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It is improbable to always know if physical condition and performance is at an optimal state as some issues have unspoken outcomes. However, the body's system can be observed by blood testing to help achieve desired results whether training for a competition, pursuing an individual goal, or improving general health.

Besides looking at a lipid profile, another important step to monitoring health is by establishing a baseline of values for fasting glucose, ferritin, vitamin B-12, and vitamin D. For the purposes of this article, these are the four blood profiles that will be emphasized. Next comes knowing what the standard values are and then aiming for peak levels, if appropriate.

GENERAL BLOOD MARKERS

Fasting Glucose: The body uses glucose for energy. The body must keep blood glucose in a tight range. Approximately 25% of those who have an ideal bodyweight and composition still show pre-diabetic numbers (7). Chronic stress or poor sleeping practices can also impact blood sugar levels in a detrimental way (6). If fasting glucose numbers are too high or too low there are negative consequences including eye, heart, kidney, and neurological damage (19). According to the American Diabetes Association, a fasting blood glucose level between 70 and 100 milligrams per deciliter is considered normal (1).

Ferritin: Ferritin is a protein found mostly in the liver, skeletal muscles, spleen, and bones. It stores iron in these areas so the body can use it in the future. The preponderance of iron stored in the body is found in ferritin. Because of this, the ferritin test is often the preferred measurement to determine the amount of iron in the body (4,20). At least 25% of any group of athletes can be expected to exhibit low ferritin levels without being anemic (18). Athletes who are most susceptible are ones with a low dietary iron intake, menstrual losses, and high training levels. Low ferritin levels may lead to anemia, extreme fatigue, impaired cognitive performance, suboptimal metabolism, susceptibility to infection, and compromised immune system and brain development (3,8). The range of ferritin levels that is considered "healthy" remains a controversial topic since recent studies have suggested that even non-athletes may need more than previously thought (12).

Many authorities recommend iron supplementation for hypoferritinemic individuals (16,23). Besides supplementation, 8 – 32 mg of iron per day through dietary intake is suggested pending on dietary practices. Too much iron intake can also be harmful to individuals, so caution is advised to maintain healthy levels. Good food sources of iron include liver, beef, chicken, salmon, lentils, beans, potatoes, quinoa, spinach, broccoli, apricots, potatoes, pumpkin seeds, thyme, 80% dark chocolate, molasses, tofu, and tempeh.

Vitamin B12: Vitamin B12 is a water-soluble vitamin that plays an important role in the body. It helps with the formation of

red and white blood cells, the metabolism, and oxygen delivery to the tissues (9). It also impacts the function of the brain and central nervous system. Signs of constipation, fatigue, loss of appetite, memory loss, shortness of breath, and weakness are all side effects of vitamin B12 deficiency. Declining vitamin B12 numbers can be linked to low stomach acid, excess alcohol intake, gut inflammation, medications, pernicious anemia, post-surgical malabsorption, and vegetarianism (10,22). A study showed that 40% of people between the ages of 26 and 83 had B12 levels in a range at which many experienced neurological symptoms, and another 25% had low or outright deficiency (11). The most unpredicted outcome was the similarly low levels found in younger people when compared with mature adults (11). Animal products, including meat, poultry, fish, seafood, eggs, and dairy products are excellent sources for vitamin B12 (24).

Vitamin D: Vitamin D is a secosteroid, which is a derivative of a steroid with a broken ring. It functions as a modulator for as many as 1,000 genes; is involved in calcium homeostasis, bone health, immunity, inflammatory intonation, and skeletal muscle function; and has a potential impact on training and performance of athletes (5,14,17). The best indicator of vitamin D levels is to measure serum 25(OH)D, which is commonly done with a 25-Dihydroxyvitamin D test. Generally, vitamin D levels range from 32 – 100 ng/dl on most lab reports.

One research study found that 72 out of 89 National Football League (NFL) players (with an average age of 25 years old) exhibited inadequate levels of Vitamin D (2). Deficiency may be linked to an increase in muscle injuries (2). Out of these 89 NFL football players, 27 players had deficient levels (<20 ng/dl) and 45 had insufficient vitamin D levels (20 – 31.9 ng/dl). Sixteen out of the 27 players suffered a muscle injury with a mean vitamin D level of 19.9 ng/dl. Possible signs of low vitamin D levels are fatigue, achiness, and compromised immune system. The goal is to strive for 200 international units (IU) of vitamin D a day from food and the rest from ideal sun exposure (15). Additional supplementation may be needed if an inadequate amount of sun exposure is not obtained. Fatty fish (e.g., mackerel, salmon, sardines, oysters, catfish, and tuna), fortified milk, egg yolks, fortified mushrooms, and certain brands of margarine, yogurt, and cereal are reputable sources for this vitamin (21).

VALUE OUTCOMES

All individuals with desirable values should continue to monitor their numbers over the years. Always get a copy of lab results and file them away for comparison. If any numbers seem irregular or suboptimal, it is highly suggested to seek out help from a sports dietitian, qualified nutritionist, or other health professionals.

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ABOUT THE AUTHOR

Dawn Weatherwax is a Registered Dietitian with a specialty in Sports Nutrition and is the Founder of Sports Nutrition 2Go. She is also a Board Certified Specialist in Sports Dietetics, which is the premier professional sports nutrition credential in the United States. In addition, she is an athletic trainer and a Certified Strength and Conditioning Specialist® (CSCS®) from the National Strength and Conditioning Association (NSCA). Therefore, she brings a comprehensive and unique understanding of an athlete's body and its nutritional needs to those interested in achieving specific performance goals and optimal health. She is also the author of "The Official Snack Guide for Beleaguered Sports Parents" and "Complete Idiot's Guide to Sports Nutrition," as well as a contributing author for "Unique Considerations for the Female Athlete."

TABLE 1. NORMAL VALUES FOR BLOOD PARAMETERS

ITEM	OPTIMAL RANGES MALES	OPTIMAL RANGES FEMALES
Fasting Glucose (mg/dl)	70 - 100	70 - 100
Vitamin B12 (pg/mL)	300 - 1000*	300 - 1000*
Vitamin D; serum 25(OH)D (ng/dl)	40 - 70	40 - 70
Ferritin (ng/mL)	20 - 100	40 - 100

* Some believe that vitamin B12 should be at least above 500 pg/mL (24)



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