



IRON & EGGS: WHAT IS THE STORY?

The historical claim that eggs are a source of heme iron in the diet is widespread – examples of this can be found in government, health professional and consumer publications. While eggs contain many essential nutrients, there is confusion and conflicting information regarding dietary iron in the common egg.

This review takes a deeper dive into the type of iron and iron bioavailability in eggs. Insights have been gained through a scan of peer-reviewed scientific papers and direct communication with academic and industry experts.

Iron is an Essential Mineral

Iron (Fe) is a natural mineral found in many foods and has several important functions in the human body. Through all life stages iron helps to carry oxygen from the lungs to all parts of the body. Iron is available in the diet in two forms: heme and non-heme. The availability and absorption of heme iron versus non-heme iron is very different, and it is important to know which foods provide each type of iron.

What is Heme and Non-heme Iron?

Heme iron is ferrous iron (Fe+2) contained in a ring-shaped molecule that is mostly present in proteins such as hemoglobin (found in red blood cells) and myoglobin (found in muscle tissue).¹ Accordingly, in food, heme iron is found in animal flesh foods such as meat, fish and poultry and is easily absorbed by the body.^{2,3,4} These foods include meat, such as beef, pork and lamb, poultry, fish and seafood. To be absorbed iron needs to be in the ferrous form (Fe+2) or bound to heme.⁵ The Hornsey laboratory method is reported to be a widely accepted method to chemically assess heme iron content of animal-based foods.

Non-heme iron is the iron mineral only and mostly exists as ferric iron (Fe+3) and some (Fe+2).⁴ Non-heme iron is found in plant foods such as cereals, whole grain breads, lentils, beans, nuts, fruits, vegetables as well as in eggs and in meats. Non-heme iron is much less well absorbed by the body versus heme iron.⁶ The AOAC 984.27 laboratory method is commonly used to assess total iron, which includes non-heme iron.⁷

Evidence Suggests Eggs Do Not Contain Heme Iron

Eggs are nutritious, are an excellent source of protein, and offer many essential nutrients such as choline. However, there is a lack of evidence to confirm that the typical table egg is a source of heme iron.⁸

A high-level summary of key insights:

- The Food and Agriculture Organization (FAO) of the United Nations states:
 - *"Heme iron is only found in meat and organ meat, and it is absorbed 2 or 3 times more than non-heme iron (the only iron form found in plant-based foods)."*⁹
- The classic study by Ramsay suggests that the unfertilized table egg from a hen (typical egg in the Canadian marketplace) only contains non-heme iron:
 - *"...it is evident that haem pigments are virtually absent."*¹⁰
- Werner et al. state that the total amount of iron in the egg is all non-heme iron, based on USDA's Food Data Central.^{11,12}
- A review paper on iron – a background article for the Nordic Nutrition Recommendations 2023 - highlights the content of iron and heme iron in a selection of cooked meat, fish and eggs. Eggs are listed as containing 0% heme iron.²
- Archundia-Herrera et al. (2024) investigated the development of a database for the estimation of heme and non-heme iron content of animal-based foods. Direct communication with the study authors revealed that there was not published evidence to confirm the heme content of eggs using the common Hornsey method, and hence eggs were not included as a source of heme iron.¹³
- Canadian Blood Services identify eggs as a source of non-heme iron.¹⁴
- The Dietary Reference Intakes: Essential Guide to Nutrient Requirements, by the Institute of Medicine, states that:
 - *"...milk products and eggs are of animal origin, but they contain only non-heme iron..."*¹⁵

Evidence Suggests that Iron Absorption from Eggs is Limited

Emerging research indicates that the iron content in eggs may have limited bioavailability. Below are publications worth noting:

- Almost all the iron in eggs is in the yolk, with a trace amount in the egg white.⁴ It is estimated that 95% of iron in eggs is bound to phosvitin to form an insoluble phosvitin-iron complex.¹⁶ As a result, the iron bioavailability in the egg can be limited which can lead to a decrease in the iron-absorption rate. Further, there is potential for phosvitin to decrease absorption of minerals such as iron, calcium and magnesium.^{16,17} While phosvitin may have potential health benefits, such as prevention of lipid oxidation in food, its potential to limit iron bioavailability is important to consider.¹⁸
- A 2023 FAO report¹⁹ notes the lower bioavailability of iron from eggs:
 - *"Iron and zinc deficiencies are highly prevalent in populations around the world, contributing significantly to the global burden of disease. Animal meats offer these minerals in compounds that are more efficiently metabolized than those obtained from plant-based foods. However, evidence suggests that iron availability from eggs and insects is lower than from meat."*
- A review examining dietary solutions to iron deficiency of young women living in industrialized countries, reports that egg consumption is either negatively associated with serum ferritin concentrations or had no impact on iron status.²⁰
- A 2024 review examining dietary solutions to iron deficiency of young women living in industrialized countries, reports that egg consumption is either negatively associated with serum ferritin concentrations or had no impact on iron status.²¹
- In 2023, Ricci et al. investigated the effect of daily egg consumption for six months with infants 6-to-9 months of age living in South Africa. They conclude that daily egg intake did not affect linear growth, underweight, wasting, motor milestones development, anemia or iron status.²²
- In 2022, Werner et al. investigated the addition of one egg per day for 6 months, to the weaning diet of 6-to-9-month old infants in Malawi, to assess if there is any effect on iron status or anemia prevalence.¹² The authors conclude:
 - *"Eggs did not affect ID (iron deficiency) or anemia prevalence among young children in a population with a high burden of these conditions. While eggs are rich in other nutrients, including choline, vitamin A, and essential amino acids, the promotion of eggs will not address the problem of ID among young children. One egg per day does not provide enough iron to meet the requirements in this population."*
 - The study also notes that *'whole eggs and egg whites inhibit iron bioavailability reducing dietary absorption in adults by up to 27%.'*

The Bottom Line

Eggs are nutrient-rich and are an excellent source of protein and other essential nutrients important for health. When it comes to iron, heme iron is mostly found in hemoglobin and myoglobin. Food sources of heme iron are animal flesh foods such as meat, fish and poultry. There is evidence to indicate that the iron in the common table egg is non-heme, has limited bioavailability (due to binding to phosvitin) and that eggs may inhibit iron absorption from other foods.

Currently, there is a lack of evidence to support the historical claims that the typical table egg contains heme iron and that eggs are a good source of iron.

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