

Iron Deficiency in Athletes

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The importance of proper nutrition and a well balanced diet for health and optimum performance in athletes are understated. Often the results of a poor diet in athletes manifest themselves when the athletes start to suffer from problems associated with iron deficiency. Sufficient iron intake is one of the key factors influencing whether or not an athlete will be healthy and able to perform to their maximum ability. Unfortunately, many athletes have iron deficiencies caused by poor diet and they lack the knowledge of how necessary it is for their health and sport to remedy this problem. Athletes are frequently reminded about the importance of consistent training, drinking lots of water, and getting enough sleep. Yet how often are they told to ensure that they are getting enough iron to function properly? It is quintessential that further education about iron deficiencies and iron deficiency anemia (a condition that occurs when iron stores are severely depleted) is made readily available to athletes and their coaches through athletic organizations, sport-specific magazines, and essays such as this one.

Iron is vital for the circulatory system to function properly. It is required for the manufacture of hemoglobin, the part of red blood cells that oxygen binds to for transport throughout the tissues.(1+) It is also used to make myoglobin, a protein “present in large amounts in the muscles of mammals... where it acts as an oxygen store”(The Wordsworth Dictionary of Biology). If the level of iron and therefore the amount of hemoglobin being produced decreases, “the oxygen-transporting capacity of the blood is impaired”(<http://www.time-to-run.com/doctor/anemia.html>). This causes the athlete’s performance capabilities to be dramatically decreased and they may experience “unexplainable” fatigue and feel low on energy. Iron is also used in cytochromes, which

are catalysts in energy transfer within cells. A lack of iron can therefore also impair proper cell function. Iron makes up 23% of the serum ferritin, an iron-phosphorus-protein complex which acts as an iron store in the liver. These stores in the vital organs can be easily depleted if an athlete does not have proper nutrition. As it is, iron occurs in low quantities in the human body, approximately “3 -5 grams”

(<http://www.rice.edu/~jenky/sports/iron.html>) in an adult. Therefore, it is very easy for an athlete to fall below these required amounts without even realizing it.

Clearly, iron is important for all people to function properly. Why then is it so especially important to athletes? The answer lies in the fact that the determinant factor in an endurance athlete’s performances is how much oxygen the athlete can use in a set period of time. The maximum amount of oxygen the athlete can use is determined by macroscopic, microscopic, and molecular factors. The macroscopic factors being the strength and size of his/her heart and lungs, the microscopic being the athlete’s capillaries and muscle tissue type, and the molecular being how cell parts such as hemoglobin function. In this situation the molecular factor is not functioning properly due to the shortage of hemoglobin because of the athlete’s iron deficiency. Therefore, the athlete’s cardiovascular system will not be able to work to its full potential because it lacks the means to transport the oxygen the athlete requires. Because of this, anaerobic conditions will occur in the athlete’s tissues before they would if the athlete had enough iron in their system. Now lactic acids will build up quickly and the athlete could experience fatigue and muscle cramps prematurely.

An iron deficiency can be caused by a variety of factors. However, the most prevalent is that the athlete’s diet does not supply them with enough iron. Often the

athlete is unaware of their dietary problem and therefore it can continue for some time without being recognized and dealt with. Athletes who exercise strenuously on a daily basis also lose iron through sweat, in their intestines, and by taking non-steroidal anti-inflammatory drugs to get rid of soreness (these drugs reduce the body's ability to absorb iron). Athletes, who participate in high impact sports such as running, often suffer from foot strike hemolysis, which is the destruction of red blood cells (and therefore iron) in the feet due to constant impact.

Women are far more likely to develop an iron deficiency than men. Up to '80% of female endurance athletes' (www.ivillagehealth.com/interests/women/articles) have an iron deficiency" whereas only 15% of male long distance runners do. Menstruating women are the most likely candidates for iron deficiencies as 0.6-15mg of iron are lost a day during a female athlete's menstruation. Other than women, vegetarian athletes and runners are the most likely to have iron deficiencies. Because vegetarians consume no meat, they lack the greatest source of iron in most people's diets. Runners are also especially susceptible to iron deficiencies because they absorb only 16% of the iron that passes through their gastrointestinal tract versus non-runners who absorb 30%.

When an athlete becomes iron deficient several unhealthy things occur in their body. Their red blood cells become too small, their hemoglobin levels are decreased, and their serum ferritin concentration is too low. As well, their immune system becomes impaired and the flow of oxygen to their muscles is decreased, leading to a drop in their maximum performance capability. There are three main stages to an iron deficiency and each is characterized by specific symptoms. The first is known as 'iron depletion' and often its symptoms are very hard to detect, the only change in the body's chemistry is that

the stores of serum ferritin in the liver are low because the body has been using them in an effort to compensate for the loss of iron intake through the diet.

The second stage is known as ‘iron-deficient erythropoiesis,’ which means that the iron shortages have led to the body’s failure to produce adequate amounts of hemoglobin. In this stage the serum ferritin levels continue to drop. The athlete’s performance will start to be effected and he/she may experience burning in the thighs and nausea due to the premature anaerobic conditions in the muscles caused by a lack of fresh oxygen to the tissues.

The final and most severe stage of an iron deficiency is ‘iron deficiency anemia’ which occurs when a male’s hemoglobin count falls below fourteen grams per deciliter and a female’s below twelve grams per deciliter. The athlete will feel weak, tired, breathless, have very little endurance, and will experience a sharp drop in their performance capabilities. Headaches, rapid heart beat, dizziness upon standing, insomnia, poor body temperature regulation, a pallor complexion, and low mental and physical energy are all common symptoms of iron deficiency anemia. Several of these symptoms are caused by an accelerated heart rate. Because of the low levels of oxygen in each red blood cell, the heart is pumping more blood, more often, to try to prevent the body’s tissues from becoming oxygen-starved. However, an athlete ‘reaching’ iron deficiency anemia is rare, most athletes who are iron deficient fall into the second stage of deficiency.

Once an iron deficiency is suspected in an athlete, they should be tested immediately to discover the severity of their condition as well as what treatment options would be best suited for them. There are several methods of testing for an iron

deficiency, the best being to determine the serum ferritin levels. They are extremely sensitive to an iron deficiency and it is unlikely that they would drop for any other reason. Other methods include blood cell analysis and finding the relative size of red blood cells (cells suffering from iron depletion will be smaller due to the fact that there will be less hemoglobin contained in them). Whatever the method, a positive diagnosis should be taken seriously and seen as an immediate medical concern by the patient.

If a positive diagnosis is made, treatment should begin immediately. It is generally fairly simple as there are only two main options for treatment. The first and most favourable option is for the athlete to begin eating a well balanced diet that is high in iron-rich foods. The athlete should maintain this diet after they have brought their iron stores back up to a normal level to prevent a reoccurrence of their iron deficiency. The second treatment option can be combined with the first and it is to take iron supplements such as ferrous sulphate. It however is not as preferable as “the natural way” because there can be negative side effects that accompany these supplements, such as diarrhea, constipation, severe heart and liver damage, and interference with zinc and copper absorption. It is therefore best to consult a physician before beginning treatment with iron supplements.

Of course, the best possible scenario is for an athlete to prevent iron deficiency from ever occurring. This can be achieved by having a healthy, well-balanced diet that takes into consideration the athlete's need for iron. The recommended daily intake of iron is "15mg per day for females and 10mg per day for males" (www.time-to-run.com/doctor/anemia.html). To reach these levels athletes should have a diet that includes red meat, dark poultry, and fish, all of which are the great sources for heme iron which is from the hemoglobin of animals and has a 15% absorption rate in the body. Enriched cereals, dried apricots, prunes, dates, raisins, beans, tofu, and spinach are all good sources of non-heme iron that has a 5% absorption rate in the body. The athlete should avoid coffee and tea both of which contain tannic acid that works against iron absorption. Calcium supplements should also be steered clear of as they also have a negative effect on iron absorption. Foods that are rich in Vitamin C such as oranges and tomatoes are helpful in iron absorption and should be incorporated into the athlete's diet. If the athlete follows these dietary guidelines their iron levels should be normal and they will most likely not be at risk of developing an iron deficiency.

It quickly becomes clear how important iron can be for an athlete to be able to lead a healthy life and reach their maximum performance capability. Though on the surface it appears that iron would be insignificant to an athlete in comparison to training and lots of sleep, it reveals itself to be a key factor in whether or not the athlete will be successful in his/her athletic endeavors. Because of the great influence iron (or the lack there of) can have on an athlete, it is important that athletes and coaches alike are educated and knowledgeable about iron deficiencies and know what nutritional steps they should take to avoid developing one. To not educate athletes on this vital topic is to do

them a great injustice that could not only hurt their athletic capabilities, but also have a great impact on their overall health.

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