

Iron Deficiency Anemia in HHT

Scott E. Olitsky, MD MBA
Chief Medical Officer
Cure HHT

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Anemia in HHT

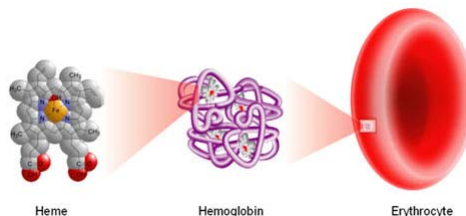
- One of the most common problems faced by HHT patients
- Often undertreated
- Many patients taught they need to live with some level of anemia
- Can worsen other HHT manifestations (increased cardiac output)
- At least 50% of HHT patients are anemic

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Hemoglobin

- Protein within Red Blood Cells (RBCs)
- Carries oxygen to the rest of your body



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Iron

- Iron is used for hemoglobin
- Iron is used in proteins in muscle
- Iron is used in many other proteins in the body
- Most of the iron in our body is in hemoglobin
- Some iron is stored in bone marrow, liver and spleen

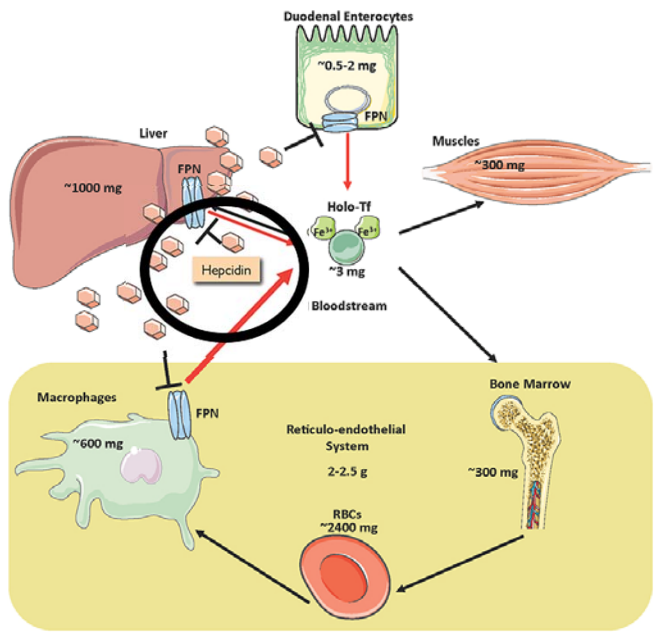
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Regulating Iron

- We can not produce iron, we must get it from our diet
- There is no mechanism to get rid of iron to regulate it
- Regulation is through adjusting absorption
- Too much or too little iron can be dangerous

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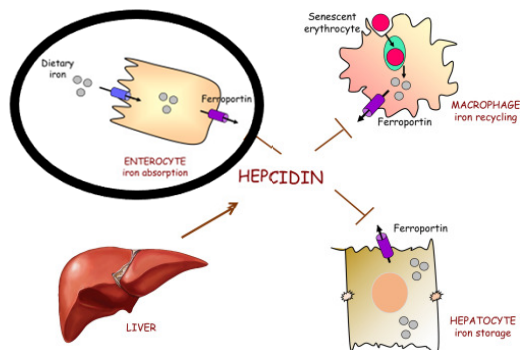


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Hepcidin

- Protein produced in the liver
- Major regulator of iron absorption
- Blocks absorption of iron from intestines
- Levels increase during the day into the night
- Levels increase after taking iron supplements (48 hours)



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Dietary Iron

- Heme iron
- Non-heme iron

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Heme Iron

- Found in animal products
- Well absorbed
- Absorption not effected by dairy, products in tea or coffee

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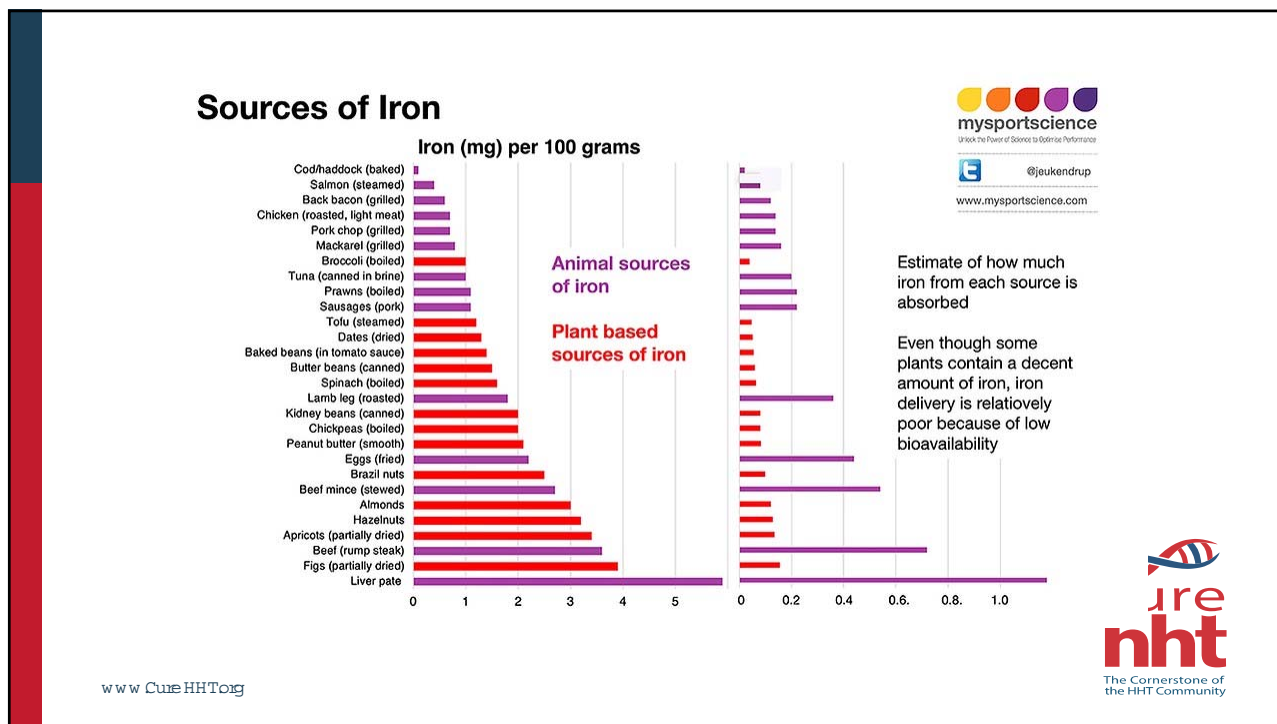


Non-heme iron

- Plant based products
- Not as well absorbed
- Vitamin C helps absorption
- Absorption decreased by dairy, tea, coffee

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Iron Deficiency Anemia (IDA)

- Worldwide the most common cause is dietary
- In HHT the cause is chronic blood loss
 - Nosebleeds
 - GI bleeding

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Symptoms of IDA

- Fatigue
- Insomnia
- Restless legs
- Exercise intolerance
- Shortness of breath
- Irritability
- Poor concentration
- Pica (craving for ice)

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Signs of IDA

- Pale skin, pale mucous membranes
- Dry mouth
- Hair loss
- Brittle fingernails

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Diagnosing IDA

- Clinical exam
- Lab tests

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Laboratory testing

- Complete Blood Count (CBC)
- Iron Studies
- Ferritin

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CBC

- Hemoglobin
- Hematocrit
- Mean Corpuscular Volume (MCV)

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Iron Studies

- Total Serum Iron
 - level of iron in your blood
- Transferrin
 - transferrin is the protein that transports iron around in the body.
- Total Iron Binding Capacity (TIBC)
 - how much transferrin is available to bind to iron

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Ferritin

- Protein that helps store iron
- An “acute phase reactant” which can be falsely elevated

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Treating Iron Deficiency Anemia

- Decrease iron/blood loss
- Increase iron intake

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Stopping or slowing blood loss

- Medications
- Procedures

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Increasing iron intake

- Diet
- Oral supplements
- IV supplementation

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It is almost impossible to make up for significant iron deficiency due to blood loss by increasing dietary iron intake

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Oral Iron

- Most are non-heme based
- Side effects limit their use for many people

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Oral Iron Products

Generic names [available formulations]	Product names	Amount of iron (varies depending on the preparation between tablets, liquids, elixirs, etc.)		Comments
		Total dose	Elemental iron	
Ferrous gluconate [available as tablets]	Fergon	240-325mg	27-38mg	Non-heme iron products. These products contain higher amounts of elemental iron compared to heme-iron containing products.
Ferrous sulfate [available as liquid, elixir, suspension, tablets, timed-release tablets and enteric coated tablets]	Feosol Slow FE Fer-iron Fer-In-Sol Mykidz Iron	75-325mg	15-65mg	These are also associated with greater GI toxicity compared to heme-iron products.
Ferrous fumarate [available as regular and timed release tablets]	Femiron Ferretts Ferro-Sequels Hemocyte Iron	63-325mg	20-106mg	
Polysaccharide-iron complex [available as capsule and elixir]	Niferex Nu-Iron Ferrex-150 ProFe Poly-Iron 150		60-180mg	
Iron polypeptide as dietary supplements	Proferrin ES		12mg	Heme-iron product

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Timing of oral iron

- On an empty stomach (1 hour before meals, 2 hours after)
- Avoid dairy, coffee, tea, antacids (non-heme)
- Avoid doxycycline for 2 hours
- Take with Vitamin C (non-heme)
- Take in the morning (hepcidin levels lower)
- ? Take every other day (limited studies)

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IV Iron

- Modern preparations are safe and effective
- Serious side effects are rare
- Vary by how much iron is delivered with each infusion


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	Molecular weight (kDa)	Test dose	Preservatives	Maximal single dose	Higher doses (off label use)
LMW Dextran (CosmoFer®, INFeD®)	165	Yes (25 mg 15–30 min)	None	100 mg (>30 s)	Total dose infusion over 4 h
Iron sucrose (Venofer®)	34–60	No	None	200 mg (2–5 min)	300 mg over 1 h
Ferric gluconate (Ferrelcit®, Nulecit®)	289–444	No	Benzyl alcohol	125 mg (10 min)	250 mg (15 min)
Ferumoxytol (Feraheme®)	750	No	None	510 mg (<1 min)	no
Ferric carboxymaltose (Injectafer®, Ferinject®)	150	No	Intravenous iron preparations None	750 mg (slow push or over 15 min)	no
Iron isomaltoside (Monofer®)	150	No	None	20 mg/kg (30–60 min)	no


1 Intravenous iron preparations (according to Larson [75] and Auerbach [76])

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Injectafer can cause reduction in serum phosphate levels (hypophosphatemia)

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Treatment of iron deficiency without anemia

- Ferritin is the “storage vehicle” for iron. Low ferritin means less reserves if bleeding occurs
- Symptoms can be similar to those of anemia
- Low ferritin levels linked to sleep disturbances

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When is it time to move beyond IV iron

- When you can not replace it well enough to maintain acceptable hemoglobin levels
- When the frequency becomes too great

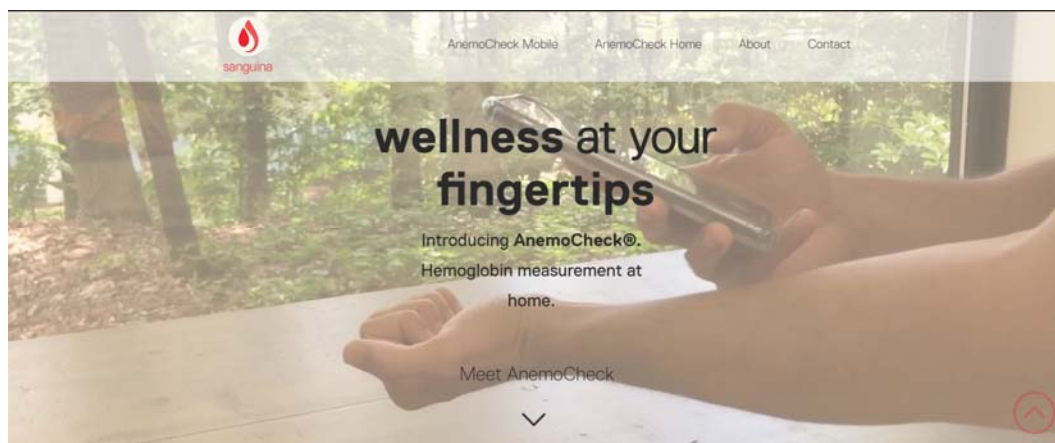
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Summary

- Anemia is common in HHT
- Very hard to make up for loss of iron by diet
- Oral iron supplementation is a good first step, consider the following
 - take on empty stomach
 - take a single dose
 - take in the morning
 - If side effects limit use, try another formulation, consider Proferrin
 - consider every other day dosing
- IV iron is safe and effective
- Combine with strategies to reduce bleeding
- If IV iron is not working or the need is too great, consider other options to stop bleeding

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Ask the Doctor



Scott Olitsky, MD, MBA
Chief Medical Officer, Cure HHT
Email: scott.olitsky@curehht.org



For more information:

CALL: 410-357-9932

EMAIL: hhtinfo@curehht.org

WEBSITE: <http://curehht.org>