A Comprehensive Look at Blood Work and Lab Tests

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Blood Work

Anybody who cycles should consider getting blood work done before and after their steroid use. Specifically **metabolic, hormone, lipid panels**. Get a baseline exam, then use this to compare for your post-PCT blood work. This is the only sure way to determine if you've recovered and if your PCT was successful.

Ask your doctor for a: Full Metabolic, Hormone & Lipid Panel this should provide you with all the information you need to know just be sure to keep a copy.

Doing Your Bloodwork

A full liver panel is important to assessing hepatic strain. It is always a good idea before the intake of any c-17 alpha-alkylated oral steroids or injectable forms of these predominantly oral compounds that baseline readings be obtained on standard markers of liver health. While the exact forms of testing may vary depending on the physical and lab, a detailed screening of liver health usually involves examining a number of liver proteins, transaminase enzymes, cholestatic enzymes and bilirubin. The markers most commonly examined when looking to determine liver strain caused by steroid use include the following five variables. Note that what values are regarded as falling in the reference (normal) range may vary slightly between labs.

ALT and AST

Alanine aminotransferase (ALT) and aspartate aminotransferase (AST) are the two enzymes most commonly discussed when it comes to steroid-induced liver toxicity. ALT and AST are necessary to the metabolism of amino acids and protein in the liver. While some may be present in other tissues, these enzymes are largely identified as liver enzymes. They are the subjects of regular testing because they can and commonly will leak out into the bloodstream as the liver becomes inflamed or damaged. As such, these two enzymes are generally regarded as important potential indicators of early steroid-induced liver toxicity. A substantial elevation in ALT and AST is usually looked at as immediate cause to suspend the intake of hepatotoxic steroids. It is of note, however, that there have been cases in which liver damage (such as hepatocellular adenoma) has occurred without substantial elevations in AST and ALT. While these enzymes are important to any examination of liver health, they should not remain the sole focus of blood testing.

ALP, GGT And Bilirubin

Alkaline phosphatase (ALP) and gamma-glutamyltranspeptidase (GGT) are known as cholestatic liver enzymes and are also very important to examining liver health during steroid use. Elevations in ALP and GGT can indicate bile duct obstruction (intrahepatic cholestasis). Intrahepatic cholestasis is a potentially very serious manifestation of steroid-induced liver toxicity, so elevations in ALP and GGT should never be disregarded. Bilirubin should also be measured, which is a yellow fluid that is found in bile. Bilirubin is responsible for the yellowing of the skin and eyes (jaundice) that can be associated with bile duct obstruction. These three markers should be specifically requested before your testing in addition to ALT and AST, as it is not common that all five variables are measured in the same standard blood test.

It is of note that mild elevations in ALT and AST (slightly above the reference range) may be caused by muscle damage (exercise) instead of liver toxicity. A comparison to baseline levels will be important in determining the cause of elevated ALT and AST. Elevations that come only after the addition of anabolic steroids (training is otherwise constant) point to the drug as the likely cause. Creatine kinase (CK) is a marker of muscle damage and can also be useful in making this determination. Mild ALT and AST elevations caused by muscle damage will usually coincide with similar elevations in CK, but normal levels of ALP and GGT. It is important to remember, however, that the substantial elevation of any hepatic markers above the reference range (even if the only markers elevated are ALT and AST) may indicate substantial liver toxicity and should be cause to discontinue the offending steroids and reassess risk. - William L.

Comprehensive Metabolic Panel
Also known as: CMP; Chem 12; Chemistry panel; Chemistry screen; SMA 12; SMA 20; SMAC (somewhat outdated terms)
There is also a basic version of this Test but I would recommend this one.

What is it?

The Comprehensive Metabolic Panel (CMP) is a frequently ordered panel of tests that gives your doctor important information about the current status of your kidneys, liver, and electrolyte and acid/base balance as well as of your blood sugar and blood proteins. Abnormal results, and especially combinations of abnormal results, can indicate a problem that needs to be addressed. The CMP is typically a group of 14 specific tests that have been approved, named, and assigned a CPT code (a Current Procedural Terminology number) as a panel by Medicare, although labs may adjust the number of tests up or down. Since the majority of insurance companies also use these names and CPT codes in their claim processing, this grouping of tests has become standardized throughout the United States.

The CMP includes:
* Glucose
* Calcium

Both increased and decreased levels can be significant.

Proteins
* Albumin
* Total Protein

Albumin, a small protein produced in the liver, is the major protein in serum. Total protein measures albumin as well as all other proteins in serum. Both increases and decreases in these test results can be significant.

Electrolytes
* Sodium
* Potassium
* CO2 (carbon dioxide, bicarbonate)
* Chloride

The concentrations of sodium and potassium are tightly regulated by the body as is the balance between the four molecules. Electrolyte (and acid-base) imbalances can be present with a wide variety of acute and chronic illnesses. Chloride and CO2 tests are rarely ordered by themselves.

Kidney Tests
* BUN (blood urea nitrogen)
* Creatinine

BUN and creatinine are waste products filtered out of the blood by the kidneys. Increased concentrations in the blood may indicate a temporary or chronic decrease in kidney function. When not ordered as part of the CMP, they are still usually ordered together.

Liver Tests
* ALP (alkaline phosphatase)
* ALT (alanine amino transferase, also called SGPT)
* AST (aspartate amino transferase, also called SGOT)
* Bilirubin

ALP, ALT, and AST are enzymes found in the liver and other tissues. Bilirubin is a waste product produced by the liver as it breaks down and recycles aged red blood cells. All can be found in elevated concentrations in the blood with liver disease or dysfunction.

How is the sample collected for testing?
The CMP uses a tube of blood collected by inserting a needle into a vein in your arm. Ask your doctor whether you should be fasting for 10 to 12 hours prior to the blood draw. Depending on the reason for ordering the CMP, it may be drawn after fasting or on a random basis.

How is it used?
The CMP is used as a broad screening tool to evaluate organ function and check for conditions such as diabetes, liver disease, and kidney disease. The CMP may also be ordered to monitor known conditions, such as hypertension, and to monitor patients taking specific medications for any kidney- or liver-related side effects. If your doctor is interested in following two or more individual CMP components, he may order the entire CMP because it offers more information.

When is it ordered?
The CMP is routinely ordered as part of a blood work-up for a medical exam or yearly physical. Although it may be performed on a random basis, the CMP sample is usually collected after a 10 to 12 hour fast (no food or liquids other than water). While the individual tests are sensitive, they do not usually tell your doctor specifically what is wrong. Abnormal test results or groups of test results are usually followed up with other specific tests to confirm or rule out a suspected diagnosis.

Lipid Profile
Also known as: Lipid Panel; Coronary Risk Panel
Formal name: Lipid Profile
Related tests: Cholesterol; HDL-C; LDL-C; Triglycerides; Direct LDL-C; VLDL-C; Cardiac Risk Assessment; Lp-PLA2

What is a lipid profile?

The lipid profile is a group of tests that are often ordered together to determine risk of coronary heart disease. They are tests that have been shown to be good indicators of whether someone is likely to have a heart attack or stroke caused by blockage of blood vessels or hardening of the arteries (atherosclerois). The lipid profile typically includes:

* Total cholesterol
* High density lipoprotein cholesterol (HDL-C) — often called good cholesterol
* Low density lipoprotein cholesterol (LDL-C) —often called bad cholesterol
* Triglycerides

An extended profile may also include:
* Very low density lipoprotein cholesterol (VLDL-C)
* Non-HDL-C

Sometimes the report will include additional calculated values such as the Cholesterol/HDL ratio or a risk score based on lipid profile results, age, sex, and other risk factors. Talk to your doctor about what these other reported values may mean for you.

How is the sample collected for testing?
A blood sample is obtained by inserting a needle into a vein in the arm. Sometimes a drop of blood is collected by puncturing the skin on a fingertip. This fingerstick sample is typically used when a lipid profile is being measured on a portable testing device, for example, at a health fair. You need to fast for 9-12 hours before having your blood drawn; only water is permitted.

How is a lipid profile used?
The lipid profile is used to help determine your risk of heart disease and to help guide you and your health care provider in deciding what treatment may be best for you if you have borderline or high risk. The results of the lipid profile are considered along with other known risk factors of heart disease to develop a plan of treatment and follow-up. Depending on your results and other risk factors, treatment options may involve life-style changes such as diet and exercise or lipid-lowering medications such as statins.
When is it ordered?
It is recommended that healthy adults with no other risk factors for heart disease be tested with a fasting lipid profile once every five years. You may be screened using only a cholesterol test and not a full lipid profile. However, if the cholesterol test result is high, you may have follow-up testing with a lipid profile.

If you have other risk factors or have had a high cholesterol level in the past, you should be tested more regularly and you should have a full lipid profile.

For children and adolescents at low risk, lipid testing is usually not ordered routinely. However, screening with a lipid profile is recommended for children and youths who are at an increased risk of developing heart disease as adults. Some of the risk factors are similar to those in adults and include a family history of heart disease or health problems such as diabetes, high blood pressure (hypertension), or being overweight. High-risk children should have their first lipid profile between 2 and 10 years old, according to the American Academy of Pediatrics. Children younger than 2 years old are too young to be tested.

A lipid profile may also be ordered at regular intervals to evaluate the success of lipid-lowering lifestyle changes such as diet and exercise or to determine the effectiveness of drug therapy such as statins.

What do the results mean?
In general, your doctor will take into consideration the results of each component of a lipid profile plus other risk factors to determine whether treatment is necessary and, if so, which treatment will best help you to lower your risk of heart disease. The National Cholesterol Education Program offers the following guidelines for adults for classifying results of the tests:

LDL Cholesterol
Optimal: Less than 100 mg/dL (2.59 mmol/L)
Near/above optimal: 100-129 mg/dL (2.59-3.34 mmol/L)
Borderline high: 130-159 mg/dL (3.37-4.12 mmol/L)
High: 160-189 mg/dL (4.15-4.90 mmol/L)
Very high: Greater than 190 mg/dL (4.90 mmol/L)

Total Cholesterol
Desirable: Less than 200 mg/dL (5.18 mmol/L)
Borderline high: 200-239 mg/dL (5.18 to 6.18 mmol/L)
High: 240 mg/dL (6.22 mmol/L) or higher

HDL Cholesterol
Low level, increased risk: Less than 40 mg/dL (1.0 mmol/L) for men and less than 50 mg/dL (1.3 mmol/L) for women
Average level, average risk: 40-50 mg/dL (1.0-1.3 mmol/L) for men and between 50-59 mg/dl (1.3-1.5 mmol/L) for women
High level, less than average risk: 60 mg/dL (1.55 mmol/L) or higher for both men and women

Fasting Triglycerides
Desirable: Less than 150 mg/dL (1.70 mmol/L)
Borderline high: 150-199 mg/dL(1.7-2.2 mmol/L)
High: 200-499 mg/dL (2.3-5.6 mmol/L)
Very high: Greater than 500 mg/dL (5.6 mmol/L)

The risk categories for children and adolescents are different than adults. Talk to your child's pediatrician about your child's results.

Common Questions

1. I had a screening test for cholesterol. It was less than 200 mg/dL (5.18 mmol/L). Do I need a lipid profile?

If your total cholesterol is below 200 (5.18 mmol/L) and you have no family history of heart disease or other risk factors, a full lipid profile is probably not necessary. However, an HDL-cholesterol measurement would be advisable to assure that you do not have a low HDL. Many screening programs now offer both cholesterol and HDL.

2. My lipid profile results came back with high triglycerides and no results for LDL-cholesterol. Why?
In most screening lipid profiles, LDL-cholesterol is calculated from the other lipid measurements. However, the calculation is not valid if triglycerides are over 400 mg/dL (4.52 mmol/L). To determine LDL-cholesterol when triglycerides are over 400 mg/dL (4.52 mmol/L) requires special testing techniques such as a direct LDL-C test or a lipid ultracentrifugation test (sometimes called a beta-quantification test).

3. What is VLDL?
Very Low Density Lipoprotein (VLDL) is one of three major lipoprotein particles. The other two are high density lipoprotein (HDL) and low density lipoprotein (LDL). Each one of these particles contains a mixture of cholesterol, protein, and triglyceride, but in varying amounts unique to each type of particle. LDL contains the highest amount of cholesterol. HDL contains the highest amount of protein. VLDL contains the highest amount of triglyceride. Since VLDL contains most of the circulating triglyceride and since the composition of the different particles is relatively constant, it is possible to estimate the amount of VLDL cholesterol by dividing the triglyceride value (in mg/dL) by 5. At present, there is no simple, direct way of measuring VLDL-cholesterol, so the estimate calculated from triglyceride is used in most settings. This calculation is not valid when the triglyceride is greater than 400 mg/dl (see question 2 above). Increased levels of VLDL-cholesterol have been found to be associated with increased risk of heart disease and stroke.

4. What is non-HDL-cholesterol?
Non-HDL-cholesterol (non-HDL-C) is calculated by subtracting your HDL-C result from your total cholesterol result. It represents the “atherogenic” cholesterol — the cholesterol that can build up in the arteries, form plaques, and cause narrowing of the vessels and blockages. Unlike calculation of VLDL-C (see question 3 above), this calculation is not affected by high levels of triglycerides. Your non-HDL-C result may be used to assess your risk for CVD, especially if you have high triglycerides since high non-HDL-C is associated with increased risk. As recommended by the National Cholesterol Education Program, Adult Treatment Plan III, if you have high triglycerides (greater than 200 mg/dL), the non-HDL-C result can be used as a secondary target of treatments such as lifestyle changes and drugs that aim to lower lipid levels.

Is there anything else I should know?

There is increasing interest in measuring triglycerides in people who have not fasted. The reason is that a non-fasting sample may be more representative of the "usual" circulating level of triglyceride since most of the day blood lipid levels reflect post-meal (post-prandial) levels rather than fasting levels. However, it is not yet certain how to interpret non-fasting levels for evaluating risk, so at present there is no change in the current recommendations for fasting prior to tests for lipid levels.

The Male Hormone Panel

The aging process is inevitable. However, restoring lost male vitality is within reach. The hormones involved in this restoration can now be collectively measured in one salivary panel using the Regular or Expanded Male Hormone Panels (MHP and eMHP). The problems that concern men that most can be grouped into 3 categories:

Vigor
- loss of sense of well being
- difficulty concentrating
- depression
- irritability and nervousness
- alternation in behavioral patterns
- change in sleep habits/insomnia

Vitality
- decrease in hair density
- reduction in masculinity
- decrease in muscle mass and strength

Virility
decline in sexual function and interest, diminished libido and erictile dysfunction (ED)
- decrease in bone mass (osteoporosis)

Andropause
At around puberty, the important male hormone, testosterone, reaches adult levels. For a long time it was believed that men maintain adequate levels of testosterone throughout life. Many men in their fifties or older however, experience a progressive decline in their energy, vitality, sexual performance and mental capacity. This decline has been labeled "Andropause." The causes of andropause are believed to be a reduction in testosterone and other androgens. The testicles show a progressive annual drop of 1-1.5% in testoterone output after age 30. Furthermore, as men age, a 1-2% in both Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH) has been documented. The clinical manifestations of andropause usually lag ten to twenty years behind the

onset of hormone decline. Statistically, andropause effects at least 40% of men ages 55-65, and up to 80% of those aged 65 years or more. Knowing the levels of the 6-8 hormones measured in the Male Hormone Panels helps you formulate an effective plan to relieve andropausal symptoms.

Regular Male Hormonal Panel (MHP)

Several years ago, Diagnos-Techs, Inc. introduced the first salivary Male Hormonal Panel which evaluates the androgen pathway by measuring the free fractions of the hormones shown below.

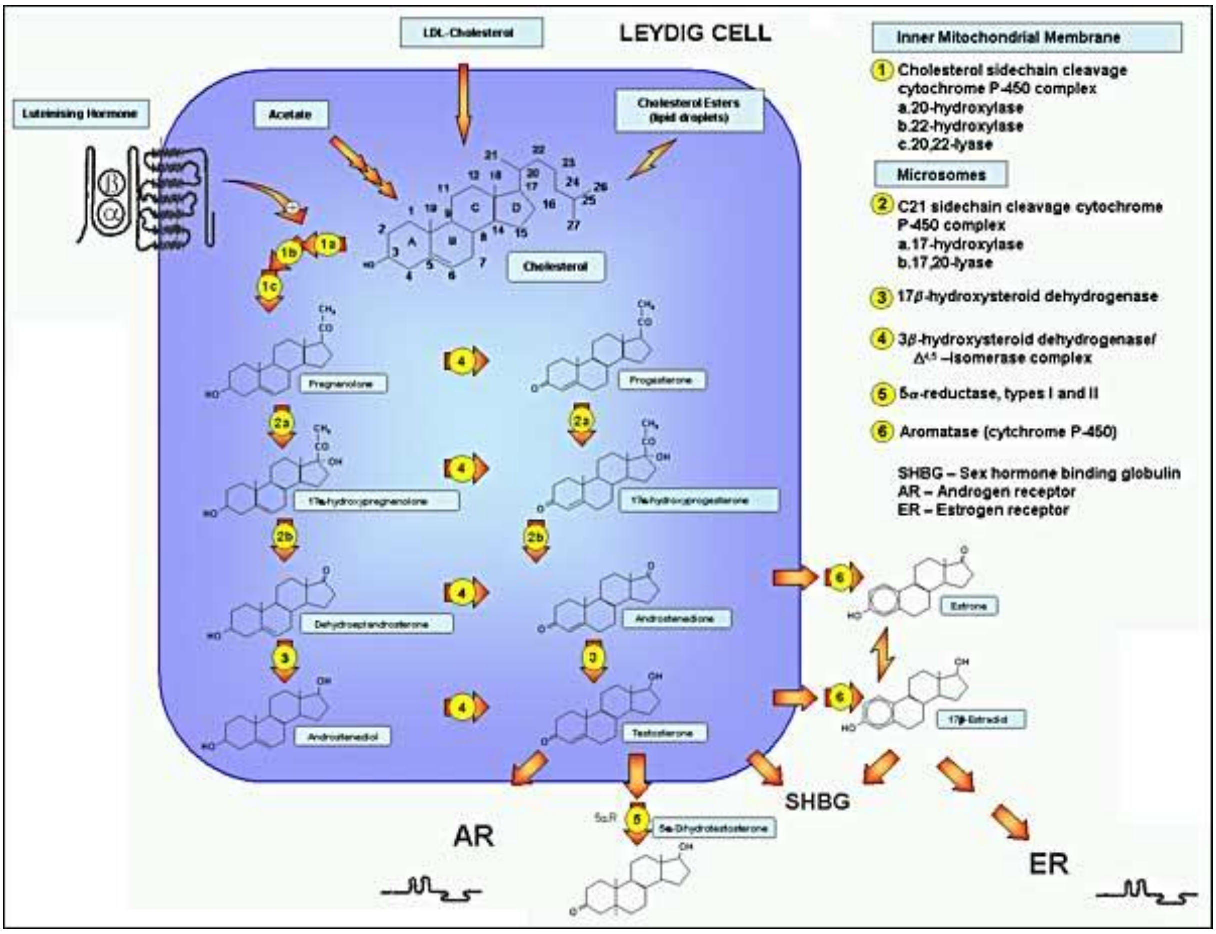

FIGURE 1. Pathways of testosterone biosynthesis and action. In men, testosterone biosynthesis occurs almost exclusively in mature Leydig cells by the enzymatic sequences illustrated. Cholesterol originates predominantly by de novo synthesis pathway from acetylâ€‘CoA with luteinizing hormone regulating the rateâ€‘limiting step, the conversion of cholesterol to pregnenolone within mitochondria, while remaining enzymatic steps occur in smooth endoplasmic reticulum. The ï□„5 and ï□„4 steroidal pathways are on the left and right, respectively. Testosterone and its androgenic metabolite, dihydrotestosterone, exert biological effects directly through binding to the androgen receptor and indirectly through aromatization of testosterone to estradiol, which allows action via binding to the ER. The androgen and ERs are members of the

steroid nuclear receptor superfamily with highly homologous structure differing mostly in the C-terminal ligand binding domain. The LH receptor has the structure of a G-protein linked receptor with its characteristic seven transmembrane spanning helical regions and a large extracellular domain which binds the LH molecule which is a dimeric glycoprotein hormone consisting of an ɑ subunit common to other pituitary glycoprotein hormones and a β subunit specific to LH. Most sex steroids bind to sex hormone binding globulin (SHBG) which binds tightly and carries the majority of testosterone in the bloodstream.

1. **Progesterone** is a precursor to all androgens and is a physiologic modulator of DHT production
2. **DHEA & DHEA-S**, the main adrenal androgens are the precursors to both testerone and estradiol, and the limiting factor in their production especially under stress.
3. **Androstenedione**, another adrenal androgen and precursor to estrone is freely inter-convertible with testosterone.
4. **Estrone** is the major estrogen in mend and is the product of peripheral aromatization of androstenedione in fat and muscle tissue.
5 & 6 **Testosterone**, the dominant testicular androgen, is the precursor to 5-dihydrotestosterone (DHT). The androgenic effect in various tissues is not exerted by testosterone buy by the locally produced DHT.

Expanded male hormone Panel (eMHP)
This panel includes all the 6 tests in the regular MHP, plus FSH and LH. Sallivary quantitation of FSH and LH is a technological breakthrough that seperates Diagnos-Techs from the crowd of copycat laboratores. Testosterone and sperm production in males are the equivalent of estrogen and ovulation in females. The pituitary neurohormones, FSH, and LH, stimulate and regulate sperm atogenesis and testosterone production respectively.

- Early detection of an increase in FSH and LH levels is indicative of a progressive decline in male sexuality and functionality. The clinical utility of the Male Hormone Panel is shown in the:
- Measuring of baseline hormones
- Diagnosing andropause and hypogonadism
- Therapeutic monitoring of HRT
- Balancing of hormones
- Investigating of prostate hypertrophy, thinning of hair and hirsutism
- Evaluating of low-libido in both sexes

Beneficial Effects
Following the use of MHP/eMHP, treatment plans using hormones to replace the balance of endogenous production usually produce several positive effects:
- Increase of fitness and sense of well-being
- Decrease of body fat and increase in lean body mass

- Resolution of hormone dependent libido problems
- Prevention of hair thinning
- Increase of hematocrit and RBC counts
- Mitigation of esteoporosis and stimulation of bone formation
- Decrease in total cholesterol, increase in HDL

Note Unmonitored male HRT may account for increased incidence of prostatic complications, liver cancer, and accelerated atherosclerosis.

Normal Range Blood Profiles:
CBC with Differential and Platelet
White Blood Cell count: 3.8 - 10.8 Thous/mcL
Red Blood Cell count: 4.2 - 5.8 Mill/mcl
Hemoglobin: 13.2 - 17.1 g/dL
Hematocrit: 38.5 - 50.0%
MCV: 80 - 100 fL
MCH: 27 - 33 pg
MCHC: 32 - 36 g/dL
RDW: 11 - 15%
Platelet Count: 140 - 400 Thous/mcL
MPV: 7.5 - 11.5 fL
Neutrophils, Absolute: 1500 - 7800 Cells/mcL
Lymphocytes, Absolute: 850 - 3900 Cells/mcL
Monocytes, Absolute: 200 - 950 Cells/mcL
Eosinophils, Absolute: 15 - 500 Cells/mcL
Basophils, Absolute: 0 - 200 Cells/mcL

Glucose, non-fasting: 65 - 125 mg/dL
Glucose, fasting: 65 - 109 mg/dL

Automated Chemistries
Urea Nitrogen: 7 -25 mg/dL
Creatinine: 0.5 - 1.4 mg/dL
BUN/Creatinine: 6 - 25
Sodium: 135 - 146 mmol/L
Potassium: 3.5 - 5.3 mmol/L
Chloride: 98 - 110 mmol/L
Carbon Dioxide: 21 - 33 mmol/L
Calcium: 8.5 - 10.4 mg/dL
Phosphorus: 2.5 - 4.5 mg/dL
Alkaline Phosphatase: 20 -125 U/L
Liver enzyme, AST: 2 - 50 U/L

Liver enzyme, ALT: 2 - 60 U/L
Bilirubin, Total: 0.2 - 1.5 mg/dL
Bilirubin, Direct: 0.0 - 0.3 mg/dL
Protein, Total: 6.9 - 8.3 g/dL
Albumin: 3.7 - 5.1 g/dL
Globulin, Calculated: 2.2 - 4.2 g/dL
A/G ratio: 0.8 - 2.0
LD: 100 - 250 U/L
Uric Acid: 2.7 - 8.2 mg/dL
GGT: 2 - 80 U/L
Cholesterol, Total: < 200 mg/dL
Triglycerides: < 150 mg/dL
Iron: 40 - 190 ug/dL

Thyroid Panel
T3, Total: 60 - 181 ng/dL
T4, Free: 0.8 - 1.8 ng/dL
T4, Total: 4.5 - 12.8 ug/dL
TSH: 0.4 - 5.5 mIU/L

Homocysteine (Cardio) , FPIA
Homocysteine: < 11.4 MICROmol/L

PSA - Prostate Specific Antigen
PSA, Total: < 4.1 ng/mL
PSA, Free and Free %: See ref. scale below
Reference scale:
PSA, 0 - 2 ng/mL = approx. 1% Probability of Cancer
PSA, 2 - 4 ng/mL = approx. 15% Probability of Cancer
PSA, 4.1 - 10 ng/mL & Free 0-10% = approx. 56% Probability of Cancer
PSA, 4.1 - 10 ng/mL & Free 11-15% = approx. 28% Probability of Cancer
PSA, 4.1 - 10 ng/mL & Free 16-20% = approx. 20% Probability of Cancer
PSA, 4.1 - 10 ng/mL & Free 21-25% = approx. 16% Probability of Cancer
PSA, 4.1 - 10 ng/mL & Free > 26% = approx. 8% Probability of Cancer
PSA > 10 = > 50% Probability of Cancer

Testosterone, LH & Estradiol
Testosterone, Total: 260 - 1000 ng/dL
Testosterone, Free: 50 - 210 pg/mL
Testosterone, Free %: 1.0 - 2.7%

Estradiol: < 32 pg/mL
LH: 1.5 - 9.3 mIU/mL

End

Extra Reading

A Comprehensive Look at Lab Tests

In the following article, I'm going to go over each of the most common tests. I'll include why it's performed, what it tells you, and what the typical ranges are for normal humans. That way, you'll have something more to go on in assessing your health other than your family doctor saying, "Well, these few values are a little worrisome, but you'll probably be okay."

One note, though, before I get started. The values I'll be listing are merely averages and the ranges may vary slightly from laboratory to laboratory. Also, if there's only one range given, it applies to both men and women.

Lipid Panel — used to determine possible risk for coronary and vascular disease. In other words...heart disease.

HDL/LDL and Total Cholesterol
These lipoproteins should look rather familiar to most of you. HDL is simply the "good" lipoprotein that acts as a scavenger molecule and prevents a build-up of material. LDL is the "bad" lipoprotein which collects in arterial walls and causes blockage or a reduction in blood flow. The total cholesterol to HDL ratio is also important.

Nevertheless, a quick reminder: your HDL should be 35 or higher; LDL below 130; and total to HDL ratio should be below 3.5. Oh and don't forget VLDL (very low density lipoprotein) which can be extremely worrisome. You should have less than 30 mg/dl in order to not be considered at risk for heart disease.

On a side note, I'm sure some of you are wishing that you had abnormally low plasma cholesterol levels (as if it's something to brag about), but the fact is that having extremely low cholesterol levels is actually indicative of severe liver disease.

Triglycerides
Triglycerides are simply a form of fat that exists in the bloodstream. They're transported by two other culprits, VLDL and LDL. A high level of triglycerides is also a risk factor for heart disease as well. Triglycerides levels can be increased if food or alcohol is consumed 12 to 24 hours prior to the blood draw and this is the reason why you're asked to fast for 12-14 hours from food and abstain from alcohol for 24 hours. Here are the normal ranges for healthy humans.
16-19 yr. old male
40-163 mg/dl

Adult Male
40-160 mg/dl

16-19 yr. old female
40-128 mg/dl

Adult Female
35-135 mg/dl

Homocysteine
Unfortunately, this test isn't always ordered by the doctor. It should be. Homocysteine is formed in the metabolism of the dietary amino acid methionine. The problem is that it's a strong risk factor for atherosclerosis. In other words, high levels may cause you to have a heart attack. A good number of lifters should be concerned with this value as homocysteine levels rise with anabolic steroid usage.

Luckily, taking folic acid (about 400-800 mcg.) as well as taking a good amount of all B vitamins in general will go a long way in terms of preventing a rise in levels of homocysteine.

Normal ranges:

Males and Females age 0-30
4.6-8.1 umol/L

Males age 30-59
6.3-11.2 umol/L

Females age 30-59
4.5-7.9 umol/L

>59 years of age
5.8-11.9 umol/L

The Hematocrit Profile
These are various tests that examine a number of components of your blood and look for any abnormalities that could be indicative of serious diseases.

WBC Total (White Blood Cell)
Also referred to as leukocytes, a fluctuation in the number of these types of cells can be an indicator of things like infections and disease states dealing with immunity, cancer, stress, etc.

Normal ranges:

4,500-11,000/mm3

Neutrophils
This is one type of white blood cell that's in circulation for only a very short time. Essentially their job is phagocytosis, which is the process of killing and digesting bacteria that cause infection. Both severe trauma and bacterial infections, as well as inflammatory or metabolic disorders and even stress, can cause an increase in the number of these cells. Having a low number of neutrophils can be indicative of a viral infection, a bacterial infection, or a rotten diet.

Normal ranges:
2,500-8,000 cells per mm3

RBC (Red Blood Cell)
These blood cells also called erythrocytes and their primary function is to carry oxygen (via the hemoglobin contained in each RBC) to varioustissues as well as giving our blood that cool "red" color. Unlike WBC, RBC survive in peripheral blood circulation for approximately 120 days. A decrease in the number of these cells can result in anemia which could stem from dietary insufficiencies. An increase in number can occur when androgens are used. This is because androgens increase EPO (erythropoietin) production which in turn increases RBC count and thus elevates blood volume. This is essentially why some androgens are better than others at increasing "vascularity." Anyhow, the danger in this could be an increase in blood pressure or a stroke.

Androgen-using lifters who have high values should consider making modifications to their stack and/or immediately donating some blood.

Normal ranges:

Adult Male
4,700,000-6,100,000 cells/uL

Adult Female
4,200,000-5,400,000 cells/uL

Hemoglobin
Hemoglobin is what serves as a carrier for both oxygen and carbon dioxide transportation. Molecules of this are found within each red blood cell. An increase in hemoglobin can be an indicator of congenital heart disease, congestive heart failure, sever burns, or dehydration. Being at high altitudes, or the use of androgens, can cause an increase as well. A decrease in number can be a sign of anemia, lymphoma, kidney disease, sever haemorrhage, cancer, sickle cell anemia, etc.
Normal ranges:

Males and females 6-18 years
10-15.5 g/dl

Adult Males
14-18 g/dl

Adult Females
12-16 g/dl

Hematocrit
The hematocrit is used to measure the percentage of the total blood volume that's made up of red blood cells. An increase in percentage may be indicative of congenital heart disease, dehydration, diarrhea, burns, etc. A decrease in levels may be indicative of anemia, hyperthyroidism, cirrhosis, hemorrhage, leukemia, rheumatoid arthritis, pregnancy, malnutrition, a sucking knife wound to the chest, etc.

Normal ranges:

Male and Females age 6-18 years
32-44%

Adult Men
42-52%

Adult Women
37-47%

MCV (Mean Corpuscular Volume)
This is one of three red blood cell indices used to check for abnormalities. The MCV is the size or volume of the average red blood cell. A decrease in MCV would then indicate that the RBC's are abnormally large (or macrocytic), and this may be an indicator of iron deficiency anemia or thalassemia. When an increase is noted, that would indicate abnormally small RBC (microcytic), and this may be indicative of a vitamin B12 or folic acid deficiency as well as liver disease.

Normal ranges:

Adult Male
80-100 fL

Adult Female
79-98 fL

12-18 year olds

78-100 fL

MCH (Mean Corpuscular Hemoglobin)
The MCH is the weight of hemoglobin present in the average red blood cell. This is yet another way to assess whether some sort of anemia or deficiency is present.

Normal ranges:

12-18 year old
35-45 pg

Adult Male
26-34 pg

Adult Female
26-34 pg

MCHC (Mean Corpuscular Hemoglobin Concentration)
The MCHC is the measurement of the amount of hemoglobin present in the average red blood cell as compared to its size. A decrease in number is an indicator of iron deficiency, thalassemia, lead poisoning, etc. An increase is sometimes seen after androgen use.

Normal ranges:

12-18 year old
31-37 g/dl

Adult Male
31-37 g/dl

Adult Female
30-36 g/dl

RDW (Red Cell Distribution Width)
The RDW is an indicator of the variation in red blood cell size. It's used in order to help classify certain types of anemia, and to see if some of the red blood cells need their suits tailored. An increase in RDW can be indicative of iron deficiency anemia, vitamin B12 or folate deficiency anemia, and diseases like sickle cell anemia.

Normal ranges:

Adult Male
11.7-14.2%
Adult Female

11.7-14.2%

Platelets
Platelets or thrombocytes are essential for your body's ability to form blood clots and thus stop bleeding. They're measured in order to assess the likelihood of certain disorders or diseases. An increase can be indicative of a malignant disorder, rheumatoid arthritis, iron deficiency anemia, etc. A decrease can be indicative of much more, including things like infection, various types of anemia, leukemia, etc.

On a side note for these ranges, anything above 1 million/mm3 would be considered a critical value and should warrant concern.

Normal ranges:

Child
150,000-400,000/mm3
(Most commonly displayed in SI units of 150-400 x 10(9th)/L

Adult
150,000-400,000/mm3
(Most commonly displayed in SI units of 150-400 x 10(9th)/L

ABS (Differential Count)
The differential count measures the percentage of each type of leukocyte or white blood cell present in the same specimen. Using this, they can determine whether there's a bacterial or parasitic infection, as well as immune reactions, etc.

Neutrophils
As explained previously, severe trauma and bacterial infections, as well as inflammatory disorders, metabolic disorders, and even stress can cause an increase in the number of these cells. Also, on the other side of the spectrum, a low number of these cells can indicate a viral infection, a bacterial infection, or a deficient diet.

Percentile Range:
55-70%

Basophils
These cells, and in particular, eosinophils, are present in the event of an allergic reaction as well as when a parasite is present. These types of cells don't increase in response to viral or bacterial infections so if an increased count is noted, it can be deduced that either an allergic response has occurred or a parasite has taken up residence in your shorts.
Percentile Range:

Basophils
0.5-1%

Eosinophils
1-4%

Lymphocytes and Monocytes
Lymphocytes can be divided in to two different types of cells: T cells and B cells. T cells are involved in immune reactions and B cells are involved in antibody production. The main job of lymphocytes in general is to fight off — Bruce Lee style — bacterial and viral infections.

Monocytes are similar to neutrophils but are produced more rapidly and stay in the system for a longer period of time.

Percentile Range:

Lymphocytes
20-40%

Monocytes
2-8%

Selected Clinical Values

Sodium
This cation (an ion with a postive charge) is mainly found in extracellular spaces and is responsible for maintaining a balance of water in the body. When sodium in the blood rises, the kidneys will conserve water and when the sodium concentration is low, the kidneys conserve sodium and excrete water. Increased levels can result from excessive dietary intake, Cushing's syndrome, excessive sweating, burns, forgetting to drink for a week, etc. Decreased levels can result from a deficient diet, Addison's disease, diarrhea, vomiting, chronic renal insufficiency, excessive water intake, congestive heart failure, etc. Anabolic steroids will lead to an increased level of sodium as well.

Normal range:

Adults
136-145 mEq/L

Potassium
On the other side of the spectrum, you have the most important intracellular cation. Increased levels can be an indicator of excessive

dietary intake, acute renal failure, aldosterone-inhibiting diuretics, a crushing injury to tissues, infection, acidosis, dehydration, etc. Decreased levels can be indicative of a deficient dietary intake, burns, diarrhea or vomiting, diuretics, Cushing's syndrome, licorice consumption, insulin use, cystic fibrosis, trauma, surgery, etc.

Normal range:

Adults
3.5-5 mEq/L

Chloride
This is the major extracellular anion (an ion carrying a negative charge). Its purpose it is to maintain electrical neutrality with sodium. It also serves as a buffer in order to maintain the pH balance of the blood. Chloride typically accompanies sodium and thus the causes for change are essentially the same.

Normal range:

Adult
98-106 mEq/L

Carbon Dioxide
The CO2 content is used to evaluate the pH of the blood as well as aid in evaluation of electrolyte levels. Increased levels can be indicative of severe diarrhea, starvation, vomiting, emphysema, metabolic alkalosis, etc. Increased levels could also mean that you're a plant. Decreased levels can be indicative of kidney failure, metabolic acidosis, shock, and starvation.

Normal range:

Adults
23-30 mEq/L

Glucose
The amount of glucose in the blood after a prolonged period of fasting (12-14 hours) is used to determine whether a person is in a hypoglycemic (low blood glucose) or hyperglycemic (high blood glucose) state. Both can be indicators of serious conditions. Increased levels can be indicative of diabetes mellitus, acute stress, Cushing's syndrome, chronic renal failure, corticosteroid therapy, acromegaly, etc. Decreased levels could be indicative of hypothyroidism, insulinoma, liver disease, insulin overdose, and starvation.

Normal range:

Adult Male
65-120 mg/dl

Adult Female
65-120 mg/dl

BUN (Blood Urea Nitrogen)
This test measures the amount of urea nitrogen that's present in the blood. When protein is metabolized, the end product is urea which is formed in the liver and excreted from the bloodstream via the kidneys. This is why BUN is a good indicator of both liver and kidney function. Increased levels can stem from shock, burns, dehydration, congestive heart failure, myocardial infarction, excessive protein ingestion, excessive protein catabolism, starvation, sepsis, renal disease, renal failure, etc. Causes of a decrease in levels can be liver failure, over hydration, negative nitrogen balance via malnutrition, pregnancy, etc.

Normal range:

Adults
10-20 mg/dl

Creatinine
Creatinine is a by-product of creatine phosphate, the chemical used in contraction of skeletal muscle. So, the more muscle mass you have, the higher the creatine levels and therefore the higher the levels of creatinine. Also, when you ingest large amounts of beef or other meats that have high levels of creatine in them, you can increase creatinine levels as well. Since creatinine levels are used to measure the functioning of the kidneys, this easily explains why creatine has been accused of causing kidney damage, since it naturally results in an increase in creatinine levels.

However, we need to remember that these tests are only indicators of functioning and thus outside drugs and supplements can influence them and give false results, as creatine may do. This is why creatine, while increasing creatinine levels, does not cause renal damage or impair function. Generally speaking, though, increased levels are indicative of urinary tract obstruction, acute tubular necrosis, reduced renal blood flow (stemming from shock, dehydration, congestive heart failure, atherosclerosis), as well as acromegaly. Decreased levels can be indicative of debilitation, and decreased muscle mass via disease or some other cause.

Normal range:

Adult Male

0.6-1.2 mg/dl

Adult Female
0.5-1.1 mg/dl

BUN/Creatinine Ratio
A high ratio may be found in states of shock, volume depletion, hypotension, dehydration, gastrointestinal bleeding, and in some cases, a catabolic state. A low ratio can be indicative of a low protein diet, malnutrition, pregnancy, severe liver disease, ketosis, etc. Keep in mind, though, that the term BUN, when used in the same sentence as hamburger or hotdog, usually means something else entirely. An important thing to note again is that with a high protein diet, you'll likely have a higher ratio and this is nothing to worry about.

Normal range:

Adult
6-25

Calcium
Calcium is measured in order to assess the function of the parathyroid and calcium metabolism. Increased levels can stem from hyperparathyroidism, metastatic tumor to the bone, prolonged immobilization, lymphoma, hyperthyroidism, acromegaly, etc. It's also important to note that anabolic steroids can also increase calcium levels. Decreased levels can stem from renal failure, rickets, vitamin D deficiency, malabsorption, pancreatitis, and alkalosis.

Normal range:

Adult
9-10.5 mg/dl

Liver Function

Total Protein
This measures the total level of albumin and globulin in the body. Albumin is synthesized by the liver and as such is used as an indicator of liver function. It functions to transport hormones, enzymes, drugs and other constituents of the blood.

Globulins are the building blocks of your body's antibodies. Measuring the levels of these two proteins is also an indicator of nutritional status. Increased albumin levels can result from dehydration, while decreased albumin levels can result from malnutrition, pregnancy, liver disease, over hydration, inflammatory diseases, etc. Increased globulin levels can result from inflammatory diseases, hypercholesterolemia (high cholesterol), iron deficiency anemia, as well as infections. Decreased globulin levels can result from hyperthyroidism, liver dysfunction, malnutrition, and immune deficiencies or disorders.

As another important side note, anabolic steroids, growth hormone, and insulin can all increase protein levels.

Normal range:

Adult
Total Protein: 6.4-8.3 g/dl
Albumin: 3.5-5 g/dl
Globulin: 2.3-3.4 g/dl

Albumin/Globulin Ratio:

Adult
0.8-2.0