



E-BOOK
Physical Activity

Table of contents

Sport related iron deficiency: what are the causes?	3
Why are low haematocrit and low haemoglobin values measured after sports activity?	6
How to manage low serum iron when practising sport	10
How do you select the best iron supplement for athletes?	14
Dietary supplements for athletes: what are the main ones?	19
Sports nutrition: which foods are suitable in cases of iron deficiency?	22





Sport related iron deficiency: what are the causes?

Agonistic athletes may be subject to iron and haemoglobin level below normal range. The causes of this condition can be related to blood loss, hereditary diseases, gastrointestinal diseases that affect the absorption of iron, vitamins and folates. **Sports related deficiency** is a condition that occurs in athletes after intense physical activity and is characterised by **low haematocrit** and **haemoglobin** levels.

Which are the normal value of haemoglobin in the blood?

Haemoglobin reference values may vary depending on gender and age. As an indication, **normal haemoglobin values** are as follows:

Men: 13,4 - 17,5 g/dL

Woman: 12 - 15,5 g/dL

Pregnant women: >11 g/dL

The **average haemoglobin values in children and adolescents** are (depending on age and gender) as follows:

Birth: average 16.5 g/dL

First month: average 14.0 g/L

2 months: average 11.5 g/dL

3-6 months: average 11.5 g/dL

From 6 months to 2 years: average 12.0 g/dL

2-6 years: average 12.5 g/dL

E-BOOK
Physical Activity



Visit Website



Take the Test



Download App



6-12 years: average 13.5 g/dL

12-18 year old girls: average 14.0 g/dL

12-18 year old boys: average 14.5 g/dL

Lower than normal haemoglobin values result in a reduced ability to transport oxygen by **erythrocytes** (red blood cells).

Low Haemoglobin and sport

Low haemoglobin levels may sometimes be measured in sportsmen and sportswomen as a result of intense and prolonged physical exertion. It is an adaptation of the body in response to increased energy and oxygen consumption during physical exertion. The **haemoglobin and haematocrit levels may be lower** as aerobic activity causes an increase in blood volume and consequently a reduction in red blood cell concentration.

It is possible to detect low level of haemoglobin and haematocrit in athletes who practice constant physical activity and it is a condition that usually is not a cause for concern. It is different when this condition overlaps with an **iron deficiency**. In the case of an **iron deficiency**, the body may already be struggling to **maintain normal haemoglobin levels** and physical activity may worsen the situation.

For those who practice **endurance training, foot race, marathon, triathlon** or **other sports** that involve prolonged physical activity, haemoglobin and haematocrit levels may decrease rapidly due to increased intravascular haemolysis. Athletes who practise sports that require significant and prolonged physical exertion may also be subject to micro-traumas that cause micro-bleeding which, in the long run, can affect the balance of iron and haemoglobin in the blood.



How do you overcome iron deficiency by acting on the causes?

When facing **iron deficiency**, the doctor generally may suggest an approach that includes a **diet with iron-rich foods** and eventually the use of **food supplements** or **drugs containing iron**. With an **iron deficiency**, there can sometimes also be a **deficiency of vitamin B12**: in these cases, the doctor will provide a diet rich in foods that also contain vitamin B12, such as meat, eggs, fish, soy and cereals.

Under normal health conditions, a **healthy and balanced diet** is sufficient to keep iron values within the normal range. However, specific physiological conditions (pregnancy, breastfeeding, menstrual cycle) or pathological conditions (diseases that decrease **iron absorption** in the intestine) may cause an **iron deficiency** or **an increased need for this nutrient**. In these cases, the doctor will assess the best diet to balance the iron deficiency and will consider whether to recommend a **dietary supplement** to compensate for the iron deficiency or increased iron demand by the body.





Why are low haematocrit and low haemoglobin values measured after sports activity?

Anyone who practises sport on a competitive level will have already heard of deficiency and **low levels of Haematocrit and Haemoglobin**. This is a condition that can manifest itself after a series of particularly intense close training sessions or when practising endurance sports, which require prolonged exertion. Let's find out the **causes of low haematocrit and low haemoglobin after sport activity** with an in-depth article dedicated to both professional athletes and people who practice sport in their spare time.

Low haematocrit and low haemoglobin in sportsmen and sportswomen: what are the causes?

The causes leading to a clinical picture of **low haematocrit** and **low haemoglobin** values may differ. In this in-depth article, we will deal mainly with a specific condition that may affect healthy people without previous pathologies.

Iron deficiency is a condition that may occur in athletes after intense and prolonged physical exertion. This condition may be sometimes associated with **low haematocrit, low haemoglobin, ferritin in the normal range** and **MCV (Mean Corpuscular Volume) in the normal range**.

The causes that determine this specific condition after intense and prolonged physical activity may be:

E-BOOK
Physical Activity



Visit Website



Take the Test



Download App



- micro-bleeding in muscles;
- moderate destruction of red blood cells that occurs in the microcirculation of the foot due to impacts with the ground (in running) or in the muscles due to contraction (in swimming and cycling);
- alterations in the osmotic resistance of red blood cells and consequent rupture;
- increase in free radicals, lactic acid and body temperature which can promote haemolysis (destruction of red blood cells);
- particularly intense and prolonged exertion can also cause micro-bleeding in the intestine;
- those who practice resistance activity may experience **low values of haematocrit and haemoglobin** associated with a higher haemodilution determined by an increase in plasma osmotic pressure.

Even people who do not practise sports professionally - and who are not trained to cope with an intense and prolonged physical workload - present **iron deficiency**. In athletes, a condition of **low haemoglobin and low iron** can be accentuated by blood loss associated with the menstrual cycle.



Low haematocrit, low haemoglobin and iron deficiency

Sometimes, **low haematocrit** and **low haemoglobin** may be added to **low iron** values. An **iron deficiency** associated with sport activity may manifest itself with symptoms as **general tiredness**, **heavy legs** and **difficulty recovering after physical exertion**.

The **causes of iron deficiency** may differ. The main causes are **low dietary intake**, diseases that cause a **malabsorption of iron in the intestine** (e.g., Crohn's disease, coeliac disease) and specific physiological conditions that lead to an **increased body iron requirement**. In **women**, for example, **iron deficiency** may be associated with menstruation, pregnancy and breastfeeding. In **children** and **adolescents**, it is growth that requires **more iron**.

What should you do in cases of low haematocrit and low haemoglobin after sport?

When the values of Haemoglobin and Haematocrit are mildly below normal range, resting may be enough to bring the **haematocrit and haemoglobin values** back to **normal** while it is different the case where there is a pre-existing condition of iron deficiency.

An **iron deficiency** can affect athletic performance both in training and competition. Athletes who practice endurance sports and suffer from iron deficiency usually follow an **iron-rich diet**.

When there is a clinical picture with **low haematocrit, low haemoglobin and iron deficiency**, it is important to try to bring the **values of iron in the body** back to normal. Nutrition is the first useful approach to overcome **iron deficiency**. Consuming **food rich in iron and vitamin C** (an essential nutrient that facilitates iron absorption and combats the formation of free radicals)





can help to maintain iron levels in cases of mild deficiencies.

When a varied and balanced diet is not sufficient to ensure the normal supply of iron to the body, **food supplements** containing iron, vitamin C and B vitamins can be useful.

E-BOOK
Physical Activity



Visit Website



Take the Test



Download App





How to manage low serum iron when practising sport

Serum iron indicates the amount of “circulating iron” in the body, i.e., the amount bound to transferrin, the protein that carries iron to all tissues of the body. When blood levels of iron are below physiological levels, it is referred to as **low serum iron**. In this in-depth article, we will find out how to manage low serum iron when playing sports on a competitive or amateur level.

Serum iron and sport: what are the values to pay attention to?

Iron is essential for the proper activity of many biochemical and metabolic functions of our body. Specifically, iron is an essential component of haemoglobin and myoglobin, proteins that regulate the transport of oxygen and carbon dioxide in the blood and muscles, respectively.

The measurement of serum iron is useful for assessing the amount of transferrin-bound iron in the liquid blood component (serum). Together with **transferrin** and **ferritin level**, **serum iron** provides a complete overview of the balance and metabolism of iron within the body. This framework is defined in the medical field as the **blood iron level**.

E-BOOK
Physical Activity



Visit Website



Take the Test



Download App



Normal values of serum iron in adults are:

- 65/170 mcg/dL for men;
- 50/160 mcg/dL for women.

When the values of serum iron are lower than the physiological ones, this is known as **low serum iron**. **Causes of low serum iron** may include:

- low dietary iron intake due to poor nutrition;
- specific physiological conditions (pregnancy, breastfeeding, menstrual cycle);
- gastrointestinal conditions that decrease the amount of iron that the body absorbs through the diet (e.g., Crohn's disease, coeliac disease).

Low serum iron may be a sign of iron deficiency, but it should always be assessed in a broader context that includes the measurement of **transferrin** and **ferritin level**. In sportsmen and sportswomen, it is particularly important to monitor the values of iron in the blood to detect a possible deficiency of this nutrient. **Iron deficiency** may be more prevalent in endurance sports or in professional athletes undergoing intense and frequent high level athletic performance. In these cases, the cause of iron deficiency could be **micro-bleeding in the muscles**.

In **women** of childbearing age and in **children**, the increased iron consumption with sport is also accompanied by an increased bodily requirement due to physiological conditions such as menstrual cycle or growth.



What are the most common side effects experienced when playing sports with low serum iron?

The most frequent side effect associated with an iron deficiency is **general fatigue**. This side effect, in the case of sportsmen and sportswomen, can compromise performance in competitions and make training particularly tiring. Other **typical symptoms of iron deficiency** that can adversely affect athletic performance are **tachycardia** and **breathing difficulties**. Further symptoms of **iron deficiency** are pale skin and mucous membranes, increased fragility of nails and hair and certain nervous system disorders, such as headaches, irritability and migraine.

How do you overcome low serum iron when carrying out physical activity on an amateur or competitive level?

An iron deficiency has a negative effect on sporting activity on both the competitive and amateur level. Specifically, for athletes who practice sports that require great physical exertion for a prolonged period of time (e.g., marathon runners, endurance athletes, triathletes) and who are often already subject to low haematocrit and haemoglobin levels after a race or a session of intense physical activity, an **iron deficiency** can also make it more difficult to recover energy.

When there is a condition of **low serum iron** accompanied by **iron deficiency**, it is therefore important to take the right countermeasures to **bring the iron values in the body back to normal**.

The first step to overcome iron deficiency and bringing serum iron values back within the normal range is to follow a diet with **iron-rich foods** and foods rich in **vitamin C** (a nutrient that increase iron absorption). To support the diet, iron and vitamin C supplements can also be taken when necessary.





SiderAL® food supplements containing **Sucrosomial® Iron** can also be useful for athletes who need to **address a deficiency or increased body need for iron.**

E-BOOK
Physical Activity



Visit Website



Take the Test



Download App





How do you select the best iron supplement for athletes?

Those who practice **endurance** sports or **sports that require great physical endurance** know that sometimes nutritional support may be needed to **maintain normal levels of iron in the blood**. In this in-depth article, we will discover the necessary characteristics of the **best iron supplement for athletes** with iron deficiencies or increased bodily iron requirements.

When are iron supplement for athletes necessary?

A balanced diet, capable of providing the right amount of nutrients, is the basis for good health and optimal athletic performance. However, in some cases, diet alone is not sufficient to meet the needs of certain essential nutrients and it **may be necessary to support the body's needs with dietary supplements**.

Iron is an essential mineral for the body as it promotes the **formation of haemoglobin and myoglobin**, which are responsible for the transport of oxygen in the blood and muscles, **as well as enzymes**, cytochromes, which play a role in the metabolism of nutrients and drugs.

Iron is also important for:

- supporting normal cognitive function;
- promoting normal energy-yelding metabolism;

E-BOOK
Physical Activity



Visit Website



Take the Test



Download App



- promoting normal function of the immune system.

Certain physiological conditions, such as the menstrual cycle, pregnancy and breastfeeding, growth in children and adolescents, or certain conditions involving poor **iron absorption** in the bowel may result in an **iron deficiency** or **an increased body need for this nutrient**.

When you have an **iron deficiency** you may experience symptoms such as:

- general fatigue;
- difficulties in recovering energy after physical activity;
- shortness of breath and difficulty breathing, even at rest;
- tachycardia;
- headache, migraine, irritability;
- sleep disorders;
- dizziness and vertigo;
- pale skin and mucous membranes; fragile nails and hair.

In sportsmen and sportswomen, an iron deficiency can negatively affect athletic performance, so it is important to keep **serum iron, transferrin and ferritin levels** under control, i.e., the values that allow to assess the blood iron level, to give an idea of the balance and distribution of iron in the body.

In endurance, marathon, triathlon or other endurance sports, or in professional athletes who require frequent athletic performance, iron deficiency can also be accompanied by micro-bleeding and increased haemolysis (destruction of red blood cells) due to shocks and continuous muscle contractions. In **women of childbearing age** and **young people**, the increased consumption of iron with sports activity can accelerate the decrease in the body's deposit of this nutrient.



In all cases in which diet alone is not sufficient to maintain normal bodily iron levels, a nutritional supplement may be required. Let's find out together what the **best iron supplement for athletes** should contain.

What are the characteristics of the best iron supplements for athletes?

There are many **iron supplements suitable for athletes**. In general, an amount of iron that can meet all or part of the daily requirement for this nutrient is accompanied by other nutrients that may promote iron absorption or that may contribute to normal haematopoiesis (red blood cell formation).

It should be noted that the **best iron supplement for sportsmen and sportswomen** is the one that can meet the needs of the individual, which may vary depending on the type of physical activity carried out or the possible deficiency of iron or other nutrients. Therefore, it makes little sense to list the **best iron supplements for athletes**, but rather it is important to have an indication of which **vitamins are most commonly associated with iron and the characteristics that can promote the absorption of iron in food supplements**.



Vitamins and iron

It is not uncommon to find vitamins listed in the ingredients of iron-based supplements. Let's find out which are the most important and what their function is.

Vitamin C and iron

The vitamin most commonly associated with iron is **vitamin C** (ascorbic acid). **Vitamin C** is a water-soluble vitamin which, when administered together with iron, promotes its intestinal absorption.

Group B vitamins and iron

Group B vitamins are often present in **iron supplements**. Group B vitamins and, specifically, **vitamin B9** (folic acid) and **vitamin B12** (cobalamin) are involved in the mechanisms of haematopoiesis (red blood cell formation) and energy metabolism. Vitamin B2 (riboflavin) promotes iron metabolism.

Characteristics that promote the absorption of iron present in supplements

Vitamin C, as we said earlier **promotes the intestinal absorption of iron**. Vitamin C, in particular, enables the absorption of trivalent iron (Fe^{3+}), which may be present at intestinal environment because it reduces it to the bivalent form (Fe^{2+}), the only form that can be absorbed by the cells of the duodenum. This mechanism regulates the absorption of non-haem iron present in plant-based foods or **inorganic iron present in most food supplements**.





Other dietary supplements, however, have been formulated to improve iron absorption. **Sucrosomial Iron®**, present in the **food supplements of the SiderAL® range**, is an iron protected with **Sucrosomial® Technology**, which is more shielded in the gastrointestinal environment and more easily absorbed by intestinal cells. **Sucrosomial® Technology** also increases the tolerability of iron and minimises any discomfort related to the use of conventional iron (heartburn, staining of the mucous membranes).

E-BOOK
Physical Activity



Visit Website



Take the Test



Download App





Dietary supplements for athletes: what are the main ones?

The basis of good health is always a varied and balanced diet. Athletes are well aware of this, so they pay a lot of attention to the quality and quantity of food they consume with their **diet**. However, sometimes, diet alone is not enough to meet the need for macro- and micronutrients before, during or after sports performance. In these cases, **specific food supplements** may be useful to **support the body in cases of deficiency of one or more essential nutrients**.

Food supplements for athletes

There are many types of **dietary supplements for athletes**. This is because, depending on the sport practised, it can be useful to support the body only with specific carbohydrates, amino acids, proteins, vitamins and minerals. However, it should be noted that food supplements are not a substitute for a varied and balanced diet, but can provide support to the body in cases of deficiency or increased needs for one or more nutrients.

Amongst the **most suitable supplements for runners and joggers**, nutritional supplements that help to quickly restore energy expenditure can be useful. **Supplements useful during running** are those containing carbohydrates, such as maltodextrin. To support the well-being of the muscles, on the other



hand, supplements with branched-chain amino acids are indicated. In the summer or in cases of excessive sweating, it may be useful to rebalance the normal amount of mineral salts in the body with supplements containing magnesium and potassium. These supplements can also be useful in cases of post-workout muscle cramps.

Those who practice **road cycling and mountain biking** put muscle endurance to the test, as do runners, therefore, maltodextrins are recommended during physical activity (to replenish sugars quickly and punctually), isotonic supplements (to replenish minerals lost through sweating) and protein and amino acid supplements to maintain the normal well-being of the muscles.

Sports characterised by intense and prolonged muscle exertion, such as **endurance training, marathon, foot race or triathlon**, may require **increased iron supplementation**. Iron supports the formation of **haemoglobin** and **myoglobin** present in red blood cells and muscle cells, respectively.

Low haemoglobin levels can cause muscle fatigue and tiredness. In the case of sports such as endurance sports or marathons, micro-bleeding may occur in muscle tissue and can contribute to iron deficiency. In people practising competitive sports, an **iron deficiency** or **low haemoglobin** and **haematocrit levels** can adversely affect performance in training and competition.

Women and **young people** who play sports may be subject to increased depletion of iron deposits due to specific physiological conditions. In women of childbearing age, for example, the **menstrual cycle, pregnancy or breastfeeding** require more iron; likewise, in **children** and **adolescents**, an increased need for iron is associated with growth and physical and cognitive development.





Iron-based supplements for athletes

If there is a deficiency or increased bodily need for iron and diet is not sufficient to provide the body with the right amount of this nutrient, you can support your **diet** with an **iron-based nutritional supplement**. **Vitamin C, B vitamins** and **folic acid** can also be useful in cases of iron deficiency, therefore, it is common to find these essential nutrients combined with iron in food supplement formulations.

The **SiderAL®** range of **food supplements** is designed to support the body in ensuring the right amount of iron in cases of deficiency or increased bodily needs. Those who practise sport must keep normal body levels of iron under control, without leading to a deficiency. The **SiderAL®** formulations, containing **Sucrosomial® Iron**, the exclusive patent of PharmaNutra which promotes a better **intestinal absorption** of iron, can be a valid ally to preserving normal levels of iron in the body at all ages.

E-BOOK
Physical Activity



Visit Website



Take the Test



Download App





Sports nutrition: which foods are suitable in cases of iron deficiency?

Sportsmen and sportswomen know how important a **varied and balanced diet** is, which is capable of providing all the essential nutrients to keep the body in good health. In fact at the basis of any good performance in training or competition is the choice of foods that can ensure the correct daily needs of each micro- and macronutrient. Let's analyse the nutrition of sportsmen and sportswomen and, specifically, the **most suitable foods in cases of iron deficiency**.

Sports nutrition: which are the most suitable foods?

The body of a person who practises sport, especially on a competitive level, requires more energy than a person who does not practise a lot of physical activity. Specifically, athletes need a **greater supply of nutrients that can quickly support their energy needs and nutrients that can help them recover**. Therefore, the diet of sportsmen and sportswomen is primarily based on the consumption of foods that are rich in carbohydrates (whole grains, wholemeal pasta) and proteins (red meat, legumes) to ensure the right intake of these nutrients. No less important are foods rich in vitamins and minerals, which are useful for replenishing the share lost through physical activity and sweating. Lastly, we must not forget the right amount of water to compensate for the amount lost through sweating.



The **most suitable foods for replenishing vitamins, minerals and other nutrients in sportsmen and sportswomen** include:

- Red meat (rich in vitamin B and iron)
- Green leafy vegetables (rich in B vitamins, folate and iron)
- Legumes (rich in protein and minerals, such as iron)
- Grains (rich in vitamins and minerals such as zinc, iron and magnesium)
- Fresh fruit (rich in vitamin C, iron and other essential minerals)
- Nuts (rich in omega-3 fatty acids, iron, zinc and magnesium)

Which are the most suitable foods for athletes in cases of iron deficiency?

Before finding out which **foods are suitable for athletes in cases of iron deficiency**, it should be specified that iron in food is found in two forms: **haem iron and non-haem iron**. The difference between the two types of food iron lies in the bioavailability and the speed of absorption: **haem iron is absorbed more easily in the intestine than non-haem iron**. To **facilitate the absorption of non-haem iron**, it may be useful to consume foods rich in vitamin C. Vitamin C is an essential nutrient that helps to absorb iron in the intestine and protects cells from oxidative stress.

In **animal-based foods**, both **haem iron** and **non-haem iron** are present, whilst in **plant-based foods**, only non-haem iron (inorganic iron) is present.



Foods that can be useful in cases of iron deficiency in athletes include:

- Meat (liver, spleen, offal, turkey meat, horse, beef)
- Fish (tuna, mackerel, snapper, sardine, anchovy)
- Molluscs and crustaceans
- Egg yolk
- Legumes (dried beans)
- Soya flour
- Dried fruit
- Whole grain cereals
- Oat flakes
- Green leafy vegetables (watercress, cabbage, lettuce, endive)
- Foods rich in vitamin C (citrus fruits, pineapple, kiwi, berries)

There are some foods that must be avoided in cases of iron deficiency or that must not be consumed at the same time as non-haem iron food sources. The **foods to pay attention to in cases of iron deficiency** are:

- **Milk and dairy products:** calcium can decrease the intestinal absorption of iron;
- **Foods rich in phytates** such as cereals, which are recommended to be taken away from other iron-rich plant-based foods or in combination with foods rich in vitamin C;
- **Foods rich in oxalates** such as spinach, which are rich in iron, but, at the same time, are a source of oxalic acid;
- **Foods containing tannins** such as tea, coffee and chocolate or containing **polyphenols**, such as wine.





When the diet alone is not sufficient to ensure energy requirements during or after physical activity, nutritional supplements can be used to help compensate for the loss of vitamins, minerals, proteins and carbohydrates. In these cases, specific dietary supplements may be useful in providing the body with adequate amounts of nutrients. If there is also an **iron deficiency or increased bodily need for this nutrient**, it may be helpful to talk to your doctor or pharmacist and assess an **iron-based dietary supplement**.

The **SiderAL®** dietary supplement range containing **Sucrosomial® Iron**, a technology that facilitates the high digestibility and absorption of iron, can be a **useful nutritional supplement in cases of iron deficiency or increased needs for this nutrient**.

E-BOOK
Physical Activity



Visit Website



Take the Test



Download App



Supplements
are not intended
as a substitute
for a varied,
balanced diet
and a healthy
lifestyle.

