Physiological Principles of Iron Metabolism and Erythropoiesis

Iron, as a constituent of hemoglobin and cytochromes, is one of the most important biocatalysts in the human body.

Absorption of Iron

The absorption of iron by the human body is limited by the physico-chemical and physiological properties of iron ions, and is possible only through protein binding of the Fe\(^{2+}\) ion (Fig. 2).

Iron is absorbed as Fe\(^{2+}\) in the duodenum and in the upper jejunum. Since iron in food occurs predominantly in the trivalent form it must (apart from the heme-bound Fe\(^{2+}\) component) first be reduced, e.g. by ascorbic acid (vitamin C). This explains why only about 10\% of the iron in food, corresponding to about 1 mg per day, is generally absorbed. This daily iron intake represents only about 0.25 \% of the body’s average total iron pool, which is approximately 4 g; this means that it takes some time to build up adequate reserves of iron. The actual iron uptake fluctuates considerably, depending on absorption-inhibiting and absorption-promoting influences in the upper part of the small intestine. The following factors inhibit absorption in clinically healthy individuals: reduced production of gastric acid, a low level of divalent iron as the result of an unbalanced diet (e.g., in vegetarians), a low level of reducing substances (e.g., ascorbic acid) in the food, or complex formation due to a high consumption of coffee or tea. Conversely, absorption is promoted by a combination of a meat-rich diet with a...
plentiful supply of heme-bound iron and an acidic, reducing envi­
ronment due to a high consumption of fruit and vegetables.

The mechanism of iron absorption has become clearer re­
cently. It is assumed to proceed in two stages. When they enter
the cells of the mucosa, the $\text{Fe}^{2+}$ ions are bound to transport sub-

Fig. 2. Intestinal iron resorption (partially hypothetical)