MCV) and red cell distribution width (RDW). If RBCs or hemoglobin are not functioning properly, then anemia can develop. Anemia is a reduction or alteration in RBCs resulting in the inability of hemoglobin to carry oxygen to the tissues.

Pages 295-301
RBC INDICES

Including MCV, MCH, MCHC and RDW

Reference Values - RBC Indices

Mean Corpuscular Volume (MCV)
(Measured in femtoliters = fL)

<table>
<thead>
<tr>
<th>Normal Range (Adult)</th>
<th>80 – 98 fL</th>
</tr>
</thead>
</table>

Note: Less than 80 and more than 100 should be monitored by your doctor.

Mean Corpuscular Hemoglobin (MCH)
(Measured in picograms per cell = pg/cell)

<table>
<thead>
<tr>
<th>Normal Range (Adult)</th>
<th>27 - 34 pg/cell</th>
</tr>
</thead>
</table>

Mean corpuscular hemoglobin concentration (MCHC)
(Measured in grams per deciliter = g/dL)

<table>
<thead>
<tr>
<th>Normal Range (Adult)</th>
<th>32 – 36 g/dL</th>
</tr>
</thead>
</table>

Note: Greater than 37g/dL should be monitored by your doctor.

Red cell distribution width (RDW)
(Measured as percentage = %)

<table>
<thead>
<tr>
<th>Normal Range (Adult)</th>
<th>11.7 – 15 %</th>
</tr>
</thead>
</table>

Why are RBC indices needed?

Measuring RBC indices are part of your complete metabolic panel (CMP). RBC indices measure MCV, MCH and MCHC. Mean corpuscular volume, or MCV, measures the average size of your RBCs. Mean corpuscular hemoglobin, or MCH, refers to the concentration of oxygen carrying hemoglobin inside your red blood cells. Mean corpuscular hemoglobin concentration, or MCHC, is a ratio (expressed as a percentage) of hemoglobin inside your red blood cells compared to the RBC cell size. Red cell distribution width (RDW) is a measure of the volume of the red blood cell.

RBC levels indicate the number of red blood cells in the body and can help indicate how well your body is taking oxygen to the tissues. RBC indices also help determine the shape and the size of the red blood cells. RBC indices help determine if you are anemic. Usually, RBC indices are performed along with red blood cells (RBCs), white blood cells (WBCs), hemoglobin, hematocrit and platelets. Below is a summary of RBC indices and effects on red blood cells.
**MCV (Mean corpuscular Volume)**
Increased in B12 and folate deficiencies; decreased with iron deficiency anemias

**MCH (Mean Corpuscular Hemoglobin)**
Same as MCV

**MCHC (Mean Corpuscular Hemoglobin Concentration)**
Can be decreased if MCV decreased; increased if too much hemoglobin is inside the red blood cell (RBC)

**RDW (Red Cell Distribution Width)**
Can be altered in anemia and other RBC disorders. The calculation for RDW = (standard deviation of MCV divided by the mean MCV) x 100.

**What Life Time Fitness Lab Tests Report RBC indices and ranges?**

+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

**What do low RBC indices mean?**

Low RBC indices can mean the ability of the RBC to carry oxygen to tissues is decreased. Low RBC indices can help determine if anemia is present. Anemia is a reduction or alteration in RBCs resulting in the inability of hemoglobin to carry oxygen to the tissues. Anemia can cause fatigue, headaches, shortness of breath, dizziness and other symptoms. Anemia can result in fatigue, headaches, shortness of breath, dizziness and other symptoms. Anemias can also lead to chronic inflammation, nutrient deficiencies and heart problems. A decrease in red blood cells are normally seen during pregnancy, generally due to excess fluid which dilutes RBC testing results, and menstruation.

There are 3 major classifications of anemia, including microcytic, macrocytic and normocytic anemias. Microcytic anemia is caused by smaller than normal RBCs. This can result from low hemoglobin, iron, lead poisoning or vitamin B6 (pyridoxine). Macrocytic anemia is when the RBCs are larger than normal. This can result from low hemoglobin, low RBC numbers, bone marrow problems, low thyroid hormones, alcohol abuse and liver problems, drugs like chemotherapy, heavy metal toxicity and nutrient deficiencies like folate and B12. Normocytic anemia is when the number of RBCs are low, but their size is normal. This can be due to blood loss, increased destruction of RBCs in chronic diseases or bone marrow failure.

There are many types of anemias under these 3 major classifications that can be present if RBCs or hemoglobin are not functioning properly, have size alterations or are decreased in number. Some of these include:

+ Iron deficiency anemia – the most common form of anemia that occurs when the dietary intake or absorption of iron is low, leading to a decrease in the formation of oxygen carrying hemoglobin and small RBCs.
+ Sickle-cell anemia – a genetic problem that causes abnormal hemoglobin molecules to be formed. The RBCs are rigid and shaped like a sickle, causing damage to blood vessels that can lead to strokes, pain, and tissue damage.
+ Thalassemia – a genetic problem that results in a low production of hemoglobin
+ Spherocytosis – a genetic problem that causes defects in the RBC cell wall, leading to small, sphere-shaped and fragile RBCs that cannot carry oxygen efficiently.
+ Pernicious anemia – an autoimmune condition in which the body lacks intrinsic factor, which is required to absorb vitamin B12 from foods. B12 is necessary in hemoglobin production and in metabolism of homocysteine (see LTF Vitamin B12 and Homocysteine Panels).
+ Aplastic anemia – caused by the inability of bone marrow to produce RBCs.
+ Pure red cell aplasia – caused by the inability of bone marrow to produce other cells like white blood cells but not RBCs.
+ Hemolytic anemia – the uncontrolled destruction of RBCs

What are steps you can take for low RBC indices?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Make sure to take a Life Time Fitness Men and Women’s AM/PM Multivit/mineral to make sure you are getting the right nutrients.
+ Increase your consumption of animal proteins, including meats and seafood. Liver is by far the richest iron-containing food. Other good sources of iron-rich foods include organ meats, fish, and poultry. Dried beans and vegetables are the best plant sources, followed by dried fruits, nuts, and whole grain breads and cereals. Fortification of cereals, flours, and bread with iron has contributed significantly to daily dietary iron consumption.
+ The diet should limit inflammatory foods, such as processed meats, chemical preservatives, and food additives. Studies have found that nitrite or nitrate treated meats such as bacon, sausage, smoked foods, and lunch meats increase the risk of cancer.\textsuperscript{1492,1493} High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketchup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such imbalances in the probiotic flora in your intestines.\textsuperscript{1494}
+ Eat green leafy vegetables, including broccoli, kale and spinach, on a regular basis. Iron in vegetables is not as quickly or readily absorbed as iron from animal sources, but it is still valuable. Other vegetable sources of iron include beans and peas.
+ Decrease citrus fruits and tea/coffee because they contain chemicals that can bind to iron and decrease it’s absorption. Citrus fruits contain ascorbate and citrate and teas/coffee contains tannins, both reported to lower iron levels.\textsuperscript{1495}
+ Dried beans are also a good source of iron, followed by dried fruits (watch sugar content), nuts, and whole grain breads and cereals. Fortification of juices, cereals, flours, and bread with iron has contributed significantly to daily dietary iron consumption, although watch your carbohydrate intake.
+ Decrease using antacids and OTC medications for ulcers (like Zantac, Tagamet and Pepcid) that lower the stomach acid. Lower acid production will lead to low iron levels.
+ Increase your protein by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with almond milk or quality water.
+ Stop smoking.
+ The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods
should be eliminated. These contaminants can lower your immunity and can alter RBCs. Buy organic foods where possible.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.
+ Drink less water. Overhydration can lead to dilution of the blood and lower RBC levels.
+ Substitute green tea for your morning coffee and increase your citrus fruit consumption. Both contain chemicals that can decrease iron absorption and lower its level.
+ Exercise in moderation. Athletes can be more susceptible to iron loss, and over-exercising can actually cause deformities in the RBCs and make them clump together, leading to less oxygen available. Swimming, aerobics, yoga and dancing are also good activities to help decrease stress and have less impact on the body.

### Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Time Fitness Men's or Women's Performance Daily Multivitamin AM/PM</td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men's and Women's Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.</td>
</tr>
<tr>
<td>Life Time Fitness Peak Performance Whey Protein Isolate</td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>+ Easily digestible, high-quality protein source. + Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH). + Provides 22gm protein per 2 scoops (30gm)</td>
</tr>
<tr>
<td>Multi-Probiotic 4000</td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health. + Supports vitamin B and K metabolism. + Helps improve absorption of nutrients from foods</td>
</tr>
<tr>
<td>Time Release Iron</td>
<td>2 tablets daily with meals</td>
<td>+ Specially designed to provide 54 mg of carbonyl iron (Ferroyl®) per serving for a 6-to 8-hour period. + Use with caution in men</td>
</tr>
</tbody>
</table>

### What do high RBC indices mean?

High RBC indices generally indicate vitamin deficiencies, including B12 and folate or an inherited disorder. The mean corpuscular volume (MCV) can be increased if your RBCs are larger than normal (called macrocytic), including anemia caused by vitamin B12 deficiency and altitude sickness. The mean corpuscular hemoglobin (MCH) can be also be increased in macrocytic anemias associated with vitamin B12 and folate deficiency.

### What are steps you can take for high RBC indices values?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.
**General Dietary and Lifestyle Recommendations**

+ Use Life Time Fitness Men and Women’s AM/PM Multivit/mineral to make sure you are getting the right nutrients.
+ Increase vitamin B12 containing foods. Vitamin B12 is produced by microbial synthesis in the digestive tract of animals. Therefore, animal protein products are the source of this nutrient. Organ meats are the best source of vitamin B12, followed by clams, oysters, beef, eggs, milk, chicken, and cheese. If you are eating meat, buy organic and all natural meat. Do not buy processed meats, packaged meats, deli meats unless the meat does not have chemical additives. Choose lean meats from quality sources, skinless poultry, and nonfat or low-fat or nonfat dairy products. Red meat should always be organic grass-fed when eaten and free of hormones and antibiotics. Get the rest of protein from a variety of sources like beans, fish, chicken, turkey, buffalo/bison, and seafood.
+ Increase folic acid containing foods. Folic acid occurs in a wide variety of foods, including dark green leafy vegetables, brewer’s yeast, liver, and eggs. Other good sources are beets, broccoli, Brussels sprouts, asparagus, orange juice, cabbage, cauliflower, cantaloupe, kidney and lima beans, wheat germ, and whole grain cereals and breads. Limit your breads though, as high carbohydrate diets can lead to insulin resistance, hormonal imbalances and weight gain.
+ Increase vitamin B6 (pyridoxine) containing foods. The best sources of pyridoxine are brewer’s yeast, wheat germ, organ meats (especially liver), peanuts, legumes, potatoes, and bananas.
+ Increase your protein by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with almond milk or quality water.
+ The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods should be eliminated. Buy organic foods where possible.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.¹⁵⁰⁴
+ Increase water intake – stay hydrated; a minimum of 2 liters of filtered water daily is recommended
+ Be careful with alcohol consumption and avoid smoking.

**Supplements**

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha lipoic acid</td>
<td>500mg 2 times daily</td>
<td>+ Antioxidant¹⁵⁰⁵ + Helps improve energy production and regulate blood glucose levels¹⁵⁰⁵</td>
</tr>
<tr>
<td>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.¹⁵⁰⁷</td>
</tr>
<tr>
<td>Product</td>
<td>Dosage/Use</td>
<td>Benefits</td>
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<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Life Time Fitness Peak</td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>+ Easily digestible, high-quality protein source&lt;sup&gt;1008&lt;/sup&gt;</td>
</tr>
<tr>
<td>Performance Whey Protein</td>
<td></td>
<td>+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).&lt;sup&gt;1009&lt;/sup&gt;</td>
</tr>
<tr>
<td>Isolate</td>
<td></td>
<td>+ Provides 22gm protein per 2 scoops (30gm)</td>
</tr>
<tr>
<td>Multi-Probiotic 4000</td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health&lt;sup&gt;1010&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Supports vitamin B and K metabolism&lt;sup&gt;1011&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Helps improve absorption of nutrients from foods</td>
</tr>
<tr>
<td>Ultra-D Tox</td>
<td>1-2 capsules 2 times daily; use for 2-3 weeks</td>
<td>+ Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Helps support digestive function and detoxification processes</td>
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</tbody>
</table>
RED BLOOD CELL (RBC)

Red blood cells (RBCs or erythrocytes) are made in bone marrow of large bones and are the most commonly found cell in the blood. About 2 million RBCs are produced every second in the average adult and each cell matures in about 7 days.

RBCs deliver oxygen to tissues and support life. They also carry carbon dioxide (CO2, as bicarbonate) from the cells back to the lungs for expiration. RBCs are rich in hemoglobin, the iron-containing molecule that transports oxygen. Hemoglobin is what gives red blood cells their color (red) and shape. Temperature of the body and pH are critical for the binding of hemoglobin to oxygen. If there is a reduction or alteration in RBCs or hemoglobin, then anemia can develop. Anemia is a reduction or alteration in RBCs resulting in the inability of hemoglobin to carry oxygen to the tissues.

After the oxygen is used by the tissues, CO2 is produced. CO2 is then picked up by the hemoglobin in RBCs and taken back to the lungs for exhalation into the air. RBCs contain an enzyme called carbonic anhydrase, which metabolizes CO2 into bicarbonate. Bicarbonate helps control the pH in your blood and is later excreted either via your lungs or your kidneys.

As RBCs age and are less able to carry oxygen, they become susceptible to destruction by cells of the immune system, which then take the unusable RBCs to the liver, spleen and bone marrow. This process is usually in balance with the creation of new RBCs in the bone marrow. Some parts of the RBCs are recycled, including iron and biliverdin (a metabolized part of part of the hemoglobin molecule). The iron is picked up by the carrier protein transferrin and taken other parts of the body for use. In the liver, biliverdin is changed into bilirubin, a yellow, toxic breakdown product of hemoglobin (see LTF Bilirubin Panel).
RBC INDICES

Reference Values

RBC Blood Level

<table>
<thead>
<tr>
<th>Normal Range (Adult Male)</th>
<th>4.1 – 5.6 x 10^6/uL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Range (Adult Female)</td>
<td>3.8 – 5.1 x 10^6/uL</td>
</tr>
</tbody>
</table>

Why is an RBC level needed?

An RBC level is part of your comprehensive metabolic panel (CMP). RBC levels indicate the number of red blood cells in the body and can help indicate how well your body is taking oxygen to the tissues and if anemia or nutrient deficiencies are present. Usually, an RBC test is performed along with white blood cells (WBCs), hemoglobin, hematocrit, platelets, mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC) and mean corpuscular volume (MCV).

What Life Time Fitness Lab Tests Report a RBC range?

+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

What do low RBC levels mean?

Low RBC levels can mean the ability of the RBC to carry oxygen to tissues is decreased. Since the major function of RBCs is to use iron for oxygen transport by hemoglobin, low RBC levels mean low iron levels, which can result in anemia, or a reduction or alteration in RBCs resulting in the inability of hemoglobin to carry oxygen to the tissues. Anemia can result in fatigue, headaches, shortness of breath, dizziness and other symptoms. Anemias can also lead to chronic inflammation, nutrient deficiencies and heart problems. A decrease in red blood cells are normally seen during pregnancy, generally due to excess fluid which dilutes RBC testing results.

There are 3 major classifications of anemia, including microcytic, macrocytic and normocytic anemias. Microcytic anemia is caused by smaller than normal RBCs. This can result from low hemoglobin, iron, lead poisoning or vitamin B6 (pyridoxine). Macrocytic anemia is when the RBCs are larger than normal. This can result from low hemoglobin, low RBC numbers, low thyroid hormones, alcohol abuse, drugs like chemotherapy, heavy metal toxicity and nutrient deficiencies like folate and B12. Normocytic anemia is when the number of RBCs are low, but their size is normal. This can be due to blood loss, chronic diseases or bone marrow failure.

There are many types of anemias under these 3 major classifications that can be present if RBCs or hemoglobin are not functioning properly, have size alterations or are decreased in number. Some of these include:

+ Iron deficiency anemia – the most common form of anemia that occurs when the dietary intake or absorption of iron is low, leading to a decrease in the formation of oxygen carrying hemoglobin
+ Sickle-cell anemia – a genetic problem that causes abnormal hemoglobin molecules to be formed. The RBCs are rigid and shaped like a sickle, causing damage to blood vessels that can lead to strokes, pain, and tissue damage.
+ Thalassemia – a genetic problem that results in a low production of hemoglobin
+ Spherocytosis – a genetic problem that causes defects in the RBC cell wall, leading to small, sphere-shaped and fragile RBCs that cannot carry oxygen efficiently.
+ Pernicious anemia – an autoimmune condition in which the body lacks intrinsic factor, which is required to absorb vitamin B12 from foods. B12 is necessary in hemoglobin production and in metabolism of homocysteine (see LTF Vitamin B12 and Homocysteine Panels).
+ Aplastic anemia – caused by the inability of bone marrow to produce RBCs.
+ Pure red cell aplasia – caused by the inability of bone marrow to produce other cells like white blood cells but not RBCs.
+ Hemolytic anemia – the uncontrolled destruction of RBCs

Low levels of RBCs can be found in the following conditions:
+ Anemia
+ Kidney or liver problems
+ Heavy metal toxicity (lead)
+ Trauma/burns
+ Bleeding (hemorrhage)
+ Bleeding ulcer
+ Frequent blood donation
+ Nutritional deficiencies, including iron, copper, folate, vitamin B12 and B6.
+ Pregnancy
+ Menstruation
+ Overhydration
+ Bone marrow disorders like leukemia or from radiation/chemotherapy
+ Chronic inflammation

Drugs that can decrease RBC levels include:
+ Chemotherapy drugs
+ Chloramphenicol
+ Phenytoin (Dilantin)
+ Quinidine

What are steps you can take for low RBC levels?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations
+ Make sure to take a Life Time Fitness Men and Women's AM/PM Multivit/mineral to make sure you are getting the right nutrients.
+ Increase vitamin B12 containing foods. Vitamin B12 is produced by microbial synthesis in the digestive tract of animals. Therefore, animal protein products are the source of this nutrient. Organ meats are the best source
of vitamin B12, followed by clams, oysters, beef, eggs, milk, chicken, and cheese. If you are eating meat, buy organic and all natural meat. Do not buy processed meats, packaged meats, deli meats unless the meat does not have chemical additives. Choose lean meats from quality sources, skinless poultry, and nonfat or low-fat or nonfat dairy products. Red meat should always be organic grass-fed when eaten and free of hormones and antibiotics. Get the rest of protein from a variety of sources like beans, fish, chicken, turkey, buffalo/bison, and seafood.

+ Increase folic acid containing foods. Folic acid occurs in a wide variety of foods, including dark green leafy vegetables, brewer’s yeast, liver, and eggs. Other good sources are beets, broccoli, Brussels sprouts, asparagus, orange juice, cabbage, cauliflower, cantaloupe, kidney and lima beans, wheat germ, and whole grain cereals and breads. Limit your breads though, as high carbohydrate diets can lead to insulin resistance, hormonal imbalances and weight gain.

+ Increase vitamin B6 (pyridoxine) containing foods. The best sources of pyridoxine are brewer’s yeast, wheat germ, organ meats (especially liver), peanuts, legumes, potatoes, and bananas.

+ Increase your consumption of animal proteins, including meats and seafood. Liver is by far the richest iron-containing food. Other good sources of iron-rich foods include organ meats, fish, and poultry. Dried beans and vegetables are the best plant sources, followed by dried fruits, nuts, and whole grain breads and cereals. Fortification of cereals, flours, and bread with iron has contributed significantly to daily dietary iron consumption.

+ Avoid animal protein that has been raised with hormones whenever possible. Chicken should also be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your hormone receptors to function appropriately.

+ The diet should limit inflammatory foods, such as processed meats, chemical preservatives, and food additives. Studies have found that nitrite or nitrate treated meats such as bacon, sausage, smoked foods, and lunch meats increase the risk of cancer. High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketsup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such imbalances in the probiotic flora in your intestines.

+ Eat green leafy vegetables, including broccoli, kale and spinach, on a regular basis. Iron in vegetables is not as quickly or readily absorbed as iron from animal sources, but it is still valuable. Other vegetable sources of iron include beans and peas.

+ Decrease citrus fruits and tea/coffee because they contain chemicals that can bind to iron and decrease it’s absorption. Citrus fruits contain ascorbate and citrate and teas/coffee contains tannins, both reported to lower iron levels.

+ Dried beans are also a good source of iron, followed by dried fruits (watch sugar content), nuts, and whole grain breads and cereals. Fortification of juices, cereals, flours, and bread with iron has contributed significantly to daily dietary iron consumption, although watch your carbohydrate intake

+ Decrease using antacids and OTC medications for ulcers (like Zantac, Tagamet and Pepcid) that lower the stomach acid. Lower acid production will lead to low iron levels.

+ Increase your protein by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with almond milk or quality water.

+ Stop smoking.
+ The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods should be eliminated. These contaminants can lower your immunity and can alter RBCs.\textsuperscript{1518} Buy organic foods where possible.

+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.\textsuperscript{1519}

+ Exercise in moderation. Athletes can be more susceptible to iron loss, and over-exercising can actually cause deformities in the RBCs and make them clump together, leading to less oxygen available.\textsuperscript{1520} Swimming, aerobics, yoga and dancing are also good activities to help decrease stress and have less impact on the body.

**Supportive Supplements**

| **Life Time Fitness FastFuel Complete** | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber\textsuperscript{TM} medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend. + Helps support digestive function\textsuperscript{1521,1522} + If gas or bloating occurs, change to l-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Life Time Fitness Men's or Women's Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men's and Women's Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.\textsuperscript{1523} |
| **Life Time Fitness Peak Performance Whey Protein Isolate** | 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source\textsuperscript{1524} + Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).\textsuperscript{1525} + Provides 22gm protein per 2 scoops (30gm) |
| **Multi-Probiotic 4000** | 1 capsule, 1-3 times daily | + Supports gastrointestinal health\textsuperscript{1526} + Supports vitamin B and K metabolism\textsuperscript{1527} + Helps improve absorption of nutrients from foods |
| **Time Release Iron** | 2 tablets daily with meals | + Specially designed to provide 54 mg of carbonyl iron (Ferronyl\textsuperscript{®}) per serving for a 6-to 8-hour period. + Use with caution in men |
Ultra-D Tox

- 1-2 capsules 2 times daily; use for 2-3 weeks
- Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C.
- Helps support digestive function and detoxification processes

What does a high RBC value mean?

High levels of RBCs can be caused by:

+ Living at high altitudes due to your body responding to the decrease in oxygen available
+ Smoking
+ Heart, kidney or lung problems
+ Dehydration
+ Polycythemia vera – a condition of excess RBCs generally due to bone marrow problems

Drugs that can increase the RBC count include:

+ Methyldopa (Aldomet)
+ Erythropoietin (EPO)
+ Anabolic Steroids, including testosterone

What are steps you can take for high RBC values?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Do not take iron supplements. Make sure your multivitamin/mineral supplement DOES NOT contain iron, especially if you are a man. Use Life Time Fitness Men and Women’s AM/PM Multivit/mineral to make sure you are getting the right nutrients.
+ Decrease meat consumption. When eating protein, use high-quality protein, like lean meats, bison, fish, chicken, turkey or ostrich.
+ There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana (limit this due to high glycemic index), or other fruit in a blender with rice milk or quality water.
+ Several foods contain high amounts of iron. You may want to avoid vitamin and mineral supplements that contain iron, especially if you are a man. Also avoid iron-fortified foods such as juices, some breakfast cereals, and especially avoid beef, liver, and pork.
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. Fatty acid balance improves immunity. 1528
+ The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods should be eliminated. Buy organic foods where possible.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.  
+ Increase foods that help with detoxification of the liver and kidneys, including asparagus, cruciferous vegetables (like cabbage, broccoli), garlic, onions  
+ Drink more quality, filtered water – at least 2 liters daily.  
+ Stop smoking  
+ Limit alcohol intake  
+ Substitute green tea for your morning coffee and increase your citrus fruit consumption. Both contain chemicals that can decrease iron absorption and lower its level.

### Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage/Use</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Alpha lipoic acid                                       | 500mg 2 times daily                                                        | + Antioxidant  
+ Helps improve energy production and regulate blood glucose levels                          |
| Life Time Fitness Men's or Women's Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner.        | + The Life Time Fitness Men's and Women's Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism. |
| Life Time Fitness Peak Performance Whey Protein Isolate  | 2 scoops in favorite beverage, mix and drink daily                         | + Easily digestible, high-quality protein source  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).  
+ Provides 22gm protein per 2 scoops (30gm)                                                                 |
| Multi-Probiotic 4000                                    | 1 capsule, 1-3 times daily                                                 | + Supports gastrointestinal health  
+ Supports vitamin B and K metabolism  
+ Helps improve absorption of nutrients from foods                                              |
Sex hormone-binding globulin (SHBG) is a protein made in the liver that binds to sex hormones in the blood, including testosterone, dihydrotestosterone (DHT) and estradiol. Most of these hormones are bound to SHBG or to albumin (another protein in the blood), and only a small fraction of the hormone is unbound, or “free.” It is the “free” form of the hormone that is available for use by the body. SHBG binds to the “free” hormone, decreases the amount of “free” hormone and inhibits its function in the body. SHBG’s role is to store sex hormones in the blood and slowly release them in case there is a deficiency of the hormone.
SHBG

Reference Values
Blood (in nanomoles per liter = nmol/L)

Normal Range (Men):

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>All ages</td>
<td>14.5 – 48.4 nmol/L</td>
</tr>
</tbody>
</table>

Normal Range (Women):

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 – 50yrs</td>
<td>26.1 – 110.0 nmol/L</td>
</tr>
<tr>
<td>Postmenopausal, untreated</td>
<td>14.1 – 68.9 nmol/L</td>
</tr>
</tbody>
</table>

Why is an SHBG level needed?
The SHBG level is used to calculate free (unbound) testosterone levels and give a more complete picture of hormonal balance in men and women. Elevated testosterone causes SHBG levels to decrease, while high estrogen stimulates SHBG production and increases the levels. SHBG can also be affected by thyroid hormone, liver function, insulin and obesity. Certain pesticides called endocrine (hormone) disruptors can lead to hormonal imbalances and alter SHBG levels.

What Life Time Fitness Lab Tests Report a SHBG value?

+ Men’s Sex Hormone Profile
+ Men’s Sex Hormone Premium Profile
+ Women’s Sex Hormone Profile
+ Women’s Sex Hormone Premium Profile
+ Men’s Longevity and Vitality Profile
+ Men’s Longevity and Vitality Premium Profile
+ Women’s Longevity and Vitality Profile
+ Women’s Longevity and Vitality Premium Profile

What does a low SHBG value mean?
Low levels of SHBG and total testosterone in men are associated with metabolic syndrome – increased inflammation, insulin resistance, “belly” fat and obesity, elevated blood pressure, and abnormal cholesterol and triglycerides. High levels of insulin and insulin-like growth factor 1 (IGF-1). SHBG levels are decreased by high levels of insulin and insulin-like growth factor 1 (IGF-1). SHBG levels respond to extreme changes in body weight, decreasing in obese patients. Low levels of SHBG are also associated with an increased risk for type 2 diabetes. Anabolic steroids can decrease SHBG also. Low SHBG in women may be found in hirsutism (excess hair growth), PCOS (polycystic ovary disease) and heart disease.

What are steps you can take for low RBC indices?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.
General Dietary and Lifestyle Recommendations

+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are consumed in adequate amounts it lowers health risks, especially for heart disease, and new studies are suggesting that adequate intakes may even help prevent obesity.\textsuperscript{1544, 1545}
+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter which should be limited to 1 to 2 servings a day. Avoid heating the oil, but it’s great on salads and sprayed on foods.
+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible.
+ High-fiber foods, including flax, fresh vegetables, and beans should be part of the diet. These foods should supply the 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar. High-fiber foods help with hormonal balance.\textsuperscript{1546} Dietary fiber also decreases the conversion of testosterone into estrogens in fat and breast cells.\textsuperscript{1547}
+ Limit soy consumption, like tofu and soymilk. An increase in soy consumption has been found to lower testosterone in men.\textsuperscript{1548}
+ Over-consumption of simple carbohydrates like refined sugars and grains, causes unfriendly flora to grow in the GI tract. These foods also raise blood glucose and insulin levels, resulting in adverse influences on sex hormone balance.\textsuperscript{23} High glycemic foods also lead to chronically high oxidative stress and release of stress hormones (such as cortisol).\textsuperscript{1549, 1550}
+ Make sure to include green, orange, and yellow fruits and vegetables - such as broccoli, carrots, cantaloupe, and citrus fruits. The antioxidants and other nutrients in these foods may help balance hormone levels.\textsuperscript{1551}
+ Avoid animal protein that has been raised with hormones whenever possible. Chicken should also be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your hormone receptors to function appropriately.
+ Studies report imbalances in hormone levels when you are overweight or obese.\textsuperscript{1552} If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance hormone levels.\textsuperscript{1553}
+ Do not microwave food in plastic containers or covered in plastic.
+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates.
+ Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours.
+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.
+ Stop smoking. Hormone levels are influenced by tobacco smoke.\(^{1554}\)
+ Drink alcohol in moderation.

### Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage/Description</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Dual-Source Chromium as chromium polynicotinate and chromium picolinate | 1 capsule (300mcg chromium) daily                                                  | + Improves insulin regulation and glucose tolerance\(^{1555}\)  
+ Helps support serotonin levels\(^{1556}\) |
| Life Time Fitness FastFuel Complete            | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage              | + Contains whey protein concentrate & isolate, Sunfiber\(^{TM}\) medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function\(^{1557,1558}\)  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| Life Time Fitness Men's or Women's Performance Daily Multivitamin AM/PM | 3 capsules in the morning after breakfast and 3 capsules with dinner.              | + The Life Time Fitness Men's and Women's Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.\(^{1559}\) |
| Life Time Fitness Omega-3 Fish Oil             | 1-2 capsules, 2 times daily                                                       | + Helps decrease inflammation and the consequences it has on your metabolism\(^{1560}\)  
+ Helps support heart and blood vessel health\(^{1561,1562}\)  
+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction.\(^{1563}\) |
| Multi-Probiotic 4000                           | 1 capsule, 1-3 times daily                                                        | + Supports gastrointestinal health\(^{1564}\)  
+ Supports vitamin B and K metabolism\(^{1565}\)  
+ Helps improve absorption of nutrients from foods  
+ Helps decrease inflammation including CRP levels\(^{1566}\) |
Vitamin D 1000

+ 1-5 capsules (1,000 – 5,000 IU) daily, depending on vitamin D3 lab value
+ If lab value 30 ng/ml or less, then take 5,000 IU daily; if 30-40 ng/ml, then take 1,000 IU daily both in addition to your multivit; retest in a month

+ Bone support
+ Treatment of vitamin D deficiency improves bone mineral density

What does a high SHBG value mean?

As men age, their serum hormone binding globulin (SHBG) starts to increase leading to a decrease in free testosterone. In men who have elevated levels of SHBG, low levels of “free” testosterone will usually result, which can lead to imbalances in metabolism, including bone loss, muscle weakness, weight gain, poor memory, depression, low sex drive (libido), decreased erections and prostate problems. At the same time, their estrogen levels start to increase.

Men make more estrogen as they age due in part to an enzyme called aromatase that converts much of their remaining testosterone into estradiol. Much of the rest of the testosterone is bound to SHBG, which becomes bio-unavailable. As long as free testosterone is low and relative estrogen (estradiol and estrone) is high, a man will store fat around his belly, hence the “pot belly”. Belly fat cells can create aromatase, thereby decreasing testosterone even further and increasing estradiol. High estradiol in men is associated with abdominal fat, chronic inflammation, enlargement of the prostate and cardiovascular risk.

High levels of SHBG in women may be found in those taking oral contraceptives or in pregnancy.

What are steps you can take for a high SHBG level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Limit soy consumption, like tofu and soymilk. An increase in soy consumption has been found to lower testosterone in men.
+ Dietary fiber improves the composition of intestinal bacteria, reduces beta-glucuronidase. This helps to reduce levels of free estrogens and the chance of developing estrogen receptor positive cancers like most breast cancer. Dietary fiber also decreases the conversion of testosterone into estrogens in fat and breast cells.
+ Eat more fresh fruits and vegetables. Diets low in fruits (such as apples, grapefruit and oranges) and cruciferous vegetables (such as broccoli, cabbage, and brussel sprouts) may result in a relative deficiency of calcium-D-glucarate and its metabolites, which help metabolize estrogen into its healthy forms.
The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible. Currently the foods that are on the most-contaminated list are peaches, apples, sweet bell peppers, celery, nectarines, strawberries, cherries, lettuce, imported grapes, pears, spinach, and potatoes.

Avoid animal protein that has been raised with hormones whenever possible. Chicken should be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your hormone receptors to function appropriately.

There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana (limit this due to high glycemic index), or other fruit in a blender with rice milk or quality water.

Over-consumption of simple carbohydrates like refined sugars and grains, causes unfriendly flora to grow in the GI tract. These foods also raise blood glucose and insulin levels, resulting in adverse influences on sex hormone balance. High glycemic foods also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which can imbalance hormone levels. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.

The diet should limit inflammatory foods, such as processed meats, chemical preservatives, and food additives. High fructose corn syrup (HFCS) is used to sweeten many foods, like soft drinks, condiments (ketchup, BBQ sauce), fruit juice beverages, and others. HFCS is reported to increase inflammation in the intestinal tract and lead to problems such as hormonal imbalances.

Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.

Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.

Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have more chances of hormonal imbalances. Reduced sleep can lower testosterone production, and negatively affect other hormones like thyroid hormone.

Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended. Exercise can help improve testosterone levels.

Limit drinking out of plastic containers. Plastics contain residues, including phthalates and bisphenol A (BPA), that can bind to estrogen receptors and disrupt hormonal balance.

Do not microwave food in plastic containers or covered in plastic.

Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates. Phthalates and other chemicals used in plastic have estrogen like binding ability and can cause hormone imbalances.
### Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIM</td>
<td>2 capsules daily</td>
<td>+ DIM™ is a synergistic combination of plant-based ingredients including diindolylmethane, curcumin, green tea, and wasabia, which help support healthy hormone balance by improving estrogen metabolism.(^{1584})</td>
</tr>
<tr>
<td>Life Time Fitness FastFuel Complete</td>
<td>4 scoops (approx. 65gm) in the morning as part of a healthy beverage</td>
<td>+ Contains whey protein concentrate &amp; isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend. + Helps support digestive function(^{1585,1586}) + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses.</td>
</tr>
<tr>
<td>Life Time Fitness Men's or Women's Performance Daily Multivitamin AM/PM</td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men's and Women's Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.(^{1587})</td>
</tr>
<tr>
<td>Life Time Fitness Peak Performance Whey Protein Isolate</td>
<td>2 scoops in favorite beverage, mix and drink daily</td>
<td>+ Easily digestible, high-quality protein source(^{1588}) + Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).(^{1589}) + Provides 22gm protein per 2 scoops (30gm)</td>
</tr>
<tr>
<td>Multi-Probiotic 4000</td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health(^{1590}) + Supports vitamin B and K metabolism(^{1591}) + Helps improve absorption of nutrients from foods</td>
</tr>
<tr>
<td>Ultra-D Tox</td>
<td>1-2 capsules 2 times daily; use for 2-3 weeks</td>
<td>+ Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C. + Helps support digestive function + Helps clear the body of environmental toxins</td>
</tr>
<tr>
<td><strong>Vitamin D 1000</strong></td>
<td>+ 1-5 capsules (1,000 – 5,000 IU) daily, depending on vitamin D3 lab value + If lab value 30 ng/ml or less, then take 5,000 IU daily; if 30-40 ng/ml, then take 1,000 IU daily both in addition to your multivit; retest in a month</td>
<td>+ Bone support + Treatment of vitamin D deficiency improves bone mineral density&lt;sup&gt;1592&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Life Time Fitness LeanSource™ Weight Loss</strong></td>
<td>4 capliques daily, 2 with breakfast and 2 with dinner</td>
<td>+ LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat - all promoting and sustaining weight loss. + LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements&lt;sup&gt;1593,1594&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

* Use if BMI 25 or >
SODIUM

Sodium is one of the body's three major electrolytes (the other two being potassium and chloride). Sodium is the primary extracellular (outside the cell) electrolyte in body fluids.

Most Americans consume enormous amounts of sodium, from 10 to 35 times more than the recommended daily intake. Dietary sodium is easily absorbed from the intestine, carried by the blood to the kidneys where it is either filtered out and returned to the blood or excreted. Sodium in the body is essential for:

+ Blood Pressure regulation: In regulating body fluids, sodium has a major role in the regulation of blood pressure.
+ Muscle and Nerve Action: Sodium ions play a critical role in the transmission of electrochemical impulses for nerve function and muscle contraction.
+ Acid/alkaline Balance: Sodium helps regulate the acid/alkaline balance (pH) in the blood and lymph fluids.
+ Cellular Permeability: Sodium helps control and operate the sodium/potassium pump. This helps make the cell walls porous and able for the transport of materials (like blood sugar, other minerals and vitamins, oxygen) across cell membranes.
+ Sodium helps regulate the transport and excretion of carbon dioxide (CO2).

Pages 317-324
SODIUM

Reference Values

Blood Sodium
(Measured in millimoles per liter = mmol/L)

| Normal Range (Adults) | 135 - 145 mmol/L |

Why is a Sodium blood level needed?
A sodium level is tested routinely as part of your comprehensive metabolic panel (CMP). A sodium level is important in evaluating heart, kidney, adrenal gland, muscle, and digestive system balance.

What Life Time Fitness Lab Tests Report a Sodium range?
- Men’s Core Health Profile
- Women’s Core Health Profile
- Men’s Longevity and Vitality Premium
- Women’s Longevity and Vitality Premium

What does a Low-sodium value mean?
A low level of sodium is also called hyponatremia. Low-sodium can be caused by starvation, chronic stress, excessive vomiting, severe diarrhea, and excess perspiration, in conjunction with a lack of water.

Symptoms of sodium deficiency include:
- Muscle weakness, cramps
- Diarrhea
- Fatigue
- Headaches
- Irregular heartbeat (arrhythmia)
- Low blood pressure
- Poor concentration, confusion
- Memory loss
- Dehydration
- Loss of appetite

Sodium deficiency is rare in humans. The following drugs can cause a depletion of sodium, which may increase an individual’s need for sodium:
- ACE inhibitors, including lisinopril (Zestril, Prinivil), captopril (Capoten), benazepril (Lotensin) and enalapril (Vasotec)
- Salicylates, including aspirin
- Loop Diuretics, including furosemide (Lasix)
+ Thiazide Diuretics, including hydrochlorothiazide
+ Colchicine

What are steps you can take for a Low-sodium value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations
+ Table salt is the most concentrated source of sodium. Protein foods generally contain more sodium than vegetables and grains. Fruits contain almost no sodium.
+ Decrease potassium-containing foods, like bananas, raisins, prunes, apricots, dates, dairy (milk, cheese, yogurt), strawberries, watermelon, citrus fruits, juices (including tomato, orange, grapefruit), spinach, greens, mushrooms (especially portabella), soy products, pumpkin, nuts (pistachio, almonds, peanuts), beets, beans, turkey, fish (such as salmon and cod) and beef.
+ Foods low in potassium include apples, grapes, lemon, blueberries, carrots, and cruciferous vegetables (cabbage, broccoli, cauliflower)
+ Eat meals at regular times each day. It’s best not to eat after 7 pm.
+ Remember to chew your food. Saliva begins the process of digestion — it tells your stomach that food is coming. Chewing your food thoroughly, rather than bolting it, is the first step in healthy digestion.
+ Increase your intake of lean, high-quality proteins in the diet, including fish, turkey, bison and ostrich.
+ Avoid animal protein that has been raised with hormones whenever possible. Chicken should also be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation and help your hormone receptors to function appropriately.
+ You can increase your protein also by using a protein supplement. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries or other fruit in a blender with almond milk or quality water.
+ Limit alcohol consumption, especially beer.
+ Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours.¹⁵⁹⁶
+ Decrease your exercise level if you are overdoing it. Sodium loss in over-training is common.
+ If you are sweating a lot, use electrolyte replacement drinks. However, you have to watch the sugar content and the chemical preservatives and sweeteners in these.
## Supportive Supplements

<table>
<thead>
<tr>
<th>Product</th>
<th>Dosage/Usage</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **Life Time Fitness FastFuel Complete**                | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage         | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function[^1596,1597]  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Life Time Fitness Creatine**                         | 10gm daily in divided doses for 1 week, then 5gm daily                      | + Promotes protein synthesis and enhances muscle mass  
+ Important in exercise and fitness performance[^1598]                                                                                                           |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner.       | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.[^1599]                                           |
| **Life Time Fitness Peak Performance Whey Protein Isolate** | 2 scoops in favorite beverage, mix and drink daily                         | + Easily digestible, high-quality protein source[^1600]  
+ Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH).[^1601]  
+ Provides 22gm protein per 2 scoops (30gm)                                                                                                                     |
| **Multi-Probiotic 4000**                               | 1 capsule, 1-3 times daily                                                   | + Supports gastrointestinal health[^1602]  
+ Supports vitamin B and K metabolism[^1603]  
+ Helps improve absorption of nutrients from foods                                                                                                              |
**Relora Plex**

* Use if stress is present

| 2 capsules, 1-2 times daily |

+ Relora® is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (Magnolia officinalis) and Phellodendron bark (Phelodendron amurense).
+ Relora Plex also contains B-vitamins, which help in stress and nervous system balance
+ Useful in stress and decreasing cortisol levels
+ Relora can increase salivary DHEA and decreases salivary morning cortisol levels
+ Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals.

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**What does a high Sodium value mean?**

High sodium levels are also called hyponatremia. Higher levels are far more common than lower levels, again, largely because of diet. A high sodium level is related to increased blood pressure (hypertension) and an increase in heart related problems including stroke. An elevated blood pressure reading is generally considered to be greater than 120/80 mmHg.

Some causes of high sodium levels include:

+ Dehydration
+ Heart problems
+ Too much salt in the diet
+ Vomiting/diarrhea
+ Thyroid imbalances
+ Kidney problems
+ Chronic Stress

Symptoms of high sodium levels include:

+ Weight gain
+ Confusion
+ Thirst
+ Dry lips, mouth and eyes
+ Low-calcium and potassium levels
+ Mood swings
+ Restlessness
+ Fluid build-up (edema)
+ High blood pressure
What are steps you can take for a high Sodium level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ According to the Food and Nutrition Board, a daily sodium intake of less than 2400 mg per is recommended for adults.
+ Lose weight. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.
+ A DASH diet is recommended. The DASH (Dietary Approaches to Stop Hypertension) trial found that a diet emphasizing fruits, vegetables, whole grains, poultry, fish, nuts, and low-fat dairy products substantially lowered blood pressure in those with elevated levels.\textsuperscript{1608}
+ Salt substitutes contain potassium, but they can lead to iodine deficiency. Make sure the salt substitute has iodine added.
+ Avoid foods high in sodium, like pre-packaged foods, fast foods, smoked and pickled foods, canned meats, lunchmeats and chips.
+ Low-sodium foods are eggplant, tomatoes, peanuts, onions, mushrooms, garlic, raisins and artichokes.
+ Avoid prepackaged dinners and smoked, pickled or cured meats like jerky, hot dogs, ham and canned meats – they are high in sodium.
+ Avoid the fast foods, since they are very high in sodium.
+ Limit snack foods like chips and pretzels; eat unsalted nuts or unsalted popcorn.
+ Do not drink soft drinks or sodas. Soft drinks generally not only have high sodium levels, but also they are sweetened with high fructose corn syrup or artificial sweeteners.
+ Increase potassium and calcium rich foods, like leafy vegetables, such as broccoli, kale, collards and turnip greens, nuts (unsalted), sweet potatoes, fruits like apricots or figs (bananas are really high in sugar, so stay away from them if possible).
+ Minimize the amount of cheese you eat (Monterey, mozzarella and ricotta are Low-salt cheeses).
+ Read labels carefully; look for the sodium content expressed in milligrams that is listed on the Nutrition Facts label.
+ Focus on buying low-sodium foods that have 140 milligrams or less of sodium per serving and make these your staples.
+ Increase foods that help detoxify the kidneys, including asparagus, artichoke, melons, parsley.
+ Increase water intake – stay hydrated; a minimum of 2 liters of filtered water daily is recommended.
+ Drink green tea daily instead of coffee.
+ Exercise appropriately, 30 minutes daily at least 3 times a week. Swimming, yoga and dancing are also good activities to help decrease stress.
+ Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours.\textsuperscript{1609}
## Supplements

<table>
<thead>
<tr>
<th>Product Name</th>
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<th>Description</th>
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| **Life Time Fitness FastFuel Complete**           | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage                       | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
  + Helps support digestive function \(^{1610,1611}\)  
  + If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner.                      | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism. \(^{1612}\) |
| **Life Time Fitness Peak Performance Whey Protein Isolate** | 2 scoops in favorite beverage, mix and drink daily                                           | + Easily digestible, high-quality protein source \(^{1613}\)  
  + Whey protein also is an antioxidant by helping to raise the levels of the glutathione (GSH). \(^{1614}\)  
  + Provides 22gm protein per 2 scoops (30gm) |
| **Multi-Probiotic 4000**                         | 1 capsule, 1-3 times daily                                                                  | + Supports gastrointestinal health \(^{1616}\)  
  + Supports vitamin B and K metabolism \(^{1617}\)  
  + Helps improve absorption of nutrients from foods |
| **Ultra-D Tox**                                   | 1-2 capsules 2 times daily; use for 2-3 weeks                                              | + Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C.  
  + Helps support digestive function |
| **Ubiquinol-QH**                                  | 1 capsule (100mg) daily                                                                     | + Highly absorbable coenzyme Q10 (CoQ10)  
  + Necessary for cellular energy and important in heart protection  
  + Reported to lower blood pressure. \(^{1617}\) |
| **Life Time Fitness LeanSource™ Weight Loss** | 4 capliques daily, 2 with breakfast and 2 with dinner | + LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat - all promoting and sustaining weight loss. + LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements. 1618,1619 |

* Use if BMI 25 or >
TESTOSTERONE

Testosterone is a steroid hormone derived from cholesterol and produced in the male testes. Testosterone is known as an androgen, or male hormone. Its production is stimulated and controlled by luteinizing hormone (LH) made in the pituitary gland located in the brain – the more LH, the more testosterone. Testosterone is also produced in smaller amounts by the adrenal glands in both males and females, and in the ovaries of females. In males, testosterone stimulates development of secondary sex characteristics, including enlargement of the penis, growth of body hair, muscle development, and a deepening voice, and is present in large amounts in males during puberty and in adult males to regulate the sex drive and maintain muscle mass. In women, testosterone is converted to estradiol, the main sex hormone in females. Testosterone in women is important for bone strength, development of lean muscle mass and strength and libido.

The effects of the sex hormone testosterone on the prostate in men are mainly due to DHT, the active metabolite of testosterone produced by the action of an enzyme called 5-alpha reductase type II. 5-alpha reductase type I is the predominant enzyme in the skin, and is responsible for the local action of DHT on hair follicles which can lead to male pattern baldness. Androgens circulate in the blood bound to proteins, especially sex hormone binding globulin (SHBG) and albumin. A trace amount of these steroids circulate in the unbound form in the blood and are referred to as free testosterone. This is the active form.

Pages 325-334
## TESTOSTERONE

### Reference Values

**Free Testosterone**  
*Blood (in picograms per milliliter = pg/ml)*

#### Normal Range (Men):

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Normal Range (Men)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages 20 - 29</td>
<td>9.3 – 26.5 pg/ml</td>
</tr>
<tr>
<td>Ages 30 - 39</td>
<td>8.7 – 25.1 pg/ml</td>
</tr>
<tr>
<td>Ages 40 - 49</td>
<td>6.8 – 21.5 pg/ml</td>
</tr>
<tr>
<td>Ages 50 - 59</td>
<td>7.2 – 24.0 pg/ml</td>
</tr>
<tr>
<td>Ages &gt;59</td>
<td>6.6 – 18.1 pg/ml</td>
</tr>
</tbody>
</table>

#### Normal Range (Women):

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Normal Range (Women)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages 20 - 59</td>
<td>0.0 – 2.2 pg/ml</td>
</tr>
<tr>
<td>Ages &gt;59</td>
<td>0.0 – 1.8 pg/ml</td>
</tr>
</tbody>
</table>

**Total Testosterone**  
*Blood (in nanograms per deciliter = ng/dL)*

#### Normal Range (Men):

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Normal Range (Men)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages 13 - 17</td>
<td>28 – 1110 ng/dL</td>
</tr>
<tr>
<td>Adult</td>
<td>280 – 800 ng/dl</td>
</tr>
</tbody>
</table>

#### Normal Range (Women):

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Normal Range (Women)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult</td>
<td>6 – 82 ng/dl</td>
</tr>
</tbody>
</table>

### Why is a Testosterone level needed?

Testosterone occurs in the blood as bound and free. Bound testosterone is linked to a protein, either sex hormone binding globulin (SHBG) or albumin. Free, or circulating, testosterone is unattached to blood proteins and are available for use by the body. A total blood testosterone level measures the bound and free testosterone. The purpose of a free testosterone level (in saliva) is to correct the total testosterone level for the effect of the binding by SHBG. Men’s testosterone levels will be highest in the morning.

### What Life Time Fitness Lab Tests Report a Testosterone value?

+ Men’s Sex Hormone Profile  
+ Men’s Sex Hormone Premium Profile
What does a low Testosterone value mean?

The aging process naturally lowers testosterone levels in men (called andropause, or male menopause) and women. Testosterone is made from DHEA (dehydroepiandosterone), a steroid hormone precursor. Recent studies have found that by age 35 as many as 25% of males will have lowered testosterone levels. Low testosterone levels have been reported in as many as 38.7% of men over 45 years. This decline in male sex hormones and associated hormonal imbalances can play a role in developing insulin resistance and diabetes, thyroid imbalances, heart conditions, Alzheimer’s disease, osteoporosis, immune problems and even cancer. A study found that lower testosterone levels, even in the low normal range, increase the risk of developing heart problems. Another study found a link between low levels of testosterone and increased risk for mortality (death) from all causes in adult men of all ages. A low testosterone level in men may also lead to a decreased sex drive and erectile dysfunction, lack of concentration, decreased sperm count, bone loss and loss of muscle mass.

As men age, their testosterone becomes further broken down to dihydrotestosterone (DHT) by the enzyme 5-alpha reductase. Studies have found that men with low circulating testosterone have higher levels of DHT, which can lead to male pattern baldness and an increase in the risk of developing prostate problems, weight gain and other metabolic imbalances including high cholesterol and triglyceride levels, weight gain, high blood pressure, insulin resistance and blood sugar imbalances. Some men genetically make more DHT, which leads to male pattern baldness and prostate inflammation (hyperplasia). What makes matters worse is that the testosterone that doesn’t get turned into DHT is available to be converted to estradiol by the enzyme, aromatase. High levels of estrogen in men can cause reduced levels of testosterone, an increase in SHBG (which binds the free, active testosterone), fatigue, loss of muscle tone, increased body fat, loss of libido and sexual function and an enlarged prostate. As men age, their available free testosterone is bound by sex hormone binding globulin (SHBG). This leads to increases in insulin resistance, and that triggers obesity—most commonly seen as a “pot belly.” In men, too little testosterone has been linked to insulin resistance and vitamin D deficiency.

Other factors like stress, smoking, and excess alcohol intake can also lower testosterone concentrations. Stress and the release of the stress hormone cortisol is a major contributor to a decline in testosterone. Sleep disturbances can disrupt the normal testosterone rhythm in men. Low testosterone has also been linked to osteoporosis. Two out of ten cases of osteoporosis are now in men. Finally, low testosterone can lead to memory and cognitive problems.

Medications that can decrease testosterone levels include:

- Leuprolide (Lupron Depot)
- Flutamide (Eulixin)
- Nilutamide (Anandron)
- Spironolactone (Aldactone)
- Finasteride (Propecia)
- Dutasteride (Avodart)
- Minoxidil (Rogaine)
- Corticosteroids, including prednisone, methylprednisolone and hydrocortisone
- Oral contraceptives

The testosterone levels of women tend to decline with age also. During perimenopause and menopause, a decline in the production of testosterone occurs in most women. A hysterectomy can lead to a decline in testosterone.
also. Testosterone deficiency may also be a key factor for heart problems in aging women or women who have had hysterectomies, and increase the risk of breast conditions such as cancer. Symptoms of low testosterone in women include less energy, brittle hair, less bone and muscle strength, immune imbalances, weight gain and a diminished sexual drive.

What are steps you can take for a Testosterone level?

**General Dietary and Lifestyle Recommendations**

+ Lose weight. If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.
+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are consumed in adequate amounts it lowers health risks, especially for heart disease, and new studies are suggesting that adequate intakes may even help prevent obesity.
+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day. Avoid heating the oil, but it’s great on salads and sprayed on foods.
+ Zinc is important for male reproductive health. Increase your zinc intake. The best dietary sources of zinc are lean meats, liver, eggs, and seafood (especially oysters, but make sure they are from a good source). Whole grain breads and cereals are also good sources of zinc, but limit your carbohydrate intake as this can lead to insulin resistance, blood sugar imbalances and weight gain.
+ Selenium is important for male reproductive health. Increase foods that contain selenium, including seafood, garlic, liver, eggs, dairy products, and some vegetables including cabbage, celery, cucumbers, and radishes. Brazil nuts have the highest amount of selenium. Food processing causes substantial loss of selenium. For example, whole wheat bread has twice the selenium as white bread, and brown rice has 15 times more selenium than white rice. Human breast milk contains six times more selenium than cow's milk. A cow’s milk diet for infants can contribute to low selenium levels and depressed immune systems in infants.
+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible.
+ High-fiber foods, including flax, fresh vegetables, and beans should be part of the diet. These foods should supply the 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar. High-fiber foods help with hormonal balance. Dietary fiber also decreases the conversion of testosterone into estrogens in fat and breast cells.
+ Limit soy consumption, like tofu and soymilk. An increase in soy consumption has been found to lower testosterone in men.
+ On the other hand, over-consumption of simple carbohydrates like refined sugars and grains, causes unfriendly flora to grow in the GI tract. These foods also raise blood glucose and insulin levels, resulting in adverse influences on sex hormone balance.
+ Diets low in protein in elderly men may lead to elevated SHBG levels and decreased testosterone bioactivity, leading to metabolic imbalances.\textsuperscript{1644} You may want to consider adding a protein drink to your diet.

+ Avoid animal protein that has been raised with hormones whenever possible. Chicken should also be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your hormone receptors to function appropriately.

+ There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana, or other fruit in a blender with rice milk or quality water.

+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.

+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance hormone levels.\textsuperscript{1645}

+ Do not microwave food in plastic containers or covered in plastic.

+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates.

+ Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours.\textsuperscript{1646} Reduced sleep can lower testosterone production, and negatively affect other hormones like thyroid hormone.\textsuperscript{1647}

+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended. Exercise can help improve testosterone levels.\textsuperscript{1648}

+ Stop smoking. Hormone levels are influenced by tobacco smoke.\textsuperscript{1649}

+ Drink alcohol in moderation.

### Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage</th>
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</tr>
</thead>
<tbody>
<tr>
<td>DHEA (dehyroepiandosterone)</td>
<td>5 - 50mg daily; depending upon laboratory results</td>
<td>+ Supports DHEA and testosterone levels</td>
</tr>
<tr>
<td>DIM</td>
<td>2 capsules daily</td>
<td>+ DIM\textsuperscript{TM} is a synergistic combination of plant based ingredients including diindolylmethane, curcumin, green tea, and wasabia, which helps support healthy hormone balance by improving estrogen metabolism.\textsuperscript{1650}</td>
</tr>
</tbody>
</table>
| **Life Time Fitness FastFuel Complete** | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function\(^{1651,1652}\)  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
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| **Life Time Fitness Omega-3 Fish Oil** | 1-2 capsules, 2 times daily | + Helps decrease inflammation and the consequences it has on your metabolism.\(^{1654}\)  
+ Helps support heart and blood vessel health.\(^{1655,1656}\)  
+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction.\(^{1657}\) |
| **Multi-Probiotic 4000** | 1 capsule, 1-3 times daily | + Supports gastrointestinal health\(^{1658}\)  
+ Supports vitamin B and K metabolism\(^{1659}\)  
+ Helps improve absorption of nutrients from foods  
+ Helps decrease inflammation including CRP levels\(^{1660}\) |
<table>
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<tr>
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<th>Dosage</th>
<th>Notes</th>
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| Relora Plex       | 2 capsules, 1-2 times daily| + Relora® is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (Magnolia officinalis) and Phellodendron bark (Phelodendron amurense).  
+ Relora Plex also contains B-vitamins, which help in stress and nervous system balance  
+ Useful in stress and decreasing cortisol levels Relora can increase salivary DHEA and decreases salivary morning cortisol levels, which can both help balance DHT and testosterone.  
+ Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals. |
| Testo-Gain        | 1 capsule 2 times daily with food | + Testo-Gain™ is a synergistic combination of phytoandrogens, androgenic adaptogens & other herbs designed to help promote optimal testosterone function. |
| Vitamin D 1000    | + 1-5 capsules (1,000 – 5,000 IU) daily, depending on vitamin D3 lab value  
+ If lab value 30 ng/ml or less, then take 5,000 IU daily; if 30-40 ng/ml, then take 1,000 IU daily both in addition to your multivit; retest in a month | + Bone support  
+ Treatment of vitamin D deficiency improves bone mineral density |
Life Time Fitness
LeanSource™ Weight Loss

* Use if BMI 25 or >

| 4 capliques daily, 2 with breakfast and 2 with dinner | + LeanSource™ is composed of dietary supplements that help balance insulin resistance and blood sugar levels, reduce cravings, balance neurochemistry, help the body adapt to stress, increase energy and help increase thermogenesis to burn fat - all promoting and sustaining weight loss. + LeanSource™ contains a thermogenic blend of green tea, conjugated linoleic acid (CLA), capsaicinoids from Cayenne pepper, Evodia and a supportive supplements 1665,1666 |

What does a high Testosterone value mean?
High levels of testosterone in men are usually seen in athletes or those who use testosterone (steroid) hormones. Symptoms of high testosterone in men include:

- Acne
- Aggressive Behavior
- Heart Damage
- Impotence
- Insomnia
- Liver Problems
- Low Sperm Count
- Shrinking Testicles

High testosterone in women can lead to hormonal imbalances, including estrogen deficiency. High testosterone levels in women can lead to male pattern hair growth (hirsutism), especially on the face and chest. Other problems with high testosterone levels in women include increased libido, increased muscle mass, redistribution of body fat, enlargement of the clitoris, deepening of the voice, male pattern baldness and/or increased perspiration. Obesity and high testosterone in women are key features of polycystic ovary syndrome (PCOS).

High DHEA levels can signal hormonal imbalances due to adrenal gland problems. In women, overproduction of DHEA can increase testosterone levels and cause menstruation to stop. High DHEA can lead to development of male characteristics, including excessive facial or body hair, male pattern baldness, muscleOther problems with high testosterone levels in women include increased libido, increased muscle mass, redistribution of body fat, enlargement of the clitoris, deepening of the voice, male pattern baldness and/or increased perspiration. Obesity and high testosterone in women are key features of polycystic ovary syndrome (PCOS).

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Medications that can increase testosterone levels include:
- Drugs for erectile dysfunction, including sildenafil (Viagra), tadalafil (Cialis), vardenafil (Levitra)
- Androgen replacement therapy, including testosterone
- Estrogen therapy
- Anticonvulsants
- Barbiturates
What are steps you can take for a high Testosterone level?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.

+ For women, increase soy consumption, like tofu and soymilk, if there is no allergy. An increase in soy consumption has been found to lower testosterone.\(^{1670}\)

+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are consumed in adequate amounts it lowers health risks, especially for heart disease, and new studies are suggesting that adequate intakes may even help prevent obesity.\(^{1671,1672}\)

+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day. Avoid heating the oil, but it’s great on salads and sprayed on foods.

+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.

+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible.

+ High-fiber foods, including flax, fresh vegetables, and beans should be part of the diet. These foods should supply the 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar. High-fiber foods help with hormonal balance.\(^{1673}\) Such foods also provide important benefits, such as antioxidant vitamins, minerals, and phytochemicals. Make sure to include green, orange, and yellow fruits and vegetables - such as broccoli, carrots, cantaloupe, and citrus fruits. The antioxidants and other nutrients in these foods may help balance hormone levels.\(^{1674}\)

+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal.

+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.\(^{1675}\)

+ Do not microwave food in plastic containers or covered in plastic.

+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates.

+ Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours.\(^{1676}\)

+ Exercise in moderation.

+ Decrease stress – take a walk, garden, do Yoga or Tai Chi.

+ Stop smoking. Hormone levels are influenced by tobacco smoke.\(^{1677}\)

+ Drink alcohol in moderation.
<table>
<thead>
<tr>
<th><strong>Supplements</strong></th>
<th></th>
</tr>
</thead>
</table>
| **Saw palmetto MAX-5**  
* For men | For men: 160mg 2 times daily, standardized to 30% fatty acids  
+ Used for prostate problems  
+ Studies indicate that saw palmetto may be able to inhibit the conversion of testosterone to its more active and potentially damaging form, dihydrotestosterone (DHT), via inhibition of alpha-5-reductase.\(^{1678}\) |
| **Life Time Fitness FastFuel Complete** | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage  
+ Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function\(^{1679,1680}\)  
+ If gas or bloating occurs, change to l-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner.  
+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.\(^{1681}\) |
| **Life Time Fitness Omega-3 Fish Oil** | 1-2 capsules, 2 times daily  
+ Helps decrease inflammation and the consequences it has on your metabolism.\(^{1682}\)  
+ Helps support heart and blood vessel health.\(^{1683,1684}\)  
+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction.\(^{1685}\) |
| **Multi-Probiotic 4000** | 1 capsule, 1-3 times daily  
+ Supports gastrointestinal health\(^{1686}\)  
+ Supports vitamin B and K metabolism\(^{1687}\)  
+ Helps improve absorption of nutrients from foods  
+ Helps decrease inflammation and improve hormone levels\(^{1688}\) |
The thyroid gland plays an enormous role in weight control. This tiny gland in your neck produces the thyroid hormones that set the basal metabolic rate of the body. Thyroid hormones regulate how each cell converts calories from food or stored fat into energy. When thyroid hormone production is impaired or interfered with, it limits energy production. That's why fatigue is the primary symptom of thyroid insufficiency, with weight gain quickly following. Estimates are that as many as 1 in 10 people suffer from some type of thyroid disorder. Hypothyroidism (low thyroid) is by far the most common. In fact hypothyroidism is second only to diabetes as the most common endocrine disorder.

Thyroid hormones are made under the direction of the hypothalamus and the pituitary gland in the brain. Initially, the hypothalamus responds to a metabolic change, such as low body temperature, by releasing thyrotropin releasing factor (TRF), which then signals the anterior pituitary gland to release thyroid stimulating hormone (TSH.) TSH stimulates the thyroid gland to then make thyroid hormone by using iodine (which the thyroid gland captures from the bloodstream and stores for ready use when needed) and tyrosine, an amino acid we obtain from proteins in our diet.

The thyroid produces and secretes three major hormones: thyroxine (T4), triiodothyronine (T3) and calcitonin. Calcitonin is important in calcium and phosphorus levels. Thyroid hormones influence almost every cell of the body. The thyroid gland has a crucial role in metabolism, fat burning, and oxygen utilization, as well as gastrointestinal and neuromuscular function.

T4 is the primary thyroid hormone produced in the thyroid gland; it is made when four molecules of iodine combine with the amino acid tyrosine. T4 circulates in the blood in two forms: (1) T4 bound to proteins, which prevents the T4 from entering the tissues that need thyroid hormone and (2) free T4, which does enter the target tissues and causes an effect. The free T4 component is the most important to determine how the thyroid is functioning. The amount of TSH that the pituitary produces and lets into the bloodstream depends on the amount of T4 in the body. If there is little T4 in the blood, then the pituitary produces more TSH to let the thyroid know to produce more T4. Once the T4 levels go up, then the pituitary decreases production of TSH.

Triiodothyronine, or T3, is made with 3 molecules of iodine and tyrosine. As they are made, they are released into the bloodstream and circulate throughout the body getting delivered to the cells. A small amount of T3 is made directly in the thyroid, but the majority is made in other tissues of the body, where specific enzymes (called diodinase enzymes) remove one molecule of iodine from circulating T4. To exert its effects, T4 is converted to triiodothyronine (T3) by the removal of an iodine atom. This occurs mainly in the liver and in certain tissues where T3 acts, such as in the brain.
**THYROID PROFILES**

### Reference Values

<table>
<thead>
<tr>
<th>Test Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>Serum T4, total bound and free (Thyroxine)</td>
<td>T4</td>
</tr>
<tr>
<td>Free T4 (Thyroxine); &gt; 19yrs</td>
<td>FT4</td>
</tr>
<tr>
<td>Serum T3, total bound and free (Triiodothyronine); &gt; 10yrs</td>
<td>T3</td>
</tr>
<tr>
<td>Free T3 (Triiodothyronine); &gt; 19yrs</td>
<td>FT3</td>
</tr>
<tr>
<td>TSH (Thyrotropin stimulating hormone)</td>
<td>TSH</td>
</tr>
<tr>
<td>T3 Uptake (binding capacity of TBG)</td>
<td>T3RU</td>
</tr>
<tr>
<td>Thyroid Peroxidase Antibody; &gt; 19yrs</td>
<td>TPO</td>
</tr>
</tbody>
</table>

<table>
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<th>Test Description</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Serum T4, total bound and free (Thyroxine)</td>
<td>4.5 – 12.0 ug/dL (micrograms per deciliter)</td>
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<tr>
<td>Free T4 (Thyroxine); &gt; 19yrs</td>
<td>0.82 – 1.77 ng/dL (nanograms per deciliter)</td>
</tr>
<tr>
<td>Serum T3, total bound and free (Triiodothyronine); &gt; 10yrs</td>
<td>71 – 180 ng/dL (nanograms per deciliter)</td>
</tr>
<tr>
<td>Free T3 (Triiodothyronine); &gt; 19yrs</td>
<td>2.0 – 4.4 pg/mL (picograms per milliliter)</td>
</tr>
<tr>
<td>TSH (Thyrotropin stimulating hormone)</td>
<td>0.45 – 4.5 uIU/mL (micro International units per milliliter)</td>
</tr>
<tr>
<td>T3 Uptake (binding capacity of TBG)</td>
<td>24 – 39 %</td>
</tr>
<tr>
<td>Thyroid Peroxidase Antibody; &gt; 19yrs</td>
<td>0 – 34 IU/mL (International units per milliliter)</td>
</tr>
</tbody>
</table>

### Why is a Thyroid Panel needed?

Life Time Fitness tests for several components of the thyroid, including:

- Free T3
- Free T4
- TSH
- T3 uptake (T3RU)
- Total T4
- TPO

Thyroid hormones are the master hormones that make your metabolism function. They affect everything from stomach acid production to absorption of nutrients like magnesium, B6, B12, and folic acid to making serotonin receptors function properly in regulating mood and hunger. But most importantly, thyroid hormones drive energy production in every cell of your body. The thyroid hormone T3 is the key to the ignition switch that turns on the power-generating abilities of your cells.

Typically, doctors will test the Thyroid-Stimulating Hormone (TSH) and T4 levels, but fail to measure the hormone T3. It is incredibly important to know this number, because T3 is the active thyroid hormone, the one that actually attaches to the cells and drives your body’s energy production. Even if the other thyroid numbers are normal, this can still be low. Many practitioners are finding an alarming number of people with normal TSH and T4 who have low T3.
Components of the Life Time Fitness Thyroid Testing include:

+ T4, total (thyroxine): T4 converts to active T3. This is a measurement of the total amount of T4 you have in your blood stream and helps determine if a thyroid imbalance is present. A large portion of this total amount is bound by protein molecules and is unavailable for use by the body, which is why your free T4 should be measured as well.

+ Free T4 (free thyroxine): This is the thyroid hormone that is not bound to protein and can be converted to T3. Regular T4 can be normal, but if you don’t have adequate free T4, you do not have the form of the hormone that can become active. It is quite possible to have adequate T4 and normal (typically at the upper end of the normal range) TSH readings but still have all the symptoms of low thyroid, including fatigue.

+ If you are suffering from fatigue, it is very important to test for Free T4 and Free T3.

+ Free T3 (triiodothyronine): It is very important to know this number because T3 is the active thyroid hormone, the one that actually attaches to the cells and drives your body’s energy production. Even if you have normal levels of Free T4, your levels of Free T3 may still be low if your body is not adequately converting Free T4 to Free T3. Minerals including magnesium, selenium, and iron are needed to help with the conversion of T4 to T3.

+ TSH (Thyroid Stimulating Hormone): A TSH level is used to evaluate the activity of the thyroid gland. TSH stimulates the thyroid gland to produce hormones. Imbalances in thyroid metabolism can alter the levels of TSH. A high TSH level can occur in thyroid disorders and if taking too little thyroid hormone as a prescription drug.

+ T3 uptake (T3RU): T3RU or T3 resin uptake helps determine how much thyroxin-binding globulin (TBG) is available in your bloodstream. TBG carries most of the T3 and T4 in the blood. The higher the level of TBG, the lower the value of T3RU.

+ Thyroid Peroxidase (TPO) Antibodies: Thyroid Peroxidase (TPO) is an enzyme normally found in the thyroid gland and it plays an important role in the conversion of T4 to T3 in the body. A thyroid antibody test measures the amount of TPO in the blood. A thyroid peroxidase test detects antibodies against TPO in the blood. Another test for antibodies associated with the thyroid is the antithyroglobulin Ab test. TPO antibodies can indicate thyroid tissue destruction, such as in autoimmune conditions like Hashimoto’s disease and thyroiditis.

Other components of thyroid testing (not in LabCorp Testing):

+ Thyroxine binding globulin (TBG) - TBG is a protein that binds thyroid hormones in circulation and carries them to their target tissues. A T3 uptake test (T3RU) can determine the level of TBG in the blood.

+ Reverse T3 - When the body is under stress, instead of converting T4 into the active T3, the body makes Reverse T3 (rT3) instead in order to conserve energy. RT3 is an inactive form of T3. rT3 has no effect on metabolism because it is biologically inactive.

What Life Time Fitness Lab Tests Report Thyroid values?

+ Energy and Metabolism Profile
+ Energy and Metabolism Premium Profile
+ Men’s Longevity and Vitality Profile
+ Men’s Longevity and Vitality Premium Profile
+ Women’s Longevity and Vitality Profile
+ Women’s Longevity and Vitality Premium Profile
What do low Thyroid Hormone values mean?

Estimates are that as many as 1 in 10 people suffer from some type of thyroid disorder. Hypothyroidism (low thyroid) is by far the most common.

Thyroid hormones tell the cells how fast to produce energy packets called adenosine triphosphate (ATP). When the thyroid hormones are balanced, there is plenty of energy available. When they are low, your energy production decreases, which can leave you feeling tired during the day and unable to sleep well at night. When T3 is low, you can’t burn glucose and fatty acids like you should, so the energy-producing organs in the cells (mitochondria) either get turned off or reduce their energy production. That means more calories are converted into and stored as fat.

Thyroid hormone imbalances can occur due to:

+ Chronic stress
+ Sleep disturbances
+ Sex hormone imbalances
+ Gastrointestinal imbalances
+ Obesity
+ Environmental toxicity, such as lead, mercury, phthalates, plastics and pesticides
+ Poor food choices, including high in refined sugar and simple carbohydrates and inflammatory foods like artificial colors, preservatives, sweeteners and high fructose corn syrup

Thyroid imbalances are often related to stress. The stress hormone cortisol can interfere with proper thyroid function. During times of chronic stress and the release of cortisol, thyroid hormones can become imbalanced, leading to a reduction in your ability to burn fuel by lowering metabolism as much as 40%.

Thyroid health and energy production also rely on a balanced endocrine (hormonal) system, which includes the sex hormones. Low thyroid function inhibits the production of pregnenolone, which is needed to make other sex hormones like progesterone, testosterone and estrogen. Low thyroid can down regulate sex hormone production, but the balance of sex hormones also influences thyroid hormone production. High levels of estrogen interfere with thyroid hormones, especially with the utilization of T3. It is important to consider the interplay of the thyroid gland during the menopausal years in women. Keep in mind that some symptoms associated with menopause are also symptoms of hypothyroidism, like depression, irritability, impaired memory or poor concentration, and insomnia. It is possible to alleviate these symptoms by addressing them as a thyroid issue before rushing to take prescription estrogen, which can lead to imbalances in metabolism.

An unhealthy digestive tract can also lead to low thyroid hormones from autoimmunity. Imbalances in the microflora of the gut (the good bacteria) can lead to overgrowth of the bacteria H. pylori in the gastrointestinal system and induce chronic inflammation and thyroid hormone imbalances. In addition, thyroid hormone production can suffer simply because a person is not getting enough of key nutrients that are needed for thyroid hormone production, like iodine, selenium and iron. Less energy also decreases the amount of acid in your stomach, leading to problems absorbing nutrients from foods. Food allergies from intestinal imbalances can also contribute to thyroid problems, as does an unhealthy diet.

And finally, there are several toxins in the environment, including heavy metals (like mercury, cadmium and lead), fluoride and chlorine in water, pesticides and chemicals (like plastics, perchlorates from jet fuel, food dyes, artificial sweeteners and preservatives) that are known to interfere with thyroid hormones.

Heavy metals may contribute to thyroid malignancies and interfere with the uptake of iodine by the thyroid cells. In one study, the thyroid glands of 135 patients and 65 control subjects were evaluated for concentrations of several
trace elements.\textsuperscript{1} It was found that mercury (along with cobalt, silver, and rubidium) was consistently higher in thyroid glands with cancerous nodules, while iodine concentrations were fifteen times lower. Lack of iodine can result in insufficient T4 production and hypothyroidism.

Many studies have explored the relationship between maternal iodine and thyroid hormone levels and the neurological development of the fetus. Maternal iodine deficiency and thyroid dysfunction, especially in the last trimester of pregnancy, is a serious threat to fetal brain development.\textsuperscript{2} A pregnant woman exposed to high levels of mercury, therefore, may be placing her unborn child at greater risk for congenital neurological defects.

Symptoms of low thyroid hormones include:

+ Fatigue
+ Weight gain
+ Constipation
+ Insulin resistance
+ Cholesterol and triglyceride imbalances
+ Decreased sex drive
+ Dry skin
+ Brittle nails
+ Thin hair and eyebrows
+ Feeling cold or having cold hands and feet
+ Mood swings and depression

But what if your thyroid hormone levels tested by your doctor are within normal values, but you still have symptoms of low thyroid? Remember, a good T4 level does not always mean the thyroid is functioning properly. A normal T4 value but symptoms of low thyroid can indicate a condition known as subclinical hypothyroidism.

Subclinical hypothyroidism is medically defined as the condition in which TSH is elevated but thyroid hormones are not low. It has virtually the same symptom profile as hypothyroidism, yet remains undiagnosed and untreated because blood tests are within normal clinical range. The problem may stem from the inability of target cells to convert T4 to T3. The negative feedback mechanism fails because serum T4 remains within normal limits. TSH is stimulated in response to drops in serum T4, not T3. A person who cannot make T3, the active thyroid hormone, may experience as much as a 40% drop in metabolism, or basal metabolic rate. On the other hand, overproduction of thyroxine can increase the normal metabolic activity by 100%. It is estimated that 15 to 25 percent of the population, approximately 43 to 72 million Americans, has some degree of subclinical hypothyroidism.\textsuperscript{3} 

Drugs that can decrease T4 levels include:

+ Anabolic steroids (testosterone)
+ Anti-thyroid drugs (propylthiouracil and methimazole)
+ Interferon alpha
+ Interleukin-2
+ Lithium
+ Phenytoin (Dilantin)
Beta blockers, including propranolol (Inderal):

+ Drugs that can decrease T3 levels include:
  + Anabolic steroids (testosterone)
  + Anti-thyroid drugs (propylthiouracil and methimazole)
  + Lithium
  + Phenytoin (Dilantin)
  + Beta blockers, including propranolol (Inderal)

Drugs that can decrease T3RU values include:

+ Anti-thyroid drugs (propylthiouracil and methimazole)
+ Oral contraceptives (birth control pills)
+ Clofibrate (Atromid-S)
+ Estrogen
+ Thiazide diuretics, including hydrochlorothiazide
+ Opiates (morphine, oxycodone, Methadone)
+ Pregnancy can also decrease T3RU levels.

What are steps you can take for low Thyroid values?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Make sure to take a Life Time Fitness Men or Women’s AM/PM Multivitamin/mineral supplement daily.
+ Life Time Omega-3 fatty acid daily is also recommended.
+ Low thyroid can result in weight gain, constipation, anemia, poor utilization of essential fatty acids, and inadequate conversion of beta-carotene to vitamin A.\textsuperscript{1711}
+ Hypothyroidism is associated with a decreased production of hydrochloric acid (HCL) by the parietal cells of the stomach, thereby decreasing digestion and absorption of nutrients. HCL provides the proper pH environment for the digestion of proteins by the enzyme pepsin. With low HCL, the amino acid phenylalanine (from which tyrosine is derived) cannot be obtained from food, and tyrosine is unavailable in adequate amounts for the production of thyroxine (T4). Taking a digestive enzyme supplement is recommended.
+ Other nutrients that are found in low values with low thyroid hormone levels include iodine, chromium, selenium, zinc and tyrosine.
+ Iodized salt is the most common source of iodine in the United States. Iodine-rich foods include seafood, sea vegetables (seaweed, but make sure it’s tested for contaminants) and vegetables grown on iodine-rich soils.
+ Food allergies alone can cause fatigue, or they can contribute to autoimmune thyroiditis. Before you discount this idea too quickly as a possible cause of your fatigue, you should know that up to one in seven persons may be intolerant to gluten, a protein found in wheat, rye, and barley. And up to one in four people may be intolerant to lactose, a natural sugar found in cow’s milk.\textsuperscript{1712} There are seven foods that are reported to make up 90% of all food allergies: peanuts, tree nuts like walnuts or almonds, shellfish, soybeans, eggs, wheat, and cow’s milk.\textsuperscript{1713} Corn and tomatoes are other common allergenic foods. However, there are two other types of reactivity to foods. One is called food sensitivity (described below) and the other is called food intolerance.
Food intolerance is when a person is incapable of digesting or absorbing a certain substance like lactose or fructose.

+ Stay away from artificial sweeteners, like aspartame (Nutrasweet), sucralose (Splenda). Splenda contains a chlorine molecule that displaces iodine in the thyroid. Use stevia or if necessary, saccharine. Artificial sweeteners have been linked to loss of concentration, headaches, immune and thyroid imbalances, weight gain, blood sugar imbalances and even cancer.1714,1715

+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in cold-water fish like halibut and salmon, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are consumed in adequate amounts it lowers health risks, especially for heart disease, and new studies are suggesting that adequate intakes may even help prevent obesity.1716,1717

+ If you eat fish such as tuna, there may be a concern over heavy metal contamination. The Center of Science and the Public Interest (CSPI), a nutrition advocacy organization in Washington, D.C., issued a warning that pregnant women should not eat more than two 6-ounce servings of canned tuna per month since tuna contains high levels of mercury.1718 Avoid eating tuna more than once a month — especially fresh tuna steaks — in addition to other fish particularly high in mercury such as pike, swordfish, shark, and walleye.

+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day. Avoid heating the oil, but it's great on salads and sprayed on foods.

+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.

+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible.

+ Fresh vegetables provides antioxidant vitamins, minerals, and phytochemicals. Make sure to include green, orange, and yellow fruits and vegetables - such as broccoli, carrots, cantaloupe, and citrus fruits. The antioxidants and other nutrients in these foods may help balance inflammation and thyroid balance.1719

+ Avoid animal protein that has been raised with hormones whenever possible. Chicken should also be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your hormone receptors to function appropriately.

+ Studies report imbalances in thyroid hormone levels when you are overweight or obese.1720 If you are overweight or obese based on your BMI (body mass index), then we recommend Life Time Fitness LeanSource Weight Loss Supplement.

+ You may want to consider adding a protein drink to your diet. There are several kinds of protein drinks on the market, but many of these contain sugar and added chemical ingredients. Life Time Fitness Peak Performance Whey Protein Isolate is an excellent source of high-quality, easily digestible protein. You can mix the protein powder with a cup of fresh berries, a banana, or other fruit in a blender with rice milk or quality water.

+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.

+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance hormone levels.1721

+ Do not microwave food in plastic containers or covered in plastic.

+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates.

+ Don’t use heartburn medicines with calcium carbonate, like Tums. This can disrupt thyroid hormones.1722 Also, laxatives with aluminum in them can imbalance thyroid hormones.
+ Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours, suggesting that chronic insomnia is a disorder of sustained excitation of the body’s stress response system and lead to hormonal imbalances.

+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.

+ Stop smoking. Hormone levels are influenced by tobacco smoke.

+ Drink alcohol in moderation.

**Supportive Supplements**

<table>
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<tr>
<th>Supplement</th>
<th>Dose/Use</th>
<th>Additional Information</th>
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<tbody>
<tr>
<td><strong>DHEA (dehydroepiandrosterone)</strong></td>
<td>5 - 50mg daily; depending upon laboratory results</td>
<td>+ Supports DHEA and testosterone levels</td>
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<tr>
<td></td>
<td></td>
<td>+ Check lab values first</td>
</tr>
<tr>
<td><strong>Life Time Fitness FastFuel Complete</strong></td>
<td>4 scoops (approx. 65gm) in the morning as part of a healthy beverage</td>
<td>+ Contains whey protein concentrate &amp; isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Helps support digestive function</td>
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<tr>
<td></td>
<td></td>
<td>+ If gas or bloating occurs, change to l-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses.</td>
</tr>
<tr>
<td><strong>Life Time Fitness Men's or Women's Performance Daily Multivitamin AM/PM</strong></td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ Multivitamin/mineral supplement contains anti-inflammatory nutrients.</td>
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<tr>
<td></td>
<td></td>
<td>+ Low levels of B vitamins, especially B6 (pyridoxine), are reported to be correlated with increased levels of CRP.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Vitamin E is reported to decrease inflammatory markers like CRP.</td>
</tr>
<tr>
<td><strong>Life Time Fitness Omega-3 Fish Oil</strong></td>
<td>1-2 capsules, 2 times daily</td>
<td>+ Helps decrease inflammation and the consequences it has on your metabolism.</td>
</tr>
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<td>+ Helps support heart and blood vessel health.</td>
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<td>+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction.</td>
</tr>
</tbody>
</table>

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Better health & performance start here.
**Life Time Fitness Peak Performance Whey Protein Isolate**

| 2 scoops in favorite beverage, mix and drink daily | + Easily digestible, high-quality protein source\(^{1733}\)  
+ Whey protein also is an antioxidant by helping to raise the levels of the antioxidant glutathione (GSH)\(^{1734}\)  
+ Provides 22gm protein per 2 scoops (30gm) |

**Moducare**

| 2 capsules 2 times daily if thyroid antibodies are present | + Moducare™ is a proprietary extract of plant sterols and sterolins that helps balance the immune system and decreases autoimmune reactions. Moducare™ also helps balance thyroid function.\(^{1735}\) |

**Multi-Probiotic 4000**

| 1 capsule, 1-3 times daily | + Supports gastrointestinal health\(^{1736}\)  
+ Supports vitamin B and K metabolism\(^{1737}\)  
+ Helps improve absorption of nutrients from foods  
+ Helps decrease inflammation including CRP levels\(^{1738}\) |

**Thyro Mend**

| 1 capsule, 2 times daily with food | + Thyro-Mend™ is a proprietary combination of iodine from seaweeds and synergistic herbs that support thyroid function.  
+ Thyro-Mend™ helps maintain proper iodine levels necessary for an increase in thyroid hormone production.\(^{1739}\) |

**Tyrosine**

| 500-1000mg daily | + Provides the amino acid tyrosine, which is important in thyroid hormone production.\(^ {1740}\) |

**Vegetarian Enzyme**

| 1-2 tablets, 3 times daily 30 minutes before meals | + Vegetarian Enzyme™ contains a mixture of vegetable-source enzymes which help digest starches, proteins, fats, and cellulose. Vegetarian Enzyme™ is used after eating a meal to help support healthy digestion.\(^ {1741}\) |

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**What does a high Thyroid value mean?**

High thyroid hormone levels, called hyperthyroidism, may occur more frequently in women than men. The annual incidence of hyperthyroidism in the United States is about one per a thousand women.\(^ {1742}\)

Hyperthyroidism occurs when the thyroid gland produces too much thyroxine (T4), despite normal levels of TSH. Hyperthyroidism can lead to:
Hyperthyroidism denotes increased secretion of thyroid hormone from the thyroid gland, which leads to a clinical picture of thyrotoxicosis. The most common cause of hyperthyroidism is Graves’ disease, which accounts for 60% to 90% of cases. Graves’ disease results from the production of antibodies directed against the TSH receptor. These autoantibodies, referred to as thyroid-stimulating immunoglobulin (TSI), cause continual stimulation of the thyroid to produce thyroxine (T4) and triiodothyronine (T3).  

Mercury has been associated with elevated T3 and hyperthyroidism. In another study, direct administration of mercury chloride into the muscles of rabbits caused immediate elevation of T3 and a dramatic drop in T4.  

Pregnancy can elevate free T4 levels; TSH may also be slightly lower. Drugs that can increase T4 measurements include:
+ Oral contraceptives (Birth control pills)
+ Clofibrate (Atromid-S)
+ Estrogens
+ Opiates, including oxycodone, morphine and Methadone

Drugs that can increase T3 measurements include:
+ Oral contraceptives (Birth control pills)
+ Clofibrate (Atromid-S)
+ Estrogens
+ Opiates, including oxycodone, morphine and Methadone

In hyperthyroidism, T3RU values may be increased also, meaning less thyroxine-binding globulin (TBG) is available. Drugs that can increase T3RU values include:
+ Anabolic steroids, including testosterone
+ Phenytoin (Dilantin)
+ Salicylates (aspirin, high doses)
+ Warfarin (Coumadin)
+ Steroid hormones, including prednisone and cortisone
+ Valproic Acid (Depakote or Depakene)

**What are steps you can take for high Thyroid levels?**

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.
**General Dietary and Lifestyle Recommendations**

+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, vienneses, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.

+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are consumed in adequate amounts it lowers health risks, especially for heart disease, and new studies are suggesting that adequate intakes may even help prevent obesity.\(^\text{1746,1747}\)

+ The Center of Science and the Public Interest (CSPI), a nutrition advocacy organization in Washington, D.C., issued a warning that pregnant women should not eat more than two 6-ounce servings of canned tuna per month since tuna contains high levels of mercury.\(^\text{1748}\) Avoid eating tuna more than once a month - especially fresh tuna steaks — in addition to other fish particularly high in mercury, such as pike, swordfish, shark, and walleye.

+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day. Avoid heating the oil, but it’s great on salads and sprayed on foods.

+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.

+ The exposure to any pesticides or toxic substances that may be present in foods should be eliminated. Buy organic foods where possible.

+ High-fiber foods, including flax, fresh vegetables, and beans should be part of the diet. These foods should supply the 20-30 grams of dietary fiber needed each day, which slows the absorption of carbohydrates and decreases the effects on insulin and blood sugar. High-fiber foods help with hormonal balance.\(^\text{1749}\) Such foods also provide important benefits, such as antioxidant vitamins, minerals, and phytochemicals. Make sure to include green, orange, and yellow fruits and vegetables - such as broccoli, carrots, cantaloupe, and citrus fruits. The antioxidants and other nutrients in these foods may help balance hormone levels.\(^\text{1750}\)

+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which can imbalance hormone levels including the thyroid.\(^\text{1751,1752}\) Modifying the diet can help decrease physical and mental stress, helping balance metabolism.

+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.

+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.\(^\text{1753}\)

+ Do not microwave food in plastic containers or covered in plastic.

+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates.

+ Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours, suggesting that chronic insomnia is a disorder of sustained excitation of the body’s stress response system.\(^\text{1754}\)

+ Exercise in moderation.

+ Drink alcohol in moderation.
### Supplements

<table>
<thead>
<tr>
<th>Product</th>
<th>Dose</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **Life Time Fitness FastFuel Complete** | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfiber™ medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function[^1755][^1756]  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.[^1757] |
| **Life Time Fitness Omega-3 Fish Oil** | 1-2 capsules, 2 times daily | + Helps decrease inflammation and the consequences it has on your metabolism[^1758]  
+ Helps support heart and blood vessel health.[^1759][^1760]  
+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction.[^1761] |
| **Moducare** | 2 capsules 2 times daily if thyroid antibodies are present | + Moducare™ is a proprietary extract of plant sterols and sterolins that helps balance the immune system and decreases autoimmune reactions. Moducare™ also helps balance thyroid function.[^1762] |
| **Multi-Probiotic 4000** | 1 capsule, 1-3 times daily | + Supports gastrointestinal health[^1763]  
+ Supports vitamin B and K metabolism[^1764]  
+ Helps improve absorption of nutrients from foods  
+ Helps decrease inflammation and improve hormone levels[^1765] |

[^1755]: [Link](#)  
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[^1761]: [Link](#)  
[^1762]: [Link](#)  
[^1763]: [Link](#)  
[^1764]: [Link](#)  
[^1765]: [Link](#)
VITAMIN D

Vitamin D is a fat-soluble vitamin known as the “Sunshine vitamin.” Vitamin D is best known for its regulation, along with parathyroid hormone, of calcium and phosphorus metabolism. Vitamin D is primarily produced in the skin from 7-dehydrocholesterol through solar ultraviolet radiation. Additional sources include the diet and oral supplementation. Independent of source, all Vitamin D is converted in the liver to 25-hydroxyvitamin D, which is the major circulating form in the blood. The kidneys produce the final step to the active form 1,25-dihydroxyvitamin D. Most Vitamin D is stored in the body as the 25-hydroxyvitamin D (25-OH-D). Vitamin D receptors have been identified in virtually every tissue, including bone, kidney, skeletal, heart, adrenal, stomach, liver, skin, breast, pancreatic, immune, brain, prostate, ovaries, and testes.
VITAMIN D

Reference Values
(in nanograms per milliliter = ng/ml)

| Normal Range (Adults): | 10 - 55 ng/mL |

Why is a Vitamid Blood Level needed?
A vitamin D level is important to determine if you have low or high levels of vitamin D. Low levels of vitamin D are associated with an increased risk for nearly all major human health concerns, such as cancer, diabetes, autoimmune conditions, cardiovascular problems, and metabolic imbalances. Vitamin D is important for metabolism, including:

+ Bones and Teeth: Vitamin D is involved in both the formation (mineralization) of bone, as well as in the mobilization (de-mineralization) of bone. The most active form of vitamin D, 1,25-hydroxyvitamin D, requires the intestinal absorption of calcium and phosphorus, which are important for the development of bones and teeth. Vitamin D combined with calcium is reported to be more effective than calcium alone in preventing bone loss.
+ Cardiovascular system: Vitamin D is important in blood pressure regulation and blood vessel health.
+ Insulin regulation: Vitamin D is important in the secretion of insulin from the pancreas.
+ Immune System: The active form of vitamin D enhances the immune system by stimulating the activity of white blood cells called macrophages. Low vitamin D levels may lead to inflammation and increase the risk for developing autoimmune conditions such as Lupus and rheumatoid arthritis, inflammatory bowel conditions and cancer. Low levels of vitamin D in children may be linked to food allergies and intolerances, possibly due to impaired immune function and microflora (probiotic) imbalances in the digestive tract.
+ Mood and cognitive function: Vitamin D supplementation may help improve mood and mild to moderate depression in those with seasonal depression.
+ Both Vitamin D2 and D3 levels are checked to help form your vitamin D level.

What Life Time Fitness Lab Tests Report a Vitamin D range?
+ Comprehensive Vitamin D
+ Cardio Metabolic Risk Premium Profile
+ Men’s Longevity and Vitality Profile
+ Men’s Longevity and Vitality Premium Profile
+ Women’s Longevity and Vitality Profile
+ Women’s Longevity and Vitality Premium Profile

What does a low Vitamin D value mean?
Low levels of vitamin D can result from inadequate dietary intake, insufficient exposure to sunlight, which reduces the body’s synthesis of vitamin D, and kidney or liver imbalances, which inhibit the conversion of vitamin D to its metabolically active forms. Vitamin D does not occur in significant amounts in many foods but does occur in...
small and variable amounts in milk, butter, cream, egg yolks, and liver, with milk fortified with vitamin D being the major source of this nutrient in the United States. Although 1,25(OH)2 is the active form of vitamin D, when testing patients for vitamin D status, 1,25(OH)2 vitamin D is an expensive test and is not a good measure of vitamin D status.1779

Low levels of vitamin D is reported in a number of health problems including cardiovascular, insulin resistance and diabetes (both Type I and 2), auto-immune disorders, obesity, cancer and osteoporosis. It is estimated that 1 billion people worldwide have Vitamin D deficiency or insufficiency.1780 A large study that looked at school children and adolescents in the US found that approximately 50.8 million had low levels of vitamin D. 1781 Age, season, northern latitudes, liver and kidney function, obesity, poor dietary intake, dark skin tone and certain medications (corticosteroids, phenytoin) all contribute to low Vitamin D levels.1782

Vitamin D is deposited into fat stores, where it becomes less available for use in the body. This is a suggested mechanism leading to insulin resistance.1783 Vitamin D also helps improve immunity and has anti-inflammatory effects that may indirectly help improve insulin sensitivity.1784 Blood sugar control in people with type 2 diabetes has a seasonal variation, being worse in the winter, in part explained by variation in exposure to sunlight and vitamin D levels.1785 Research suggests that low levels of vitamin D may contribute to or be a cause of metabolic syndrome with associated hypertension, obesity, diabetes and heart disease.1786

In humans, low vitamin D has been strongly linked to heart and vascular problems including high blood pressure1787, blood vessel problems1788, atherosclerosis, heart attack and stroke.1789,1790,1791,1792 In addition, low Vitamin D is linked to death associated with heart problems.1793

Low levels of vitamin D can also lead to calcium, magnesium, iron and zinc deficiencies.1794 An estimated 10 million individuals in the US are estimated to already have osteoporosis and almost 34 million more are estimated to have low bone mass, placing an estimated 55% of Americans at an increased risk for osteoporosis.1795 Of the individuals with osteoporosis, approximately 80% are women and 20% are men. Vitamin D deficiency is linked to poor bone mineral density.1796 Vitamin D deficiency is prevalent in the US, 60% of nursing home residents and 57% of hospitalized patients being vitamin D deficient.1797,1798 Vitamin D supplementation has been reported to reduce bone fractures by at least 20% in individuals aged 65 and older.1799

Vitamin D supports production of estrogen in men and women.1800 PCOS (Polycystic Ovarian Syndrome) has been corrected by supplementation of D and calcium.24

Vitamin D plays a role in regulation of the immune system and chronic inflammation. Low vitamin D is associated with several autoimmune diseases including multiple sclerosis, Sjogren’s Syndrome, rheumatoid arthritis, thyroiditis and inflammatory bowel conditions.1801,1802 Low levels of vitamin D are also associated with chronic pain, such as fibromyalgia, chronic fatigue or peripheral neuropathy.1803

Low vitamin D levels are associated with mood disturbances and depression.1804 Activated vitamin D in the adrenal gland regulates tyrosine hydroxylase, an enzyme necessary for the production of brain neurochemicals, including dopamine, epinephrine and norepinephrine. Older adults with low levels of vitamin D appear more likely to experience declines in thinking, learning and memory. People with Parkinson’s and Alzheimer’s disease have been found to have lower levels of vitamin D.1805,1806

The following drugs can cause a depletion of vitamin D, which may increase an individual’s need for the vitamin:

+ Anticonvulsants including barbiturates, carbamazepine, fosphenytoin and phenytoin
+ Bile acid sequestrants including cholestyramine and colestipol
+ Corticosteroids
+ H-2 receptor antagonists including cimetidine, famotidine, nizatidine, and ranitidine
+ Isoniazid
What are steps you can take for a low Vitamin D value?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Take a separate vitamin D along with Life Time Fitness Men or Women’s Daily Performance Multivitamin AM/PM to ensure adequate intake. Vitamin D3 (cholecalciferol) is the best type of vitamin D to take. Generally recommended dosages, the DRI for vitamin D is 400 IU/day. However, experts at The Vitamin D Council recommend taking 1000-5,000 IU/day for healthy adults and teens.
+ Vitamin D does not occur in significant amounts in many foods. It occurs in small and highly variable amounts in butter, cream, egg yolks, and liver. Milk fortified with vitamin D is the major source of this nutrient in the United States. However, if you have an allergy to dairy, find other sources of vitamin D.
+ Increase your intake of cold-water fishes like salmon, herring, cod, and halibut. These not only contain high levels of vitamin D, they contain heart healthy omega-3 fatty acids.
+ Increase calcium-containing foods, such as green leafy vegetables and dairy products if you can tolerate dairy.
+ Increase intake of vitamin D containing foods such as milk and other dairy products. Snack on almonds or Brazil nuts.
+ Soft drinks, even artificially sweetened ones, contain high levels of phosphoric acid. Phosphoric acid in the drinks can deplete calcium from the body, leading to bone loss.1807
+ Trans fatty acids, found in margarine and shortenings used in most commercial baked goods, should be avoided. These fats can interfere with the enzyme systems the body uses to convert vitamin D in the liver.1808
+ Decrease caffeine intake. Caffeine has been reported to negatively affect vitamin D and bone formation.1809
  Caffeine is included in tea, coffee and chocolate.
+ Get out in the sun! Sunlight, specifically UV-B rays, stimulate the production of vitamin D. The current suggested exposure of hands, face and arms is 10-20 minutes, three times a week. However, this provides only 200-400 IU of vitamin D each time or an average of 100-200 IU per day during the summer months. Supplementing vitamin D3 along with safe sun exposure is best.
+ Because the body needs 30-60 minutes to absorb vitamin D from made from the sun, it is best to delay showering or bathing for one hour after exposure. Use cholesterol-containing skin oils and wear appropriate sun protection if you are fair skinned.
+ Vegetarian and vegan diets generally are poor sources of vitamin D. So are low-fat foods and diets.1810
+ Stop smoking.
+ Exercise appropriately, 30 minutes daily at least 3 times a week. Studies report that appropriate vitamin D levels are needed for exercise and muscle function.1811
  Physical activity and fitness may help reduce risk of osteoporosis and fracture and fall-related injuries in men and women.1812,1813,1814
  Studies have also reported that bone mineral density in postmenopausal women can be maintained or increased with therapeutic exercise.1815
  Increase weight-bearing exercises, which include walking, cycling and weight training. These exercises can help slow down bone loss or osteoporosis.1816
  Swimming, yoga and dancing are also good activities to help decrease stress.
In a study in elderly men and women, higher dietary protein intake was associated with a lower rate of age-related bone loss. However, an acidic diet, which includes one high in meats, may decrease bone density.

Fruit and vegetable intake was positively associated with bone density in a 1999 study in men and women.

### Supportive Supplements

| **Alpha lipoic acid** | 500mg 2 times daily | + Antioxidant\(^{1819}\)  
+ Helps improve energy production and regulate blood glucose levels\(^{1820}\) |
|-----------------------|---------------------|-------------------------------------------------|
| **Cal/Mag 1001**      | 1 tablet 2 times daily | + Bone support  
+ Contains highly absorbable calcium, magnesium, vitamin D3, vitamin C, boron and glutamic acid.  
+ A meta analysis of 29 randomized trials showed that supplementation with calcium and vitamin D3 reduces risk of bone fractures by 24% and significantly reduces loss of bone mass.\(^{1821}\) |
| **Dual-Source Chromium as chromium polynicotinate and chromium picolinate** | 1 capsule (300mcg chromium) daily | + Improves insulin regulation and glucose tolerance\(^{1822}\)  
+ Helps support serotonin levels \(^{1823}\) |
| **Life Time Fitness FastFuel Complete** | 4 scoops (approx. 65gm) in the morning as part of a healthy beverage | + Contains whey protein concentrate & isolate, Sunfibre\(^{TM}\) medium chain triglycerides, a proprietary digestive enzyme blend (consisting of amylase, lipase, protease), L-glutamine and a proprietary fruit and vegetable complex blend.  
+ Helps support digestive function\(^{1824,1825}\)  
+ If gas or bloating occurs, change to L-glutamine, 1-4 capsules (500mg – 2 grams) daily in divided doses. |
| **Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.\(^{1826}\) |
| **Multi-Probiotic 4000** | 1 capsule, 1-3 times daily | + Supports gastrointestinal health\(^{1827}\)  
+ Supports vitamin B and K metabolism\(^{1828}\)  
+ Helps improve absorption of nutrients from foods |
| Tyrosine        | 500-1000mg daily | + Amino acid  
+ Supports thyroid hormone metabolism  
+ Dairy products, meats, fish, wheat, oats contain tyrosine. |
|-----------------|-----------------|-----------------------------------------------|
| Vitamin D 1000  | + 1-5 capsules (1,000 – 5,000 IU) daily, depending on vitamin D3 lab value  
+ If lab value 30 ng/ml or less, then take 5,000 IU daily; if 30-40 ng/ml, then take 1,000 IU daily both in addition to your multivit; retest in a month | + Bone support  
+ Treatment of vitamin D deficiency improves bone mineral density |

**What does a high Vitamin D value mean?**

Vitamin D can be toxic. Excessive intake of this nutrient results in hypercalcemia, which causes calcium deposits in soft tissues such as kidneys, arteries, heart, ears, and lungs. Signs of vitamin D toxicity include headache, weakness, nausea and vomiting, and constipation.  

**What are steps you can take for a high Vitamin D level?**

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**

+ Increase fluid intake; drink at least 2 liters of filtered water daily
+ Substitute green tea for your morning coffee. Use organic green tea (sencha preferred). Steep 1-2 teaspoonfuls in a cup of hot water, strain, drink 2-3 times daily.
+ Decrease vitamin D intake, including dairy products.
+ Incorporate low-calcium foods into your diet, such as chicken, cottage cheese, pinto beans, eggplant, apples, beets, grapes, tomatoes, pineapple, strawberries, cantaloupe, asparagus.
+ Increase foods that help detoxify the kidneys, including asparagus, artichoke, melons, parsley
+ Stay out of the sun as much as possible; wear sunscreen (SPF 30 or higher) and cover exposed body parts until vitamin D levels return to normal.
## Supplements

| **Multi-Probiotic 4000** | 1 capsule, 1-3 times daily | + Supports gastrointestinal health[^1832]  
+ Supports vitamin B and K metabolism[^1833]  
+ Helps improve absorption of nutrients from foods |  |

| **Life Time Fitness Men's or Women's Performance Daily Multivitamin AM/PM** | 3 capsules in the morning after breakfast and 3 capsules with dinner. | + The Life Time Fitness Men's and Women's Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism[^1834] |  |

[^1832]: https://www.integrativehealthresources.com
[^1833]: https://www.integrativehealthresources.com
[^1834]: https://www.integrativehealthresources.com
WBC DIFFERENTIAL

WBC differential determines the level of white blood cells (WBCs) in the body. WBCs help the body fight illness or infection. WBCs are part of the immune system, and they recognize and fight things that are foreign to the body. There are 5 types of WBCs. A differential test determines the values for five types of white blood cells, also called leukocytes, that appear normally in the blood, including:

+ **Neutrophils** are the most common type of WBCs and serves as our first line of defense against infection. The typical response to infection, inflammation or serious injury is an increased production of neutrophils, and in extreme cases can be due to bone marrow disorders. Decreased neutrophil levels may be the result of severe infection or other conditions, such as responses to various medications, particularly chemotherapy.

+ **Eosinophils** are increased in response to allergic disorders, inflammation or infection. Decreased levels of eosinophils can occur as a result of infection. Decreases in eosinophil counts are associated with stress and medications that decrease WBC levels, including steroids and chemotherapy.

+ **Basophils** can increase due to chronic inflammation, the presence of a hypersensitivity reaction to food, radiation therapy or some cancers. Basophils can digest bacteria and other foreign bodies (phagocytosis) and also have some role in allergic reactions. Decreased basophil counts are associated with stress, allergic reactions, thyroid imbalances or medications like steroids.

+ **Lymphocytes** can increase in chronic inflammation, viral infections, radiation therapy or certain cancers. Decreased lymphocytes can lead to immune imbalances, including autoimmune conditions like Lupus. Decreased numbers of lymphocytes can be caused by immune deficiencies, kidney problems, some cancers and steroid drug use.

+ **Monocytes** respond to inflammation, infection and foreign bodies by ingesting and digesting the foreign material. Monocyte levels can increase in response to infection, chronic inflammation, and certain cancers. A decreased monocyte level can indicate immune imbalances, steroid use or bone marrow problems.
WBC DIFFERENTIAL

Reference Values
(in nanograms per milliliter = ng/ml)

Normal Values (Adults):

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>White Blood Cell Count (WBC)</td>
<td>4.0 - 10.5 x10^9/uL</td>
<td>Neutrophils</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40.0 - 74.0 %</td>
</tr>
<tr>
<td>Neutrophils, Absolute</td>
<td>1.8 - 7.8 x10^5/uL</td>
<td>Lymphocytes</td>
</tr>
<tr>
<td>Lymphocytes</td>
<td>14.0 - 46.0 %</td>
<td>Monocytes</td>
</tr>
<tr>
<td>Lymphocytes, Absolute</td>
<td>0.7 - 4.5 x10^5/uL</td>
<td>Eosinophils</td>
</tr>
<tr>
<td>Monocytes</td>
<td>4.0 - 13.0 %</td>
<td>Basophils</td>
</tr>
<tr>
<td>Monocytes, Absolute</td>
<td>0.1 - 1.0 x10^5/uL</td>
<td>0.0 - 0.4 x10^5/uL</td>
</tr>
<tr>
<td>Eosinophils</td>
<td>0.0 - 7.0 %</td>
<td>Basophils, Absolute</td>
</tr>
<tr>
<td>Basophils</td>
<td>0.0 - 3.0 %</td>
<td>0.0 - 0.2 x10^5/uL</td>
</tr>
</tbody>
</table>

Why is a WBC Differential level needed?

A WBC differential test is also called a white blood cell count differential or just differential. The differential test measures the percentage of each type of white blood cell (WBC) that you have in your blood to determine how the immune system is functioning. The test is performed as part of your complete blood count (CBC) and may be able to determine if you have immune imbalances, including infection and inflammation. The differential test can determine your body’s ability to fight and get rid of the cause of an infection, such as bacteria, parasites or a virus.

What Life Time Fitness Lab Tests Report a Differential value?

+ Men’s Core Health Profile
+ Women’s Core Health Profile
+ Men’s Longevity and Vitality Premium
+ Women’s Longevity and Vitality Premium

What does a low WBC Differential value mean?

A low WBC level is also called leukopenia. Each component in the WBC differential can be independently low. A low WBC differential reading can be due to an underactive immune system, allergies, chronic inflammation, and vitamin deficiencies, such as vitamin E, vitamin C, zinc, selenium, B vitamins. Low WBC levels can be caused by some viral infections (such as HIV), bone marrow problems or drugs like chemotherapy. Low basophils can indicate an allergic reaction. Medications that can decrease WBC levels:

+ Chemotherapy
+ Corticosteroids, including prednisone, cortisone, hydrocortisone
+ Antibiotics
+ Diuretics
+ Anticonvulsants
+ Antihistamines
+ Antithyroid drugs
+ Barbiturates
+ Sulfonamides, including Bactrim (sulfamethoxizole/trimethoprim)

What are steps you can take for low WBC Differential levels?

DISCLAIMER: Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

General Dietary and Lifestyle Recommendations

+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which can imbalance immunity.\textsuperscript{1835,1836} Modifying the diet can help decrease physical and mental stress, helping balance metabolism.
+ Avoid common food allergens, including wheat, dairy, soy.
+ When you eat foods, try to buy organic when possible. The use of chemical additives, hormones, pesticides and antibiotics in our food supply can lead to imbalances in the immune system. Foods that you should avoid include processed meats, frozen dinners, preserved meats like hot dogs or bacon, fast foods, artificial ingredients and sweeteners, anything with MSG or monosodium glutamate.
+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy. These foods can imbalance immunity.
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. Fatty acid balance improves immunity.\textsuperscript{1837}
+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day. Avoid heating the oil, but it’s great on salads and sprayed on foods.
+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ The exposure to pesticides, chemical additives, preservatives and heavy metals (like lead and mercury) in foods should be eliminated. These contaminants can lower your immunity.\textsuperscript{1838} Buy organic foods where possible.
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.
+ Limit drinking out of plastic containers. These may have chemical residues, including bisphenol A, that can imbalance immunity and metabolism.\textsuperscript{1839}
+ Do not microwave food in plastic containers or covered in plastic.
+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain chemical ingredients like phthalates.
+ Get adequate rest — about 7-8 hours of interrupted sleep a night for the average adult.
+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.
+ Decrease stress – take a walk, garden, do Yoga or Tai Chi.
+ Stop smoking.
+ Drink in moderation.

## Supportive Supplements

<table>
<thead>
<tr>
<th>Supplement</th>
<th>Dosage Details</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>L-glutamine</strong></td>
<td>500mg – 2 grams daily in divided doses</td>
<td>+ Gastrointestinal support&lt;br&gt;+ Supports digestive tract tissue and immune function&lt;sup&gt;1&lt;/sup&gt;&lt;sup&gt;840&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Life Time Fitness Men's or Women's Performance Daily Multivitamin AM/PM</strong></td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men's and Women's Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.&lt;sup&gt;1&lt;/sup&gt;&lt;sup&gt;841&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Life Time Fitness Omega-3 Fish Oil</strong></td>
<td>1-2 capsules, 2 times daily</td>
<td>+ Helps decrease inflammation and the consequences it has on your metabolism.&lt;sup&gt;1&lt;/sup&gt;&lt;sup&gt;842&lt;/sup&gt;&lt;br&gt;+ Helps support heart and blood vessel health and immunity.&lt;sup&gt;1&lt;/sup&gt;&lt;sup&gt;843, 844&lt;/sup&gt;&lt;br&gt;+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction.&lt;sup&gt;1&lt;/sup&gt;&lt;sup&gt;845&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Moducare</strong></td>
<td>1-2 capsules 2 times daily</td>
<td>+ Moducare™ is a proprietary extract of plant sterols and sterolins that helps balance the immune system and decreases autoimmune reactions. Moducare™ also helps balance thyroid function.&lt;sup&gt;1&lt;/sup&gt;&lt;sup&gt;846&lt;/sup&gt;</td>
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<td><strong>Multi-Probiotic 4000</strong></td>
<td>1 capsule, 1-3 times daily</td>
<td>+ Supports gastrointestinal health and immunity&lt;sup&gt;1&lt;/sup&gt;&lt;sup&gt;847&lt;/sup&gt;&lt;br&gt;+ Supports vitamin B and K metabolism&lt;sup&gt;1&lt;/sup&gt;&lt;sup&gt;848&lt;/sup&gt;&lt;br&gt;+ Helps improve absorption of nutrients from foods&lt;br&gt;+ Helps decrease inflammation including CRP levels&lt;sup&gt;1&lt;/sup&gt;&lt;sup&gt;849&lt;/sup&gt;</td>
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Ultra-D Tox
1-2 capsules 2 times daily; use for 2-3 weeks
+ Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C.
+ Helps support digestive function and detoxification processes

What does a high WBC Differential value mean?
A high WBC Differential is also called leukocytosis. Infections, stress, thyroid imbalances, inflammation or bone marrow problems can increase WBCs. Eating a large meal can also lead to WBC increases as can exercise. A high WBC differential means that some part of your immune system is activated. Drugs that can increase WBC levels include:
+ Allopurinol
+ Aspirin
+ Corticosteroids
+ Quinine
+ Triamterene

What are steps you can take for a high Differential level?

**DISCLAIMER:** Laboratory tests that are out of range should always be reviewed by a doctor and you should follow his/her recommendations.

**General Dietary and Lifestyle Recommendations**
+ Stay away from inflammatory foods, like high fructose corn syrup, fried foods, baked goods, refined sugar and carbohydrates, processed, preserved foods (like lunchmeats, wiener, fast foods), artificial sweeteners, dyes and chemical additives, saturated fats founds in fatty meats and dairy.
+ Avoid common food allergens, including wheat, dairy, soy. Food allergies can cause inflammation and raise WBC levels, which can lead to metabolic imbalances.¹⁸⁵⁰
+ Increase omega-3 fatty acids in foods. Omega-3 fatty acids are found in fish, walnuts, plant foods and wild game, which are well documented to have anti-inflammatory effects in the body. When omega-3 fats are consumed in adequate amounts it lowers health risks, especially for heart disease, and studies report it improves immunity.¹⁸⁵¹,¹⁸⁵²
+ Use healthy fats like olive oil, grapeseed oil, nuts and seeds, and organic butter. You can complement that with a little fruit and some beans and whole grains, but in most people these foods should be limited to 1 to 2 servings a day. Avoid heating the oil, but it’s great on salads and sprayed on foods.
+ Zinc is important for the immune system.¹⁸⁵３ Increase your zinc intake. The best dietary sources of zinc are lean meats, liver, eggs, and seafood (especially oysters, but make sure they are from a good source). Whole grain breads and cereals are also good sources of zinc, but limit your carbohydrate intake as this can lead to insulin resistance, blood sugar imbalances and weight gain.
+ Selenium is important for immunity.¹⁸⁵⁴ Increase foods that contain selenium, including seafood, garlic, liver, eggs, dairy products, and some vegetables including cabbage, celery, cucumbers, and radishes. Brazil nuts have the highest amount of selenium. Food processing causes substantial loss of selenium. For example, whole wheat bread has twice the selenium as white bread, and brown rice has 15 times more selenium than white rice. Human breast milk contains six times more selenium than cow’s milk. A cow’s milk diet for infants can contribute to low selenium levels and depressed immune systems in infants.
+ Minimize or eliminate fast food completely, or opt for the salads with grilled meats now offered in most fast food restaurants.
+ Increase antioxidant-containing foods like green, orange, and yellow fruits and vegetables — such as green leafy vegetables, broccoli, peppers, carrots, cantaloupe, and citrus fruits (although fruit sugars should be limited). Polyphenols in these foods are reported to improve immune function.  
+ Dietary factors, such as chronic consumption of high-glycemic index foods (including white breads and refined sugars), also lead to chronically high oxidative stress and release of stress hormones (such as cortisol), which can imbalance hormone levels. Modifying the diet can help decrease physical and mental stress, helping balance metabolism.
+ Your protein requirements increase when you’re under stress — especially physical stress and illness. And even if you don’t feel ill, your body probably still needs some extra protein to heal the hidden damage metabolic imbalances have done to your intestines and other especially vulnerable areas of your body. You may want to consider adding a protein drink to your diet.
+ Avoid animal protein that has been raised with hormones whenever possible. Chicken should also be cage free, and free of antibiotics. Grass-fed organic beef is lower in saturated fat and richer in omega-3 fatty acids that act to reduce inflammation chemistry and help your immunity function appropriately.
+ Remember to consume adequate liquids between meals to help maintain both proper digestion and proper hydration. Six to eight 8-ounce glasses of high-quality water per day is the goal. Try to make clean water that has been purified by reverse osmosis your drink of choice whenever possible.
+ Do not microwave food in plastic containers or covered in plastic.
+ Avoid using personal care items such as face creams, shampoos, and toiletries that contain estrogens and particularly phthalates.
+ Get adequate rest — about 7-8 hours of uninterrupted sleep a night for the average adult. Several studies have found that those individuals with insomnia and other sleep disturbances have higher levels of the stress hormone cortisol, particularly in the evening and night-time hours. Lack of sleep can cause immune imbalances.
+ Exercise and other physical activity are essential in managing stress. At least 30 minutes of exercise daily, 5 days a week is recommended.
+ Decrease stress – take a walk, garden, do Yoga or Tai Chi.
+ Stop smoking. Immunity is affected with tobacco smoke.
+ Drink in moderation.

**Supplements**

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<th>L-glutamine</th>
<th>500mg – 2 grams daily in divided doses</th>
<th>+ Gastrointestinal support + Supports digestive tract tissue and immune function</th>
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<tr>
<td><strong>Life Time Fitness Men’s or Women’s Performance Daily Multivitamin AM/PM</strong></td>
<td>3 capsules in the morning after breakfast and 3 capsules with dinner.</td>
<td>+ The Life Time Fitness Men’s and Women’s Performance Daily Multivitamin AM/PM are formulated to provide the body with key nutrients needed for proper metabolism.</td>
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Better health & performance start here.
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<tr>
<th>Product</th>
<th>Dosage</th>
<th>Benefits</th>
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| Life Time Fitness Omega-3 Fish Oil | 1-2 capsules daily | + Helps decrease inflammation and the consequences it has on your metabolism.  
+ Helps support heart and blood vessel health and immunity.  
+ Fish oil may increase bleeding in sensitive individuals, such as those taking warfarin (Coumadin) or aspirin, although clinical studies have not reported this interaction. |
| Moducare            | 1-2 capsules 2 times daily | + Moducare™ is a proprietary extract of plant sterols and sterolins that helps balance the immune system and decreases autoimmune reactions. Moducare™ also helps balance thyroid function. |
| Multi-Probiotic 4000 | 1 capsule, 1-3 times daily | + Supports gastrointestinal health and immunity  
+ Supports vitamin B and K metabolism  
+ Helps improve absorption of nutrients from foods  
+ Helps decrease inflammation including CRP levels |
| Relora Plex         | 2 capsules, 1-2 times daily | + Used for stress reduction  
+ Relora® is a patented combination of two herbs used in Traditional Chinese medicine, Magnolia (Magnolia officinalis) and Phellodendron bark (Phelodendron amurense).  
+ Relora Plex also contains B-vitamins, which help in stress and nervous system balance  
+ Useful in stress and decreasing cortisol levels  
Relora can increase salivary DHEA and decreases salivary morning cortisol levels, which can both help balance DHT and testosterone  
+ Use with caution if taking medications that can make you drowsy or if drinking alcohol. Relora may cause drowsiness or sedation in sensitive individuals. |
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| Sleep Solve 24/7 | 1 capsule daily, 1 hour before bedtime | + Improves sleep/wake cycles  
+ Melatonin decreased with increased cortisol levels¹²² |
| Ultra-D Tox      | 1-2 capsules 2 times daily; use for 2-3 weeks | + Contains significant quantities of detoxifying herbs, minerals, and probiotics, as well as vitamin C.  
+ Helps support digestive function and detoxification processes |
**ENDNOTES**


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