

Four Important Tests Where Ranges for Normal Vary

The right test can often solve health mysteries and bring about a complete diagnosis. Some of these tests are not routine, and must be requested. Compounding the issue is that one might get the test, but because ranges for normal vary from lab to lab the diagnosis continues to be missed. Serum ferritin (SF), Thyroid Stimulating Hormone (TSH), gamma-glutamyl transpeptidase (GGT--a liver enzyme) and Vitamin D are among the tests that can be extraordinarily helpful, but often declared normal because results are "within range" when, for the individual, the levels are actually abnormal.

Serum ferritin (SF): Ferritin is a protein produced by the body to contain iron. Low serum ferritin detects iron deficiency, (low hemoglobin detects "anemia"; SF determines iron deficiency); high serum ferritin is present with inflammation or excess tissue iron. Serum ferritin reference ranges differ by age and gender. Newborns and infants have very high levels of ferritin, whereas adult measurements range from about 15 – 200 ng/mL for women and 20 – 300 ng/mL for men. Elevated SF can be present in people before the onset of chronic conditions such as diabetes mellitus, bone and joint disease, cardiovascular disease, liver/gallbladder disease, hormone imbalances and some cancers. Serum ferritin distinguishes "defense anemia" (anemia of inflammatory response) from iron deficiency anemia. Donating blood will lower serum ferritin. Ferritin levels can be increased with supplemental iron, blood transfusion, iron infusion or diets rich in heme iron found in meat, especially red meat. Presently the Iron Disorders Institute Medical and Scientific Advisory Board members are discussing the issue of establishing an ideal serum ferritin range of 50-150ng/mL for adults.

gamma-glutamyl transpeptidase (GGT) is a liver enzyme that has traditionally been measured to detect liver health and function. The normal biologic role of GGT is to reconstitute glutathione, the body's master antioxidant. Glutathione provides natural protection against harmful oxidative stress. When GGT concentrations are above "low-normal" ranges, excess GGT can catabolize (break down) glutathione causing critical depletion of this very important antioxidant. When glutathione is depleted, and only insufficient amounts remain to protect the body's organs from oxidative stress, damage starts to occur. Excess levels of uncontained metals such as iron contribute to this destructive process. A harmful combination is elevated iron with low GGT. Over time, oxidative stress can lead to a vicious cycle of irreversible cell, tissue and DNA damage, and ultimately to severe impairment of vital organ function. In recent years, elevated GGT measurements have proved to be effective early warning signs of other health risks such as atherosclerosis, stroke, type 2 diabetes, kidney disease and even cancer. Large population studies conducted in the US and around the world have identified increased risks of metabolic syndrome, including cardiovascular disease and diabetes, as well as all-cause mortality in both men and women, when GGT concentrations exceeded the lowest 25% of normal population ranges. Fortunately, an inexpensive blood test can determine GGT concentration. GGT levels can be lowered through a balanced diet that includes ample portions of grains, fruits, nuts and vegetables; this bolsters the body's natural antioxidant defenses. Several studies have shown that blood donation reduces GGT and other enzymes often associated with liver diseases. Coffee and tea consumption help to lower GGT levels; excessive alcohol consumption can increase GGT. Elevated GGT depletes glutathione and impairs antioxidant protection. The high end of "normal" GGT laboratory ranges are generally 65 – 70 U/L for men and 40 – 45 U/L for women.

thyroid stimulating hormone (TSH): is an indirect way to determine under-active or over-active thyroid function. When thyroid function is over-active (hyperactive) the TSH is low. When thyroid function is under-active (hypoactive), the TSH is elevated. People with diseases or conditions that cause iron overload are prone to hypothyroidism, possibly due to iron related injury to the anterior

pituitary. These individuals may suffer with many symptoms before they are properly diagnosed and treated. Depression, infertility, irregular or heavy menstruation, hair loss, poor concentration or poor memory, loss of interest in sex, elevated body fat, irregular slow heart beat, dry itchy skin, heat or cold intolerance, and muscle pain can be attributed to low thyroid function.

Many doctors use 0.5-5.0 mU/L reference range for TSH; The Iron Disorders Institute provides a reference range for TSH of 0.5—3.5mU/L but considering changing its reference range to be compatible with the American Association of Clinical Endocrinologists (AACE) guidelines for TSH of 0.3-3.0mU/L. These tighter ranges help detect hyper or hypo active thyroid sooner.

Vitamin D: Adequate levels of vitamin D protect us against osteomalacia, osteoarthritis, high blood pressure and possibly type 1 or 2 diabetes, some cancers (prostate, colorectal) or multiple sclerosis. We get vitamin D from foods or sunshine, but studies demonstrate that people with adequate exposure to sunshine have insufficient levels of vitamin D. According to the Office of Dietary Supplements, National Institutes of Health: supplemental intakes of 400 IU/day of vitamin D are insufficient and that daily intakes of approximately 1,700 IU are needed to raise these concentrations to more healthy levels.

At risk for low levels of D are people with liver disease, or who have taken anti-tuberculosis or anti-convulsant medications for prolonged periods of time. Also at risk are individuals who have conditions that interfere with absorption (short bowel syndrome, gastric-banding, celiac disease) or problems of fat malabsorption syndromes such as cystic fibrosis or inflammatory bowel disease such as Crohn's disease.

According to clinical researcher vitamin D expert B.W. Hollis, MD, Department of Pediatrics, Medical University of South Carolina, Charleston current adult recommendations for vitamin D, 200-600 IU/d, are very inadequate when one considers that a 10-15 min whole-body exposure to peak summer sun will generate and release up to 20,000 IU vitamin D-3 into the circulation

The 25-hydroxy vitamin D test is the most accurate way to measure how much vitamin D is in your body.

<10-11ng/mL <25-27.5 nmol/L

Associated with vitamin D deficiency, leading to rickets in infants and children and osteomalacia in adults

<10-15 ng/mL <25-37.5 nmol/L

Generally considered inadequate for bone and overall health in healthy individuals ≥ 15 ng/mL ≥ 37.5 nmol/L Generally considered adequate for bone and overall health in healthy individuals

Consistently >200 ng/mL Consistently >500 nmol/L

Considered potentially toxic, leading to hypercalcemia and hyperphosphatemia, although human data are limited. In an animal model, concentrations ≤ 400 ng/mL ($\leq 1,000$ nmol/L) demonstrated no toxicity

* Serum concentrations of 25(OH)D are reported in both nanograms per milliliter (ng/mL) and nanomoles per liter (nmol/L).** 1 ng/mL = 2.5 nmol/L

References:

Vitamin D ranges: National Institutes of Health Office of dietary Supplements, Fact sheet <http://dietary-supplements.info.nih.gov/factsheets/vitamind.asp>
2006 American Association of Clinical Endocrinologists Medical Guidelines for Clinical Practice for the Evaluation and Treatment of Hyperthyroidism and Hypothyroidism.