# Hepcidin

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- Astrocyte-derived hepcidin aggravates neuronal iron accumulation after subarachnoid hemorrhage by decreasing neuronal ferroportin1
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- Naotaifang formula attenuates OGD/R-induced inflammation and ferroptosis by regulating microglial M1/M2 polarization through BMP6/SMADs signaling pathway
- Apo- and holo-transferrin differentially interact with hephaestin and ferroportin in a novel mechanism of cellular iron release regulation
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<html><iframe width="560" height="315" src="https://www.youtube.com/embed/TwJ0DuI2-lc" title="YouTube video player" frameborder="0" allow="accelerometer; autoplay; clipboard-write; encrypted-media; gyroscope; picture-in-picture; web-share" allowfullscreen></iframe></html>

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Hepcidin is a hormone produced by the liver that plays a key role in regulating iron metabolism in the body. It is a small peptide that regulates iron absorption and distribution in the body by binding to and regulating the activity of ferroportin, a protein that exports iron from cells and tissues into the bloodstream.

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Hepcidin works by binding to ferroportin on the surface of cells that store or export iron, leading to the internalization and degradation of ferroportin. This decreases the amount of iron that is released into the bloodstream and makes it more difficult for cells to absorb iron.

## Hepcidin Regulation

Hepcidin regulation is a complex process that involves the control of hepcidin production and release in the body. Hepcidin is a small peptide hormone produced by the liver, and it plays a central role in regulating iron homeostasis by influencing the absorption, storage, and release of iron. Here's how hepcidin regulation works:

Iron Levels: The primary stimulus for hepcidin production is the level of iron in the body. When iron levels are high, hepcidin production is stimulated. Conversely, when iron levels are low, hepcidin production is suppressed. This mechanism helps the body maintain an appropriate balance of iron.

HFE Protein: The HFE protein, which is mainly expressed in the liver and intestinal cells, plays a crucial role in hepcidin regulation. Mutations in the HFE gene can lead to hereditary hemochromatosis, a condition characterized by excessive iron absorption and iron overload due to dysregulated hepcidin production.

Inflammation and Cytokines: In addition to iron levels, inflammation and inflammatory cytokines can also influence hepcidin regulation. Inflammatory conditions, such as infections or chronic diseases, can lead to increased hepcidin production. This is a protective response designed to sequester iron away from pathogens, as many microorganisms require iron for their growth and replication. Interleukin-6 (IL-6) is a key cytokine involved in this process.

Erythropoiesis: The rate of red blood cell production (erythropoiesis) can also affect hepcidin regulation. Increased erythropoiesis, as seen in conditions like anemia, can suppress hepcidin production, allowing for increased iron absorption to support the production of red blood cells.

Hypoxia-Inducible Factors (HIFs): Hypoxia, or low oxygen levels in tissues, can lead to increased production of hepcidin through the activation of hypoxia-inducible factors (HIFs). This is another mechanism by which the body can adapt hepcidin levels to its oxygen needs.

Regulation by Hepatic Signals: The liver itself can release signals that regulate hepcidin production. Factors such as bone morphogenetic proteins (BMPs) and the BMP receptor, as well as other molecules like SMAD proteins, are involved in this process.

Regulation by Erythroferrone (ERFE): Erythroferrone is a hormone produced by erythroblasts (developing red blood cells) in response to erythropoietin. ERFE suppresses hepcidin production, allowing for increased iron absorption to support erythropoiesis when the body needs more red blood cells.

The regulation of hepcidin is a dynamic process that integrates multiple signals and pathways to ensure that the body maintains an appropriate balance of iron. This balance is essential to meet the body's iron requirements for various physiological functions while protecting against iron overload or deficiency. Dysregulation of hepcidin regulation can lead to iron-related disorders, such as anemia of chronic disease or hereditary hemochromatosis.

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The regulation of hepcidin is complex and involves multiple signals, including iron levels in the body, inflammation, and erythropoiesis (the production of red blood cells). Dysregulation of hepcidin levels can lead to disorders of iron metabolism, such as iron-deficiency anemia or iron overload disorders like hereditary hemochromatosis.

Measurement of hepcidin levels in the blood is used as a diagnostic tool for these disorders and as a tool to monitor the efficacy of treatments. Therapeutic modulation of hepcidin levels is also being explored as a potential treatment strategy for iron-related disorders.

# Key points

Iron Regulation: Hepcidin is a key regulator of iron homeostasis. It controls the absorption, storage, and release of iron in the body to maintain iron balance. When iron levels are high, hepcidin levels increase, leading to reduced iron absorption in the small intestine and decreased release of iron from

storage sites like the liver and spleen. Conversely, when iron levels are low, hepcidin levels decrease to promote increased iron absorption and release.

Role in Inflammation: Hepcidin production can also be induced by inflammation or infection. Inflammatory cytokines, such as interleukin-6 (IL-6), stimulate hepcidin production. This is part of the body's defense mechanism to limit the availability of iron to pathogens, as many microorganisms require iron to grow and reproduce.

Genetic Disorders: Mutations in genes associated with hepcidin regulation can lead to iron disorders. For example, mutations in the HFE gene are associated with hereditary hemochromatosis, a condition characterized by excessive iron absorption and iron overload in the body.

Clinical Significance: Hepcidin measurements are used in clinical settings to assess iron-related disorders and to guide treatment. High hepcidin levels may indicate iron-restrictive conditions like anemia of chronic disease, while low hepcidin levels may be seen in iron-deficiency anemia.

Therapeutic Potential: Researchers are exploring hepcidin and its regulation as a potential target for therapies aimed at treating iron-related disorders. Modulating hepcidin levels could offer a way to manage conditions involving iron overload or deficiency.

In summary, hepcidin is a hormone critical for the regulation of iron in the body, helping to maintain iron balance and respond to changes in iron status and inflammation. It plays a vital role in ensuring that the body has the right amount of iron available for essential functions while protecting against iron-related disorders.

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## Hepcidin in neurosurgery

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