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Iron pyrite is commonly known as fool's gold due to its shiny yellow appearance; very different to rusty old iron. In a similar contrast, iron serves functions in the human body that make it as precious as gold, yet in overload it can be deadly.

Iron-indispensable friend

Without iron, all life would cease to exist. Most of our iron is found in haemoglobin in red blood cells, and the numbers are mind-blowing: each haemoglobin can hold four atoms of iron, there are approximately 280 million haemoglobin molecules in each red blood cell, and about 260 million red blood cells in a single drop of blood: that's billions of iron atoms. The iron captures oxygen from the air during each breath and transports it to our tissues, readily giving it up for use.

Iron is present in a smaller amount in myoglobin in muscles, where it stores oxygen for energy production. The aptly-named 'ironman' athletes are likely to have a large supply of iron in their muscles. Iron also serves as a component of several enzymes and the immune system. It is indeed a precious metal for our bodies.

Iron-too much of a good thing?

In the 'Wizard of Oz' the Tin Woodman asks Dorothy to put the oil-can in her basket saying, "If I should get caught in the rain, I will rust again". Tin doesn't rust, but it's likely that his joints were made of iron, which does. Humans don't rust, but the skin can turn a shade of bronze when iron is present in excess. More seriously, high levels of iron can be toxic, causing feelings of fatigue, depression, joint pain and organ damage. In one study, high blood levels of iron were shown to lead to more severe brain damage after brain haemorrhage; in a study in the USA, higher levels of iron were associated with increased risk of diabetes, possibly caused by iron damaging the pancreas. Interestingly, frequent blood donations, which reduce iron stores, were associated with a reduced incidence of diabetes. Iron can also build up in the liver and heart, affecting function.

Fortunately, iron overload is rare, and only really occurs in genetic conditions such as haemochromatosis (where the body absorbs too much iron) or after repeated blood transfusions or consumption of high levels of supplements. Iron overload is sometimes seen in Africa where a traditional beer, brewed in steel drums or iron pots, is consumed.

An amazing balancing act

To keep levels constant, just the right amount of iron is absorbed from the gut: more iron is absorbed when blood levels and body stores of iron are low. This complex process is controlled by a recently discovered hormone called hepcidin, mainly produced by the liver. It also regulates blood iron levels by determining how much iron is released into the blood from stores in the liver and white blood cells. Once in the blood stream, most iron is escorted by a protein called transferrin, rendering it less toxic than unbound iron. We are well protected from this dangerous yet essential element.



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