DrPaulApproved

MICRONUTRIENTS

VITAMINS,
MINERALS
& MORE

CHROMIUM, COPPER, IODINE, IRON

DR PAUL APPROVED-VOLUME 6

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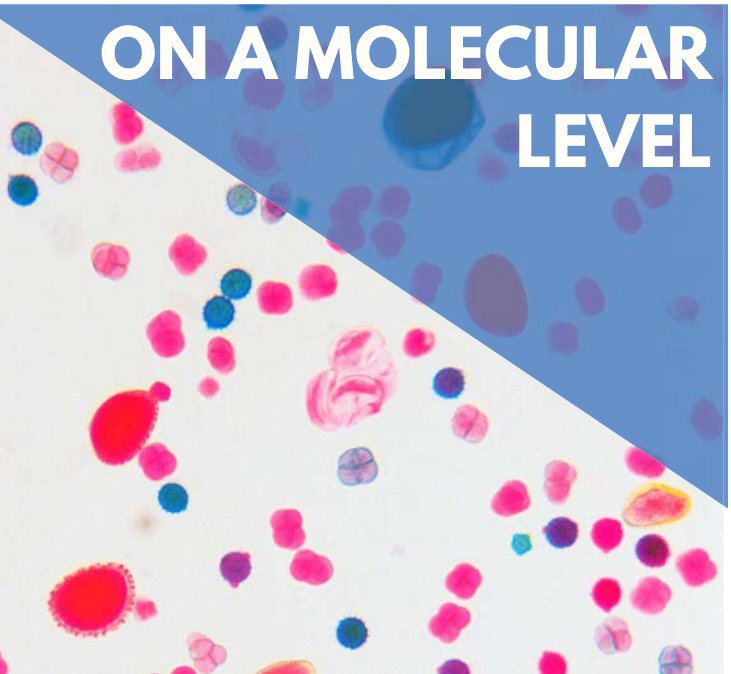
Check Vitamin Levels At Home:
https://trylgc.com/paulthomasvitamin

CHROMIUM

WHY IS IT IMPORTANT?

Chromium is known to be an essential mineral in our diets, yet most processing of food removes chromium. Chromium III (trivalent) is the form our body needs and that is present in food. This is not to be confused with chromium VI (hexavalent) that is a carcinogen. Stomach acids and reducing substances in foods convert chromium VI to the safe biologically necessary chromium III.

ON A MOLECULAR LEVEL

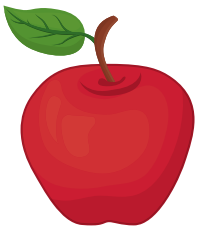


Chromium is known to be important for:

- The attachment of insulin to the insulin receptors (without it insulin resistance can develop)
- Has a role in cholesterol metabolism, preventing atherosclerosis (role in lowering triglycerides and raising HDL)
- Role in maintaining the structural stability of proteins and nucleic acids hence vital for normal fetal growth and development

SYMPTOMS OF DEFICIENCY

- Metabolic syndrome with insulin resistance, elevated blood insulin and blood glucose leading to high blood pressure, high triglycerides, low HDL and increased risk of heart disease, atherosclerosis, stroke and mortality.
- Fetal growth retardation or intrauterine growth retardation (IUGR) is thought to be caused by a chromium deficiency.
- There may be a role in increasing lean body mass and decreasing body fat although studies are mixed on this.
- Gestational diabetes and type 2 diabetes may be more common when there is a chromium deficiency.



FOOD SOURCES

Food Sources	mg
Broccoli (1/2 cup)	11
Grape juice (8 oz)	8
Potatoes (1, 1 cup)	3
Garlic (1 tsp)	3
Meat (3 oz)	2
Apple/banana (1)	1
Breads	2 - 6
Proceeded turkey	7 - 10

SAFETY AND TOXICITY

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RDA (Recommended Daily Allowance)

ADEQUATE INTAKE
micrograms/day
Infants 1 - 5
children 10 - 25
teens and adults 20 - 45

A reasonable supplemental dose for those who may be deficient would be 50 - 200 micrograms daily, for children and adults. Chromium is absorbed better if taken with vitamin C (100 mg Vitamin C would be adequate). Chromium takes one of the iron binding sites on transferrin, thus long term supplementation might affect iron status.

Chromium status is best assessed by functional testing such as that done by spectracell (www.spectracell.com).

The only toxicity of chromium III (trivalent) has been in rare cases of supplementation above 600 micrograms a day for weeks or months, which has lead to reports of impaired kidney and liver functions. Other studies have shown no problems with doses up to 1000 micrograms daily.
Hexavalent chromium (VI) is a known carcinogen with exposure to dust high in this causing lung cancer and skin inflammation.

http://lpi.oregonstate.edu/infocenter/minerals/chromium/
http://ods.od.nih.gov/factsheets/Chromium-HealthProfessional/
http://www.ncbi.nlm.nih.gov/pubmed/18636317
http://www.ncbi.nlm.nih.gov/pubmed/15208835
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3308119/

COPPER

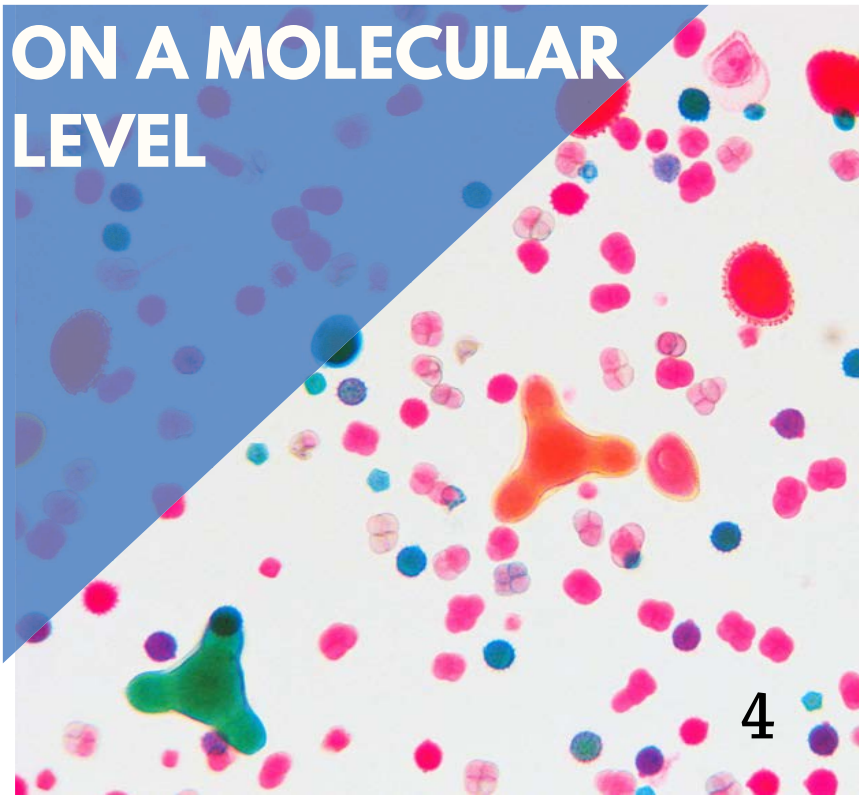
WHY IS IT IMPORTANT?

Copper is and essential trace element that can donate an electron in oxidative-reduction reactions and is vital for a number of enzymes:

- Cytochrome c oxidase allows mitochondria to create the energy molecule ATP, and is needed for synthesis of myelin sheaths
- Lysly oxidase for proper collagen and elastin in heart, blood vessels, bone and connective tissue
- Ceruloplasmin (ferroxidase) enzymes involved in iron transport by transferrin
- Dopamine-beta-mono-oxygenase converts dopamine to norepinephrine (neurotransmitters)
- Monoamine oxidase (MAO) is important in the breakdown of serotonin and metabolism of neurotransmitters
- Tyrosinase is important for the formation of melanin, that gives our skin pigment
- Superoxide dismutase (SOD) acts as important anti-oxidant converting super-oxide free radicals to hydrogen peroxide. SOD may also be involved in transcription of specific genes affecting the ability to make certain proteins.

Copper status seems to be linked with both iron and zinc status. It seems one needs adequate copper for normal iron transport to the bone marrow and red blood cell production. High iron in formula results in less copper absorption. High zinc supplementation increases intestinal metallothionein which due to its high affinity for copper will result in less copper being absorbed.

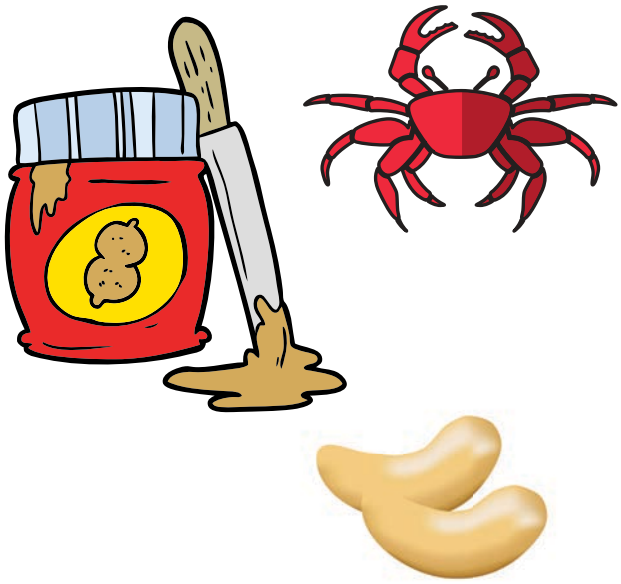
ON A MOLECULAR LEVEL



SYMPTOMS OF DEFICIENCY

Classic copper deficiency has been found in those with anemia that did not respond to being given more iron and then would respond to taking a supplement of copper. Since cows milk has less copper than human milk, this would be more common in formula fed infants, premature infants and those with intestinal issues that might reduce the absorption of nutrients.

Other reported symptoms of copper deficiency include; neutropenia (low white blood cells) with increased risks of infections, loss of pigmentation, neurological symptoms, osteoporosis and impaired growth.



FOOD SOURCES

Liver, shellfish, nuts and seeds are the best sources for copper. Wheat bran and whole grains or fortified cereals also will have some copper.

Food Source	mg
Beef liver (1 oz)	1265
Shell fish (3oz)	585 - 670
Cashews (1oz)	629
Hazelnuts (1oz)	496
Sunflower seeds (1oz)	519
Lentils (1 cup cooked)	497
Almonds (1oz)	332
Peanut butter (2 TBS)	165

SAFETY AND TOXICITY

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RDA (Recommended Daily Allowance)

TOLERABLE UPPER LIMITS
Micrograms/day
Infants not known
children 1-3 1000
children 4-8 3000
children 9-13 5000
teens/adults 8000 - 10,000

Copper deficiency is difficult to assess either clinically or from just a serum blood level. I don't recommend extra copper beyond what is in a multivitamin.

Spectracell micronutrient testing (www.spectracell.com) can provide an assessment of your micronutrient status inside the white blood cells, a good indication of status over the past 3 - 6 months.

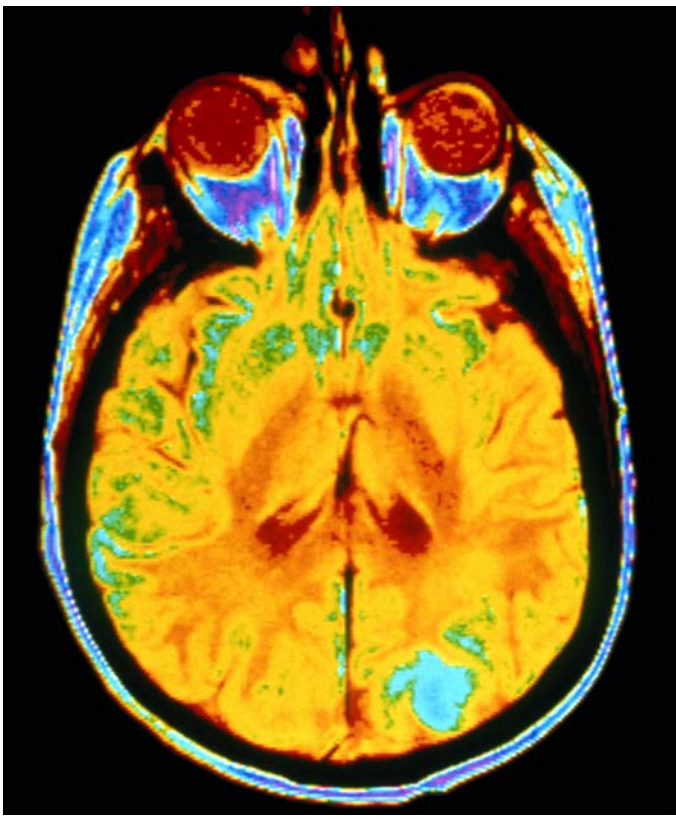
Toxicity is rare unless you drink from contaminated water on an ongoing basis (safe maximum water copper levels set at 1.3 mg/L). Individuals with genetic disorders affecting copper metabolism are also at risk (Wilson's disease, Indian childhood cirrhosis, idiopathic copper toxicity). Acute toxicity can include nausea, vomiting, diarrhea, abdominal pain and in serious cases, liver or kidney damage, or coma and death.

http://www.ncbi.nlm.nih.gov/pubmed/24748564
http://lpi.oregonstate.edu/infocenter/minerals/copper/
http://www.ncbi.nlm.nih.gov/pubmed/21947641
http://www.ncbi.nlm.nih.gov/pubmed/20979948
http://www.ncbi.nlm.nih.gov/pubmed/24847050

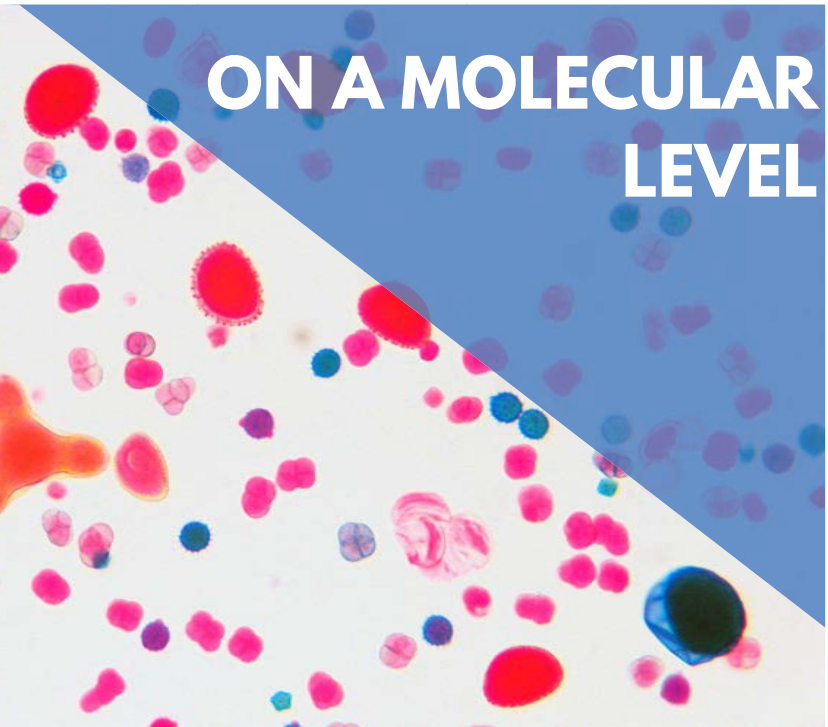
IODINE

WHY IS IT IMPORTANT?

Iodine is essential in the making of thyroid hormone. Low thyroid has particularly severe consequences if present while pregnant (see below).
In the thyroid gland under stimulation from Thyroid Stimulating Hormone (TSH) that comes from the hypothalamus, iodine is added to thyroid hormone to make triiodothyronine (T_3) and thyroxin (T_4).



ON A MOLECULAR LEVEL



While it is T_4 that is most abundant in the blood, the active thyroid hormone is free-T_3, formed in the tissues by enzymes that convert T_4 to T_3. In the body thyroid hormones are important for:

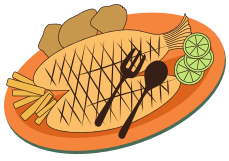
- Normal brain development in the womb and during childhood (needed for myelination)
- Normal growth and development
- Reducing thyroid disease, goiter, breast cancer and fibrocystic disease, prostate cancer
- Thyroid hormone acts on all cells in the body, important for metabolism including the heart

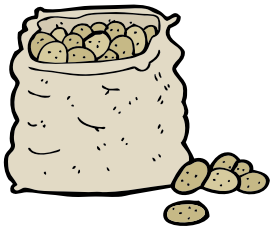
SYMPTOMS OF DEFICIENCY

Iodine deficiency is the leading cause of preventable brain damage in the world, and thought by the world health organization to affect 740 million people. The most concerning is the brain damage to unborn children born to moms who are low in iodine. Since Iodine is needed for myelination of the central nervous system the most severe forms are called cretinism, and typically present with irreversible mental retardation, deafness and physical growth retardation with short stature and myxedema (swelling).

Mild forms may often be detected by the presence of a goiter (enlarged thyroid gland). School age children may have poor school performance, slower response times, ADHD, and other learning issues.

Iodine is protective against radiation damage, and thyroid cancer that can result from the excessive radiation. This has been vital in accidents like the 1986 Chernobyl nuclear accident, the more recent Fukashima reactor accident in Japan and also in cases where radiation for medical treatment is excessive and near the thyroid gland in the neck. Iodine may benefit fibrocystic breast disorders suggestive that deficiency may be a contributing cause.





FOOD SOURCES

Almost all the iodine that is available is in the sea and seaweed is by far the best food source of iodine other than iodine supplemented foods (iodine salt, iodized vegetable oil).

Food Source	mg
Seaweed (1 ounce)	up to 18,000 (18 grams)
Cod (3 oz)	99
Iodized salt (1gm=1/3tsp)	77
Potato with skin (1)	63
Milk (8oz)	56
Seafood	17-35
Navy beans (1/2 cup cooked)	35
Egg (1)	29

SAFETY AND TOXICITY

RDA (Recommended Daily Allowance)

In Japan where lots of seaweed is eaten, dietary intakes as high as 50,000 or more (50mg) a day have not resulted in any toxicity. Since elevated TSH has been seen with iodine intakes over 1700 micrograms (1.7grams) a day the following upper limits were set:

TOLERABLE UPPER LIMITS
micrograms / day

Infants	unknown
children 1-3	200
children 4-8	300
children 9-13	600
teens/adults	1000

If your diet contains some seaweed - great. If not you would be wise to supplement a little iodine. Pregnancy recommendation is to take 150 micrograms a day. Not all prenatal vitamins contain iodine. If not please be sure you get your 150 micrograms either from the diet or as a supplement.

Acute poisoning is very rare, may present with burning of the mouth, throat and stomach, nausea, vomiting and diarrhea, fever, stomach aches and rarely a weak pulse and coma have been reported.

http://www.drmeletis.com/wp-content/uploads/2012/07/Meletis-11.pdf
http://www.ncbi.nlm.nih.gov/pubmed/20172467
http://www.ncbi.nlm.nih.gov/pubmed/22297907
http://www.ncbi.nlm.nih.gov/pubmed/22191793
http://www.ncbi.nlm.nih.gov/pubmed/12915350
http://www.ncbi.nlm.nih.gov/pubmed/22443974

IRON

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WHY IS IT IMPORTANT?

Cellular energy depends on ATP (adenosine triphosphate) that is made in the mitochondria with the help of cytochromes that have heme (iron-containing). Iron is important for certain enzymes:

- Catalase and peroxidase that break down hydrogen peroxide (a reactive oxygen species - ROS)
- Myeloperoxidase in the neutrophils (WBC's) helps with the destruction of bacteria the WBC has engulfed
- Ribonucleotide reductase is vital for DNA synthesis

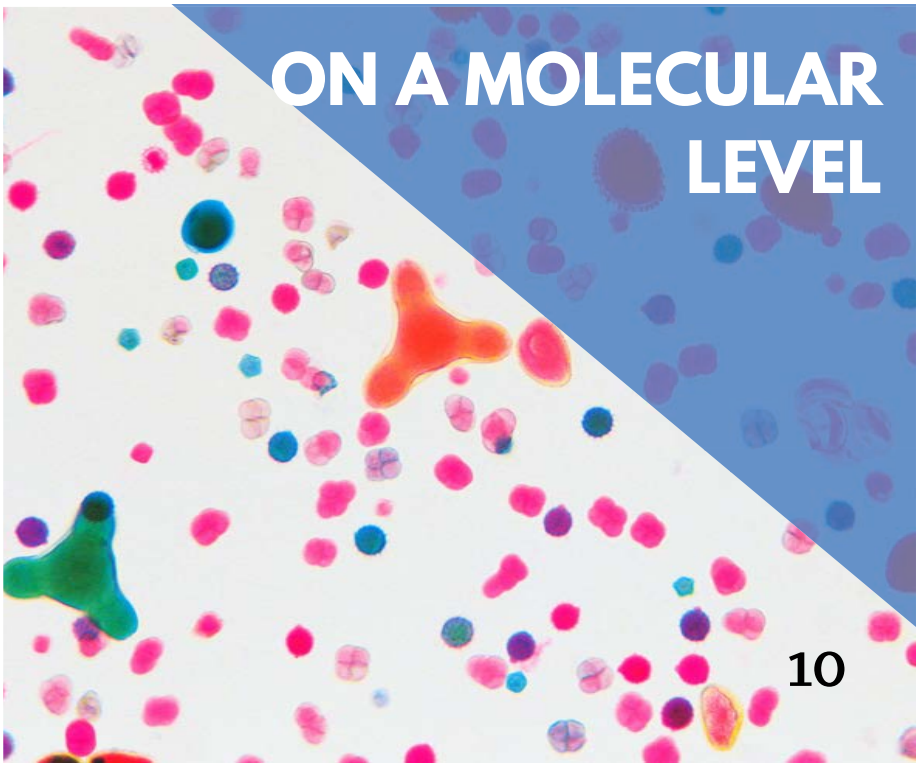
The iron storage protein ferritin is made in response to adequate iron, and ferritin is reduced when iron is low.

Several nutrients have important interactions with iron:

- Vitamin A deficiency makes iron deficiency worse
- Copper seems important for proper iron absorption, and transport to the bone marrow and red blood cells
- Zinc is not well absorbed if a zinc supplement is taken with iron supplements
- Calcium supplements reduce iron absorption if taken at the same time.

Iron is known to have a role in hundreds of enzymes and proteins. Hemoglobin in the red blood cells contains about 2/3 of the bodies iron with the rest being mostly in the myoglobin or muscles cells. Hemoglobin transports oxygen from the lungs to the rest of the body and myoglobin also stores and releases oxygen to the muscles.

Deficiency of iron is most common in conditions of chronic blood loss (infants consuming cows milk, parasites, H. pylori infections, heavy menstruation) and during times of increased need (pregnancy, infants, young children, adolescents). While some vegetarian diets may be low in iron and the iron in vegetables is harder to absorb - there are plenty of high iron vegetables (see below).



ON A MOLECULAR LEVEL

SYMPTOMS OF DEFICIENCY

ANEMIA - the main symptom of iron deficiency is anemia, microcytic (small cells) and hypochromic (pale, with less hemoglobin). Most symptoms of iron deficiency are related to the anemia; fatigue, rapid heart rate, dizziness, headaches, shortness of breath with exertion or at higher altitude, reduced athletic performance and endurance with increased lactic acid production on exertion. As anemia gets worse you look pale, hands and feet get cold. In children iron deficiency has been associated with delayed development and lowered IQ, and behavior issues. Restless Leg Syndrome (RLS) has been reported to be related to iron deficiency.

Severe iron deficiency can result in cold intolerance, brittle spoon-shaped nails, sores at the corners of the mouth. Arythmias (irregular heart beats) and eventually heart failure can occur. Rarely difficulty swallowing with webs of tissue in the throat and esophagus (Plummer-Vinson syndrome) can occur. Children may be seen with Pica (eating non-food items).

In pediatrics, routine screening by 9 months age by measuring a hemoglobin (Hgb) will detect anemia as an indirect clue to iron deficiency. If no anemia then most likely the iron status is adequate. I am suspicious that this is inadequate as nearly all children on whom I check more specific iron studies (serum iron, TIBC - total iron binding capacity, ferritin) show significant iron deficiency and typically very low ferritin levels suggesting low iron stores in the body.

FOOD SOURCES

Food Sources	mg iron
Clams (3 oz)	24
Oysters (3oz)	10
Organ meats (3 oz)	5 - 10
Tofu, soy bean (1/2 cup)	4 - 6
Bran cereal w/raisins	5 - 18
Fortified cereals	5 - 8
Seeds (pumpkin) 1 - oz	4
Beef (3 oz)	3
Beans, lentils (1/2 cup)	2 - 3
Meats	2
Fish / chicken	1
Prunes / raisins (1.5 oz)	1

SAFETY AND TOXICITY

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RDA (Recommended Daily Allowance)

TOLERABLE UPPER LIMITS

40 - 45 micrograms a day for all ages infants to adults.

Recommended daily allowance (RDA) ranges between 7 - 18 micrograms a day from age 6 months to adults with 27 micrograms recommended for pregnancy.

In children, accidental overdose can be fatal. It is for this reason multivitamins with iron should be locked up and dispensed with care. Acute iron toxicity can occur at doses of 20 - 60 mg/Kg and death at doses above 200mg/Kg of body weight.

Symptoms of acute poisoning begin with nausea and vomiting, abdominal pain, black or tarry stools from the intestinal bleeding, low blood pressure and weak pulse, difficulty breathing and coma within hours of a severe poisoning. Long term and fatal damage to multiple organ systems can occur in a day or two or be delayed up to 6 weeks if the fatal ingestion doesn't kill you in hours. This is a medical emergency, and if in doubt, call poison control and get to the nearest emergency room immediately.

The major issues with iron overload occurs in individuals with hereditary hemochromatosis (HH), a genetic condition where iron is deposited in the liver and other tissues due to excessive absorption of iron over years. The genetic tests for HH can now be done and those with this condition would limit iron containing foods and avoid alcohol and acetaminophen. The other common form of iron overload comes from over supplementing (taking too much iron) by those with anemia that is thought to be iron deficiency when in fact it is another cause such as thalassemia or hereditary spherocytosis. It is for this reason that anemia not responding to iron supplementation in 3 - 6 months should prompt your physician to do iron studies, to confirm that you do indeed have iron deficiency. If the iron studies are normal, a smear and hemoglobin electrophoresis will usually provide the answer.

http://lpi.oregonstate.edu/infocenter/minerals/iron/
https://www.youtube.com/watch?v=3TgkD_V0f58
http://www.integrativepediatricsonline.com/blog/2014/06/11/iron-deficiency-can-have-long-term-negative-effects/
http://www.integrativepediatricsonline.com/blog/2013/11/26/breastfeeding-and-iron-deficiency-2/
http://bembu.com/iron-rich-foods-for-vegetarians-and-vegans

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DR. PAUL'S SUPPLEMENT RECOMMENDATIONS

(Visit wellevate.me/drpaul to get 25% discount)

For pregnancy remember to get a prenatal that has iodine, some iron and folate as methyl-folate consider Thorne Basic Prenatal

IRON EXTRA by Vitanica

Disclaimer: Please check with your health care provider to see if this supplement is appropriate for you and what dose to use.

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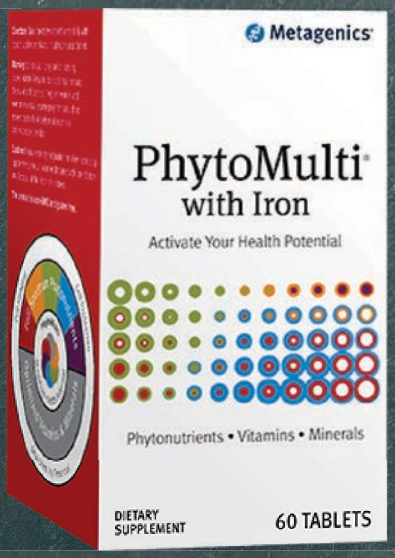
DR. PAUL'S SUPPLEMENT RECOMMENDATIONS

(Visit wellevate.me/drpaul to get 25% discount)

Liquid iron apple cinnamon by integrative therapeutics

You may want to get your iron as part of your multivitamin;
a good consideration will be phytoMulti w/ iron.
As it also provides important phytonutrients



Disclaimer: Please check with your health care provider to see if this supplement is appropriate for you and what dose to use.

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DR. PAUL'S SUPPLEMENT RECOMMENDATIONS

(Visit wellevate.me/drpaul
to get 25% discount)

Chromium (picolinate) 200mcg by Pure Encapsulations

Multi-Nutrients II Citrate/Malate Formula with cooper)
Cooper should always be taken as part of the multivitamin and in low doses.

Disclaimer: Please check with your health care provider to see if this supplement is appropriate for you and what dose to use.

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DR. PAUL'S SUPPLEMENT RECOMMENDATIONS

(Visit wellevate.me/drpaul
to get 25% discount)

**Iodine (potassium iodide)
120 caps by Pure
Encapsulations**

**Liquid Iodine 150
mcg 1 oz. by
Genestra Brands**

Disclaimer: Please check with your health care provider to see if this supplement is appropriate for you and what dose to use.