

## Categories of Oral Iron

### Iron Salts

Ferrous sulfate, ferrous fumarate, and ferrous gluconate are the iron salt formulations most commonly prescribed for treatment of iron deficiency anemia in otherwise healthy patients, given their general availability, and low cost. However, expect a discontinuation or non-compliance rate of as high as 30-40% due to gastrointestinal side effects. In patients with co-morbid conditions associated with inflammation and an increase in hepcidin, ferrous sulfate (as well as other iron salts and, to a great degree, oral iron in general) will be ineffective. An increase in the dose of oral iron in an effort to increase absorption will only result in increased gastrointestinal toxicity.

Ferrous sulfate is generally ineffective in the immediate post-surgical setting due to post-surgical inflammation, and may contribute to a prolongation in post-operative ileus.

### Carbonyl Iron and Polysaccharide-iron Complex

Carbonyl iron is available in the U.S. as Feosol with Carbonyl Iron. This is not an iron salt, but rather microparticles of elemental iron. It requires an acidic environment in the stomach for the microparticles to dissolve and form a hydrochloride salt.

It does not appear to offer a significant advantage over ferrous sulfate other than less poisoning potential in children. Niferex is a polysaccharide iron complex consisting of ferric iron complexed to hydrolyzed starch. It is promoted to cause less GI irritation, but the claim is unproven.

### Heme Iron

A heme iron polypeptide is commercially available and marketed in the United States as *Proferrin ES* or *Proferrin Forte* (combined with 1 mg of folate and therefore requiring a prescription). This product is made from hemoglobin extracted from cow red blood cells.

Data suggest that heme iron is better tolerated and better absorbed than iron salts. However, like other oral iron supplements, bioavailability of the iron moiety is limited in patients with inflammation and elevated hepcidin levels.

Heme iron is an excellent alternative to ferrous sulfate in otherwise healthy patients with iron deficiency, who are intolerant to iron salts. It is significantly more expensive.

### Iron Amino Acid Chelates

These iron products consist of a conjugate of ferrous iron with an amino acid, typically glycine. Products marketed in the United States include *Easy Iron*, *Gentle Iron*, and *Ferrochel* (combined with calcium, vitamin B12, vitamin C, and folate).

There are some data suggesting higher bioavailability than iron salts in otherwise healthy, iron deficient patients. The iron amino acid chelates appear less likely to cause gastrointestinal intolerance than the iron salts and represent another (and only modestly more expensive) alternative to ferrous sulfate.

### Iron Protein Succinylate (IPS)

These iron products are a form of ferric iron bound with a chemically modified protein (casein) via succinylation that stabilizes the complex. IPS is insoluble at low pH and becomes soluble in the duodenum due to hydrolysis of the protein moiety at the higher pH in the duodenum. Studies have shown a significantly lower rate of adverse events compared to ferrous fumarate, ferrous sulfate, ferrous gluconate and ferrous glycine.<sup>1</sup> Efficacy may be superior to the ferrous salts as well. A number of formulations are available without prescription in the United States including *Ferrets IPS*, *Ironsorb*, and *Iron Protein Plus*.

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#### References

1. Cancelo-Hidalgo MJ *Curr Med Res Opin* 2013; 29:291-303  
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