

# THE IMPORTANCE OF OPTIMISED IRON LEVELS FOR FEMALE ATHLETES



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## INTRODUCTION

Iron is a major component of haemoglobin, a type of protein in red blood cells that carries oxygen from your lungs to all parts of your body. Without sufficient iron, there are not enough red blood cells to transport oxygen, leading to low energy and fatigue.

Iron has further functions including cognitive development, as well as supporting immune function.

## BACKGROUND

Good iron levels and stores are critical for athletes, due to the key role iron plays in the production of myoglobin, a protein that carries and stores oxygen specifically in muscle tissue. Thus, low levels or a depletion will have a significant negative impact on performance.

Iron deficiency is a common phenomenon in athletes, particularly those involved in endurance sports. It has been reported to impact up to 11% of male athletes and up to 35% of female athletes.<sup>1</sup>

But why is this the case? In the first instance, athletes have higher requirements of iron due to the increase in production of erythropoietin (EPO). This increased production of EPO is an advantageous training adaptation, optimising performance. This is also the key reason many endurance athletes aim to spend some time at high altitude, ahead of big races, as this accelerates this process.

Furthermore, iron losses are exaggerated in athletes due to high training loads that result in haemolysis (that is the breakdown of red blood cells), sweating and potential gastro-intestinal bleeding, especially during periods of high intensity training. In addition, after endurance exercise, as part of an acute inflammatory response, there is an up regulation of an iron regulating hormone, hepcidin which reduces overall iron absorption.<sup>2</sup>

Female athletes are at further risk of low iron due to monthly menstrual losses. Monthly periods are the most common cause of iron loss, with women of childbearing age needing almost two times more daily iron than men<sup>3</sup>. While this varies from female to female, most women will lose 20-90 ml of blood

during their period. Those who have heavy periods, can have losses in excess of 160ml during their monthly cycle.<sup>4</sup> It has been reported that 1 in 3 women suffer with heavy menstrual bleeding.<sup>5</sup>

In more recent years, the awareness around low energy availability (LEA) has also increased. Especially in athletes, LEA results in a reduced energy intake which restricts iron intakes but also, compromises iron absorption and red blood cell production. While all athletes can be at risk of LEA, there is still a much higher prevalence of it in female athletes which puts them at higher risk of all nutrient deficiencies including iron deficiency anaemia (IDA). Nutrient deficiencies leave them more vulnerable to injuries such as bone stresses.

Iron deficiency affects athletes' physical performance. While aerobic metabolism is directly impacted by low iron levels, it has a multifaceted impact.

### Iron deficiency is associated with\*:

- ✓ Reduced overall capacity for strength
- ✓ Poor coordination
- ✓ Reduction in power and speed
- ✓ Depressed immune system
- ✓ Increased fatigue
- ✓ Low mood
- ✓ Overall reduced recovery

Iron deficiency is one of the most common nutrient deficiencies in sport<sup>7</sup> and although widely studied in endurance sports, it remains a concern across all sports. However, those in weight category/dependent sport, such as climbing, lightweight rowing, or aesthetic sports, such as ballet and rhythmic gymnastics, may also be at increased risk due to higher prevalence of LEA associated with these sports.

## WHAT DEFINES DEFICIENCY?

The RNI for dietary iron in the UK and Ireland is 14.8mg of iron per day, with the RDA in the US set at 18mg a day. Whilst additional iron intakes are recommended for pregnancy and lactation, to date, there are no actual additional recommendations for female athletes. However, studies on female runners repeatedly show a need for an additional 10mg of iron a day due to training losses and adaptation.<sup>8</sup> This is an increase of approximately 70%.

Iron deficiency can occur with or without anaemia. The WHO defines iron deficiency without anaemia when ferritin levels are low (<30 mg/L) but haemoglobin levels are normal (above 120g/L in women, and 130g/L in men). Iron deficiency with anaemia occurs when both ferritin and haemoglobin levels are low.

In sport, we tend to define iron deficiency without anaemia when ferritin levels are <50mg/L, and haemoglobin labels are > 130g/L for women and >140g/L for males<sup>9</sup>. Iron deficiency with anaemia is defined when haemoglobin levels are lower than the recommended values.

# PROPOSED SOLUTION

## FOOD FIRST

In order to prevent iron deficiency in the first instance, education to athletes about their increased requirements is necessary as well as information on the most appropriate dietary sources.

The best sources of iron are animal sources, such as red meat, poultry, and fish, but many female athletes have reduced their consumption of foods such as red meat for other health reasons.

Plant based sources of iron include pulses and legumes, dark green leafy vegetables, nuts and seeds, and foods fortified with iron such as cereal and bread, except wholemeal. In general, iron from plant-based options is much more difficult to absorb, so plant-based athletes may need to pay particular attention to their iron intakes.

Additionally, some foods can inhibit iron absorption including foods containing phytates (wholegrains/cereal) and tannins (tea and coffee). Calcium-rich foods (dairy products like milk, cheese, and yogurt) can also interfere with iron absorption, so it is advisable to avoid consuming these foods alongside iron rich foods to maximise absorption. Absorption of iron can also be improved by consuming iron rich foods with a source of Vitamin C (citrus fruits and juices, peppers, strawberries, tomatoes) or an animal protein.

For example, beans on toast with a glass of orange juice will help to maximise iron absorption from both the beans and wholegrain bread. Aim to consume tea or coffee either an hour before or after iron rich meals.

## SUPPLEMENTATION

Supplementation is also a key consideration in both male and female athletes. However, supplementation with traditional oral iron supplements has its challenges. Unfortunately, most oral iron supplements are poorly absorbed in the gut. This often leads to gastrointestinal distress such as constipation, bloating, and nausea. Some studies have shown that compliance with supplementation can be poor. It is estimated that 8/10 people who take iron supplements report side effects<sup>10</sup>, with 50% stopping taking their supplements entirely.<sup>11</sup>

There have been some alternative formulations developed in recent years that aim to increase iron levels without the negative side effects often associated with oral iron. One such solution that I recommend to athletes is Active Iron, as it is highly absorbed compared to standard ferrous sulfate,<sup>12</sup> making it gentle on the stomach. Recent clinical data shows that those taking Active Iron were 4 times more likely to be compliant versus previous oral iron.<sup>13</sup> It is clinically proven to increase ferritin levels by 94% within 6 weeks, and significantly increases resulting energy levels.<sup>13</sup>

Active Iron also work with Informed Sport to ensure that their products are certified to be free from any banned substances, providing reassurance to athletes and exercisers that they can trust Active Iron to support their training without any risk of failing a drug test.

When supplementing with iron, it is recommended that repeat blood tests should occur 6-8 weeks from starting to monitor outcome and also control the dose. Some data suggests that there is little performance benefit of taking an iron supplement if iron deficiency is not indicated. It has been proven however that the most pronounced effects on iron status by supplementation occur in athletes with low ferritin levels. If athletes are training at altitude, iron supplementation can be of benefit regardless of ferritin stores.

## CONCLUSION

Good iron levels and stores are critical for all athletes, especially in endurance sports and particularly amongst females. Low iron levels can have a significant negative impact on performance.

While there is no set protocol for optimising female athletes iron status, it is clear that supplementation is indicated when ferritin levels are low. High dose oral iron can cause gastrointestinal distress in some people. Use of low dose iron may preclude the risk of athletes experiencing a range of unpleasant symptoms, and the resulting lapsed usage.

This paper was written with the hope that healthcare professionals can use it to provide consistent and high-quality advice to female athletes on the importance of optimised iron levels for better performance.

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For more information on Active Iron's clinical evidence use this QR code to visit: [www.activeiron.com/activeiron/healthcare-professionals](http://www.activeiron.com/activeiron/healthcare-professionals) or contact [info@activeiron.com](mailto:info@activeiron.com) @activeironworld

