



Iron Supplements Increase Infection Risk

It's been known for some time that iron supplements increase infection risk, because people who take them have more infections. A recent report clarifies some mechanisms.

Evidence for increased infections with iron

Many people in the tropics, especially children, are iron-deficient, given both the relative lack of dietary meat and high rates of intestinal parasites and malaria, so naturally doctors would like to fix that. Unfortunately, the most direct way, giving iron supplements, often backfires.

For example, [giving iron to nomads in Somalia](#) greatly increased the number of infections, compared to those who took a placebo.

Seven episodes of infection occurred in the placebo group and 36 in the group treated with iron; these 36 episodes included activation of pre-existing malaria, brucellosis, and tuberculosis. This difference suggested that host defence against these infections was better during iron deficiency than during iron repletion. **Iron deficiency among Somali nomads may be part of an ecological compromise, permitting optimum co-survival of host and infecting agent.**

[Giving iron to children increases their risk of diarrhea and malaria](#), which in some cases requires hospitalization and can kill the patients. Many other reports ([e.g.](#)) and reviews describe similar findings.

Bacteria thrive with iron supplements

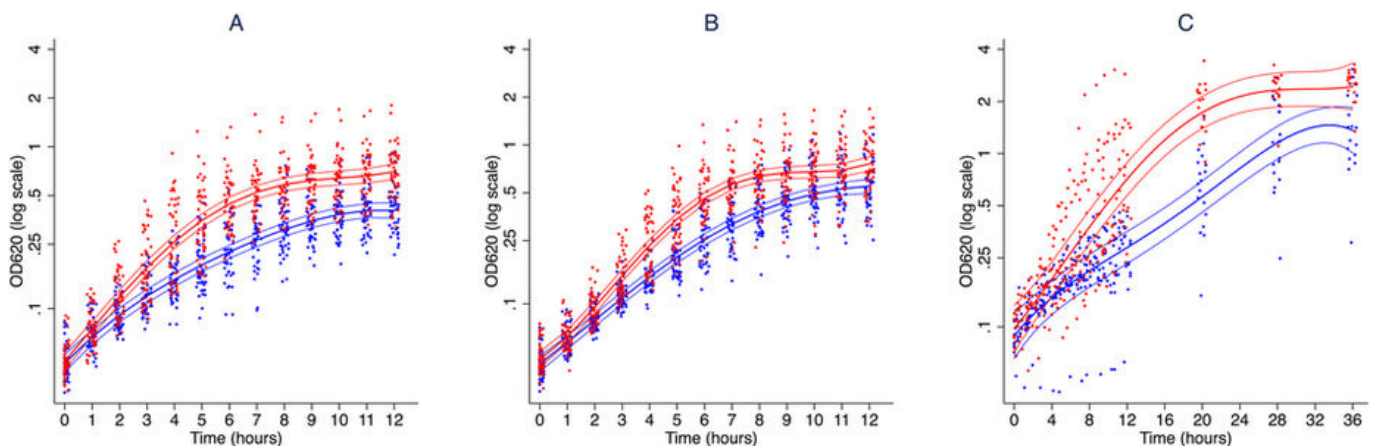
This next study is quite neat, since it's simple and straightforward.

A group of adult male volunteers in the Gambia gave a blood sample. They then took one dose of ferrous sulfate, an iron supplement, at 400 mg, which is [a typical or even low dose of iron](#). They then gave another blood sample. Both samples were centrifuged, and the serum was used to grow bacteria. The researchers discovered that [oral iron acutely elevates bacterial growth in human serum](#).

Escherichia coli, *Yersinia enterocolitica* and *Salmonella enterica* serovar Typhimurium (all gram-negative bacteria) and *Staphylococcus epidermidis* (gram-positive) showed markedly elevated growth in serum collected after iron supplementation. Growth rates were very strongly correlated with transferrin saturation ($p < 0.0001$ in all cases). Growth of *Staphylococcus aureus*, which preferentially scavenges heme iron, was unaffected. These data suggest that even modest oral supplements with highly soluble (non-physiological) iron, as typically used in low-income settings, could promote **bacteremia** by accelerating early phase bacterial growth prior to the induction of immune defenses.

Bacteremia means a blood infection with bacteria, and is a serious, life-threatening condition. Also known as sepsis or septicemia, [it's ranked number 10 in the list of leading killers of people over 65 years old in the U.S.](#)

Below are growth curves for bacteria in serum before iron supplementation (blue lines) and after (red lines).



The y-axis on these charts is a log scale, x-axis is time, so the charts indicate doubling times and final concentration of bacteria. The bacteria grew far faster in serum from individuals after iron supplementation.

Bacteria and other microorganisms require iron

Why should bacteria grow so much faster with excess iron?

The answer is that bacteria, like virtually all living things, require iron for growth. However, in humans and other animals, iron is tightly controlled and sequestered, and one of the main reasons for this is to stop bacteria from acquiring iron.

[Control of iron is an important part of the innate immune system.](#)

The frontline of host-pathogen coevolution

Pathogens have to subvert a host's innate defenses to avoid being killed. Barber and Elde now show that this principle extends to nutrient-transporting proteins, such as transferrin, which binds iron... Without iron, invading pathogens cannot replicate, but iron is sequestered in transferrin, which stops pathogens using it. So pathogens have evolved a succession of transporters that can hijack transferrin's iron. Over time, the primate transferrin binding surface has coevolved to wrestle iron back from the grip of pathogens.

Transferrin is the protein molecule used to transport iron in the blood stream, and it's been suggested that [infusions of transferrin could be used in the treatment of septicemia.](#)

Meat is a better source of iron

If someone were iron-deficient, a better way to get iron is eating meat. The iron in meat is heme iron, as opposed to the non-heme (unbound) iron in iron tablets. Heme iron is handled more safely by the body, and doesn't result in spikes of iron in the bloodstream. In addition, heme iron doesn't cause excess free iron in the gut, so bacteria can't get it and use it for growth.

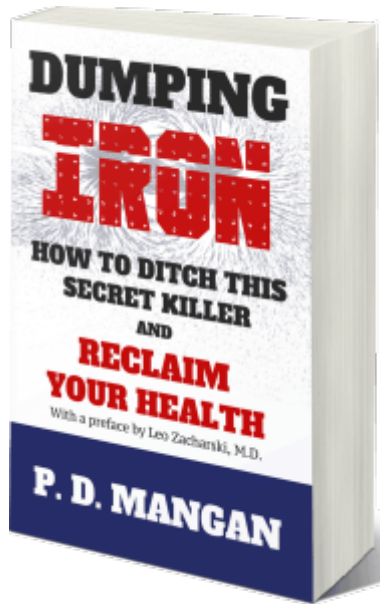
Iron supplements increase infection risk

Iron supplements increase the risk of infection.

In the U.S., all flour, corn meal, and rice must be iron-fortified by law. Is this increasing the rate of infections? How many people with gut dysbiosis and other problems such as irritable bowel syndrome owe their problems to iron fortification or supplementation? How many people with septicemia, the 10th leading cause of death among the elderly, got that way due to iron?

No one knows.

PS: For more on the effects of excess iron, see my book, [Dumping Iron.](#)



PPS: [Check out my Supplements Buying Guide for Men.](#)