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REPORT**The Lifesaving Benefits of Annual Blood Screening**

By Penny Baron



Annual blood screening is the key component for preventing degenerative disease. By providing a comprehensive snapshot of your current state of health, blood screening can catch potential health problems in their early stages when they can be managed most effectively.

Sadly, many physicians request only minimal testing for their patients. As a result, many deadly diseases ranging from heart disease to cancer silently progress undetected until it is too late. Regular blood testing is the single most important tool available to prevent degenerative disease through early intervention. Many of the advanced tests offered by Life Extension are unavailable or unknown to many doctors. It is our goal to provide our members with the latest in blood screening so that they may better control their health.

Screening tests assess the status of numerous systems in the body, monitoring for cardiovascular risk factors, blood sugar levels, liver and kidney function, immune system wellness, and optimal hormone balance. Regular testing also monitors electrolyte levels, mineral balance, and red blood cell size and number.

Careful attention to your laboratory findings can help you reduce your risk for disorders such as heart disease, stroke, kidney disease, liver conditions, anemia, and diabetes. Regular testing also can help you prevent and treat conditions associated with hormone imbalances, including fatigue, erectile dysfunction, memory impairment, bone loss, weight gain, and depressed mood.

While many doctors routinely prescribe general tests such as total cholesterol, conventional medicine tends to neglect age-related hormone imbalances that develop in both men and women. The result is that many aging people suffer discomforts and diseases that are correctable and preventable by making simple hormone level adjustments. Mainstream medicine accepts these imbalances of life-sustaining hormones as “normal” in aging people. These practitioners almost never test for hormone levels, and largely reject the idea of restoring hormone profiles to youthful ranges. Increasingly, however, aging adults no longer want to be prisoners of poor health due to declining hormone levels.

Because most doctors rarely order advanced screening tests such as CRP (C-reactive protein), DHEA-S (dehydroepiandrosterone-sulfate) or estradiol, Life Extension created the Male and Female Life Extension Panels to provide a comprehensive overview of critical risk factors and predictors of future diseases. The panels comprise the most requested tests, which happen to be the best screening tools for identifying many common and not-so-common conditions. A yearly blood test is a relatively inexpensive investment when compared to the cost of disease-related health care and prescription medications, with tremendous potential to protect your health and increase your quality of life.

While many of the tests in the Male and Female Panels overlap, they diverge in measures that are specific to the health concerns of men or women. The men’s panel includes measurement of prostate-specific antigen (PSA), a marker of enlarged prostate or prostate cancer, while the women’s panel assesses progesterone levels, an important female hormone related to a host of menopausal and post-menopausal disorders.

Both panels include the CBC/Chemistry Profile, which measures over 40 different blood components, including cholesterol and triglyceride levels, blood glucose, iron and mineral levels, kidney and liver function, and blood cell components.

The Male and Female Panels also test for levels of total and free testosterone, DHEA-S (an indicator of adrenal cortical function), estradiol, homocysteine, and C-reactive protein (CRP). Both homocysteine and CRP, along with LDL, are powerful predictors of cardiovascular disease.

Table 1 below summarizes the different components offered in the Male and Female Panels.

TABLE 1: Components of Male and Female Panels	
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MALE PANEL	FEMALE PANEL
Complete Blood Count	Complete Blood Count
Chemistry Panel	Chemistry Panel
Total and Free Testosterone	Total and Free Testosterone
DHEA-S	DHEA-S
Estradiol	Estradiol
Homocysteine	Homocysteine
Cardio CRP	Cardio CRP
PSA	Progesterone

COMPLETE BLOOD COUNT (CBC)

The Complete Blood Count (CBC) measures the number, variety, percentage, concentration, and quality of blood cells. It is useful in screening for infections, anemias, and hematological abnormalities. The CBC includes red blood cells (RBCs), hematocrit, hemoglobin levels, red blood cell indices, platelet count, and white blood cells (WBCs) and their components.

RBC COUNT, HEMATOCRIT, HEMOGLOBIN, RBC INDICES, PLATELETS

Red blood cells (RBCs) transport oxygen from the lungs to body tissues and transfer carbon dioxide from the tissues back to the lungs. Hemoglobin, an iron-containing component of red blood cells, serves as the vehicle for transporting oxygen and carbon dioxide through the body. Hematocrit measures the mass of red blood cells as a percentage of the volume of whole blood. Thus, abnormalities in red blood cells, hemoglobin, or hematocrit can affect the body’s ability to deliver oxygen to its tissues. Red blood indices measure the size and hemoglobin concentration of red blood cells, providing clues to nutritional status and oxygen-carrying capacity. Platelets are an essential part of the coagulation (clotting) cascade, and normal levels are necessary to maintain hemostasis.



Abnormally low RBC, hemo-globin, or hematocrit levels may indicate anemia due to deficiencies of iron, vitamin B6, vitamin B12, or folic acid,¹ as well as certain chronic diseases. Hematocrit levels can be depressed by dehydration or blood loss, and elevated by a condition that is marked by increased production of red blood cells.

Mean corpuscular volume (MCV) is calculated by dividing hematocrit by RBC count. A decreased value indicates small red blood cells, which are often correlated with iron-deficiency anemia. In contrast, an elevated MCV is associated with macrocytic anemia, which can be caused by deficiencies of vitamin B12 or folic acid.² Abnormal distribution of the RBC width (RDW) may detect such problems as aplastic anemia, thalassemia, anemias, and deficiencies of iron, folate, and vitamin B12. Decreased platelet counts may be seen in patients undergoing chemotherapy or in hemolytic anemia, leukemia, and other disorders characterized by diminished clotting ability.

WBC COUNT AND COMPONENTS (LYMPHOCYTES, MONOCYTES, NEUTROPHILS, EOSINOPHILS, AND BASOPHILS)

White blood cells (WBCs) are an important component of the immune system. Increased levels of all types of WBCs in the blood are usually associated with bacterial, viral, parasitic, or protozoal infections. While the total count of WBCs can provide general information about one’s state of health, it is the differential count that provides the most useful information.

When elevated, neutrophils, which are the first WBCs to respond to infection, often indicate bacterial infection. Decreased neutrophil levels may indicate chronic infection or bone marrow depression. Deficiencies of vitamin B12 and folic acid can also cause diminished neutrophil production.³ Monocytes, the body’s second line of defense against infection, can be elevated in conditions such as leukemia and lymphomas. Lymphocytes are the source of serum immunoglobulins and cellular immune responses, and elevated levels can indicate the presence of a viral infection. Increased basophil count is most often associated with leukemias or Hodgkin’s disease. Elevated eosinophil count often indicates allergies or parasitic infection.

CHEMISTRY PROFILE

The Chemistry Profile is an excellent place to begin your disease-prevention program, as it provides a wide range of diagnostic information to assess cardiovascular, endocrine, hepatobiliary, and kidney function. The following overview and table summarize test indications and problems associated with abnormally high or low test values.

CARDIOVASCULAR

The Chemistry Profile provides up-to-date information on the status of your cardiovascular system. These tests include total cholesterol, HDL (high-density lipoprotein) and LDL (low-density lipoprotein), triglycerides, and total cholesterol/HDL ratio, which is more valuable as a predictor of heart disease than total cholesterol or HDL levels alone.⁴ When combined with measurements of C-reactive protein and homocysteine, these tests serve as powerful indicators of cardiovascular status, including risk of future heart disease.⁵

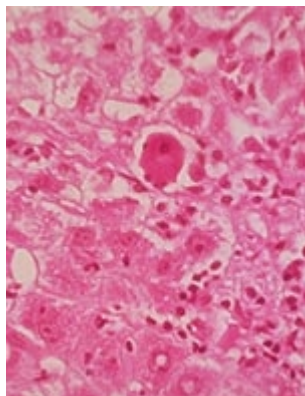
ENDOCRINE

The endocrine system is responsible for producing hormones throughout the body. One of the most critical hormones is insulin, a regulator of glucose uptake and utilization. Measuring your blood glucose may be the single most important step you can take to prevent metabolic syndrome and diabetes. The Chemistry Profile measures fasting glucose levels. Skewed values may indicate problems with glucose metabolism, such as hyperglycemia (an indicator of diabetes mellitus) or hypoglycemia (low blood sugar, which may preempt hyperglycemia in some individuals), acidosis or ketoacidosis, and other problems with carbohydrate metabolism.

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Hepatitis, inflammation of the liver, showing disarray of the hepatocytes or liver cells.

HEPATOBIILIARY

The hepatobiliary system comprises the liver and gall bladder. The liver functions as the body's key detoxification system for toxins, pharmaceuticals, and hormone breakdown products. Without the liver functioning at optimal capacity, the body would literally poison itself. Peak liver function ensures that the body is able to neutralize harmful compounds and regulate sugar and lipid metabolism. The gall bladder serves as a storage vessel for bile, which is used in the digestion of food.

Abnormal levels of protein, albumin, globulin, albumin/globulin ratio, bilirubin, alkaline phosphatase, lactic dehydrogenase (LDH), AST (SGOT), ALT (SGPT), iron, cholesterol, and lipoproteins indicate potential liver/biliary problems. These may include liver damage induced by alcohol or drug abuse, liver cancer, or obstruction of the bile duct, among others. Together, ALT and AST allow for differential diagnosis of disorders associated with the hepatobiliary system and pancreas. High levels of alkaline phosphatase may also indicate abnormally high levels of vitamin D or diseases of the liver or bones.

KIDNEY

The kidneys, a component of the urinary system, help regulate blood pressure and are responsible for regulating the pH, mineral concentration, and water composition of blood. The kidneys filter and remove waste (especially urea) from the blood and eliminate it along with water as urine. Checking your kidney function can help you avoid irreversible kidney damage from medications and illnesses.

Kidney function can be assessed by evaluating blood levels of blood urea nitrogen (BUN), uric acid, creatinine, BUN/creatinine ratio, sodium, potassium, and chloride ions. BUN measures urea nitrogen, a breakdown product of protein metabolism, in the blood. Most diseases affecting the renal system affect urea excretion by the kidneys and will elevate BUN levels. Creatinine, a breakdown product of muscle creatine phosphate, is excreted by the kidneys, and its level may be used to assess the rate of kidney filtration. Abnormally high creatinine levels may indicate impaired renal function, renal failure, or dehydration, and decreased levels may indicate liver disease. The BUN/creatinine ratio may help determine factors causing decreased kidney function, such as dehydration. Sodium, potassium, and chloride ion levels help evaluate hydration status and electrolyte balance. High levels of potassium may indicate renal failure or dehydration, while low levels can occur with diarrhea, vomiting, or excessive sweating.

HORMONE LEVELS

Testosterone (free and total)

The hormone testosterone plays different roles in men and women, including the regulation of fertility, libido, and muscle mass. It exists as free testosterone, which is active and unbound, as well as in a form bound to either albumin or sex hormone binding globulin (SHBG). Included in both the Male and Female Panels, testosterone is produced in the testes in men, in the ovaries in women, and in the adrenal glands of both men and women.

Approximately 50% of testosterone is bound to SHBG and the remainder to albumin. In the serum of both men and women, less than 2% of testosterone typically is found in the free (uncomplexed) state. Unlike bound testosterone, the free form of the hormone can circulate in the brain and affect nerve cells.⁶

Total testosterone is useful for assessing gonadal, adrenal, and pituitary function in men. In women, total testosterone can help in the evaluation of Stein-Leventhal (polycystic ovarian) syndrome, testosterone-producing tumors of the ovary, tumors of the adrenal cortices, and congenital adrenal hyperplasia.



In men, free testosterone levels may be used to evaluate whether sufficient bioactive testosterone is available to protect against abdominal obesity, mental depression, osteoporosis, and heart disease. In women, high levels of free testosterone may indicate hirsutism, which causes excessive hair growth on the face and chest, and is often indicative of polycystic ovaries. Increased testosterone in women also suggests low estrogen levels.

Importance of Testosterone in Men

In men, testosterone production is stimulated by luteinizing hormone, which is produced by the pituitary gland. Luteinizing hormone stimulates the Leydig cells in the testes to produce testosterone. Testosterone levels normally decline with age, dropping to approximately 65% of young adult levels by age 75.⁷ This drop in testosterone is partially responsible for the significant physiological changes seen in aging men. In fact, low levels of testosterone are associated with numerous adverse health conditions, including diminished libido, erectile dysfunction, loss of muscle tone, increased abdominal fat, low bone density, depression, Alzheimer's, and heart disease.

The studies described below underscore the value of maintaining youthful free testosterone levels:

- **Depression.** The relationship between depression and testosterone was assessed in 856 men between the ages of 50 and 89. The study results showed depression was significantly correlated with lower levels of bioavailable (free) testosterone levels, leading the researchers to suggest, "testosterone treatment might improve depressed mood in older men who have low levels of bioavailable testosterone."⁸
- **Type II diabetes.** A recent study in the Journal of Clinical Endocrinology and Metabolism found a link between type II diabetes and decreased testosterone levels in men. According to S. Dhindsa and colleagues, 33% of study subjects with type II diabetes had low testosterone levels. This deficiency, referred to as hypogonadism, was the result of pituitary gland malfunction. This study was the first to link hypogonadism with type II diabetes.⁹
- **Atherosclerosis and heart disease.** The relationship between coronary artery disease and testosterone levels was investigated in men aged 40-60 with and without atherosclerosis. Investigators in Poland found a significant association between diminished testosterone and decreases in insulin sensitivity and HDL. The study authors concluded that low levels of total testosterone often appear with features of metabolic syndrome, and may be involved in the pathogenesis of atherosclerosis.¹⁰
- **Alzheimer's disease.** A study from the University of Texas found that elderly hypogonadal males with newly diagnosed Alzheimer's re-responded favorably to testosterone replacement therapy. Following treatment with intramuscular testosterone (200 mg every two weeks for one year), patients showed improvements in the Initial Alzheimer's Disease Assessment Scale cognitive subscale as well as the Mini Mental Status Examination. The placebo-treated group "deteriorated gradually." The investigators concluded that testosterone "could indeed improve cognition, including visual-spatial skills in mild to moderate Alzheimer's disease."¹¹

Importance of Testosterone in Women

Although women produce only small quantities of testosterone, mounting evidence indicates that this important hormone helps women maintain muscle strength and mass. Investigators reporting in the Journal of Clinical Endocrinology and Metabolism found that when obese women were given low doses of a synthetic testosterone analogue, they lost more body fat and subcutaneous abdominal fat, and gained more muscle mass, than women given placebo. The testosterone-supplemented women experienced a slight increase in resting metabolic rate.¹²



Progesterone (Female Panel only)

Progesterone, a steroid hormone produced in men and women, is synthesized in a biochemical pathway leading from cholesterol to pregnenolone to progesterone, which in turn is a precursor to other steroid hormones, including cortisol, estrogen, and testosterone. In women, progesterone is produced in the corpus luteum of the ovary, in smaller amounts by the adrenal glands, and in copious amounts by the placenta during pregnancy.

With advancing age, progesterone levels decline. Following menopause, progesterone levels decrease dramatically to nearly undetectable levels; along with estrogen, low progesterone may be responsible for bone loss leading to osteoporosis. Low progesterone levels may also be associated with irregular menstrual cycles, heavy bleeding, endometriosis and uterine fibroids, tender breasts, and mood swings. High levels of progesterone relative to estrogen can cause increased insulin

levels, decreased insulin sensitivity, weight gain, reduced libido, and depression.

DHEA-S

Dehydroepiandrosterone, or DHEA, is a hormone produced by the adrenal glands. Serum levels of its sulfated form, DHEA-S,

measure adrenal cortical function. Elevated levels, which peak during one's twenties, may indicate congenital adrenal hyperplasia, a group of disorders that result from the impaired ability of the adrenal glands to produce corticosteroids. Between the ages of 70 and 80, DHEA-S levels decline to 20-30% of peak value. Clinical trials are evaluating DHEA's role in memory and Alzheimer's.

According to researchers, DHEA-S may be implicated in longevity. Men with high levels of DHEA may be less likely to die of cardiovascular disease by affecting levels of the inflammatory cyto-kines interleukin-6 and TNF-alpha, which are part of the inflammatory cascade that is associated with heart disease, Alzheimer's, and even certain cancers.¹³

Estradiol

In non-pregnant women, estradiol is the most commonly measured type of estrogen. Its levels vary throughout the menstrual cycle, and drop to low but constant levels after menopause. Increased levels of estradiol in woman indicate an increased risk of breast or endometrial cancer.^{14,15} Low levels may increase the risk for bone fractures.

A recent study from the Netherlands found a clear association between estradiol levels and vertebral fractures in elderly women. Women with the lowest levels of estradiol had more than a twofold greater risk of incident vertebral fractures, independent of bone mineral density. Women with low estradiol combined with high sex hormone binding globulin concentrations had a 7.8 times higher risk of incident vertebral fracture. Researchers found no clear association between testosterone and vertebral fracture risk in women.¹⁶

Men produce estradiol in much smaller amounts than do women. For men, estradiol is an indicator of hypothalamic and pituitary function. Increased levels of estradiol, along with decreased levels of testosterone, may accompany diminished sex drive and difficulty with urination. In men, estradiol and testosterone levels should be tested together.

In men, estrogen deficiency is implicated in the pathogenesis of osteoporosis. A study from Denmark examined a group of men diagnosed with osteoporosis. It found that none of the cases was attributable to hypogonadism (low testosterone), while 38% of men had undetectable levels of estradiol. Investigators concluded, "estrogen deficiency is much more prevalent than androgen deficiency in primary male osteoporosis," and future "screening tests for osteoporosis in men should therefore include assessment of serum estradiol."¹⁷

HOMOCYSTEINE

Homocysteine is an amino acid formed during the metabolism of methionine. Elevated homocysteine levels are an independent risk factor for coronary artery disease and stroke. Data also indicate that homocysteine levels may be increased in patients with depression. Deficiency of folic acid, a B vitamin that plays important roles in mood and homocysteine breakdown, may be the link between depression and elevated homocysteine.¹⁸

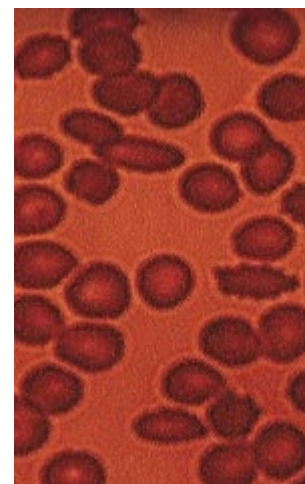
Researchers in the Netherlands investigated whether homocysteine levels were a risk factor for cognitive decline in normal individuals between the ages of 30 and 80. Follow-up after six years revealed that while "a relation between vitamin B12 or folic acid and cognition was almost absent, elevated homocysteine concentrations were associated with prolonged lower cognitive performance in this normal aging population."¹⁹

Incremental increases in homocysteine levels correlate with increased risk for coronary artery disease. Data from the Physicians' Health Study, which included 14,916 healthy male physicians with no prior history of heart disease, showed that highly elevated homocysteine levels were associated with a more than threefold increase in the risk of heart attack over a five-year period.²⁰

Homocysteine is also becoming recognized as an independent risk factor for bone fractures. According to two studies published in the New England Journal of Medicine in 2004, high homocysteine levels are associated with osteoporotic hip fracture. Dutch researchers studied the association between homocysteine

levels and the incidence of osteoporotic fracture in 2,406 subjects aged 55 and older. They found that an "increased homocysteine level appears to be a strong and independent risk factor for osteoporotic fractures in older men and women." The authors noted that while folic acid supplements can effectively reduce homocysteine levels, additional studies are needed to assess whether such therapy will reduce the risk of fracture.²¹

These results were corroborated in another study that assessed the association between homocysteine levels and risk of hip fracture in men and women enrolled in the Framingham Heart Study. RR McLean and colleagues said their findings "suggest that



the homocysteine

concentration, which is easily modifiable by means of dietary intervention, is an important risk factor for hip fracture in older persons," but that further "population-based research is needed to examine the role of homocysteine in osteoporosis and osteoporotic fracture and to determine whether nationwide folic acid fortification of food will help to reduce rates of hip fracture in the United States."²²

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CARDIO C-REACTIVE PROTEIN (HIGH SENSITIVITY)

Inflammation is a pathogenic mechanism for development and progression of atherosclerosis and heart disease, as well as other disorders such as arthritis, cancer, and autoimmune conditions. C-reactive protein (CRP) is a very sensitive marker of systemic inflammation, and has emerged as a powerful predictor of coronary heart disease and other diseases of the cardiovascular system.²³

Elevated levels of CRP have also been associated with the risk for developing type II diabetes,²⁴ loss of cognitive ability in seemingly healthy people,²⁵ and major depression in men.²⁶

A study published in the New England Journal of Medicine in January 2005 found that among patients who were given statin drugs to lower cholesterol, those who achieved lower CRP levels had better clinical outcomes than those with higher CRP levels. The investigators concluded, "strategies to lower cardiovascular risk with statins should include monitoring CRP as well as cholesterol."²⁷

The highly sensitive cardio CRP test measures C-reactive protein in the blood at very early stages of vascular disease, allowing for appropriate intervention with diet, supplements, or anti-inflammatory therapy. The cardio CRP test detects much smaller levels of inflammation than the regular CRP test, so is therefore able to identify at-risk patients earlier, even among apparently healthy persons.

A review of epidemiological data found that high-sensitivity cardio CRP was able to predict risk of incident myocardial infarction, stroke, peripheral arterial disease, and sudden cardiac death among healthy individuals with no history of cardiovascular disease, and predict recurrent events and death in patients with acute or stable coronary syndromes. This inflammatory marker provided prognostic information that was independent of other measures of risk such as cholesterol level, metabolic syndrome, and high blood pressure. Greater levels of cardio CRP are associated with higher cardiovascular risk.²⁸ High-sensitivity CRP testing also reveals systemic inflammation that is associated with disease activity in patients with rheumatoid arthritis.²⁹

PROSTATE-SPECIFIC ANTIGEN (MALE PANEL ONLY)

Prostate-specific antigen (PSA) is a protein manufactured by the cells of the prostate gland in men. Elevated PSA levels can suggest benign prostatic enlargement, prostate inflammation, or prostate cancer. Measurement of PSA levels is thus a screening tool. PSA may also be used to monitor progression of prostate disease and response to treatment.

The PSA test has been widely used since the early 1990s. During that time, the prostate cancer death rate has dropped. The American Cancer Society recommends annual PSA testing beginning at age 50. Men who are at high risk should begin PSA testing at age 40-45. PSA levels go up with age, even in the absence of prostate abnormalities.³⁰

PSA velocity is the change in PSA values over time. It is determined by monitoring PSA values over the course of one or more years. PSA values that increase dramatically over time suggest that cancer may be present and a biopsy should be considered.³¹

A recent study demonstrated that PSA levels tend to be lower in obese men than in men of normal weight. As a result, physicians may not suspect prostate enlargement or cancer in heavier men, and these conditions may go undetected. Therefore, physicians must be particularly diligent when screening heavier men for prostate conditions. A digital rectal exam may be used as an additional screening tool along with PSA testing.³²

CONCLUSION

The Male and Female Panel discussed above can be your best defense against a range of degenerative diseases including cardiovascular disease, diabetes, cancer, stroke, immune disorders, blood abnormalities and inflammation. Armed with these annual lab findings, you can take timely and critical steps to prevent many of the diseases associated with aging.



View Male and Female Panel Charts

(You will need Adobe® Reader® installed on your computer to view this file.)

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