

Tentative Title: “**Meat: Grows the Brain and Rusts the Body?**”

Back in the day, in [1946](#), we were *right* to like meat, it was the fun way to get our proteins, it came in cans. Sometimes with a sack of sauce! And people knew meat was good, but thanks to the American Meat Institute, they then learned that it was *this* good. That same year, a paper from JAMA was recommending that pregnant women add an extra generous serving of meat to their daily diet.

Fast forward to 2019, for one reason or another various public figures from celebrities, companies and even [New York Public Schools](#) want people eating less meat. There are many studies showing that people who eat more meat seem to have more heart disease, more diabetes more cancer and other health issues.

And when it comes down to the specifics of why meat is bad, compounds in meat are often investigated - things like heterocyclic amines, TMAO, Neu5GC, Arachadonic acid, and the list goes on.

In the first Chapter of “Survival of the Sickest,” Dr. Sharon Moalem tells the story of how long distance runner Aaron Gordon found himself in a very peculiar situation while training for a 150 mile race across the Sahara desert. He was actually feeling fatigued while training - having been a natural athlete, he was a competitive swimmer since age 6, and physical difficulty was new for him. In fact, he was tired all the time. His joints hurt and his heart seemed to be skipping beats. After 3 years of trying to figure out the cause, his doctors found that An abnormal buildup of iron in his blood and liver was rusting him to death. He had 5 years left to live.

So, the first “bad” compound in meat we’ll have a look at is **heme iron**. You may be familiar with news headlines like this: \_\_\_\_ The WHO’s IARC report that lead to these news reports identified heme iron as one of the suspect compounds in meat. Heme iron is said to increase your risk for heart disease, and even cancer, particularly colon cancer.

But, I think everyone knows we *need* iron.

The [WHO estimates 25% of the population to be anemic](#) - iron deficient.

Plants provide non-heme iron whereas meat and fish gives us heme-iron which is absorbed much more easily. Depending on the person and their lifestyle, iron stores can deplete rapidly when you stop ingesting heme iron.

Youtuber [Liam Thompson](#) tried eating no meat or fish for one year. Near the end of the first six months, he noticed he was a bit tired and was requiring more sleep, so he went to get a blood test. The test showed his iron level had halved. Liam happens to runs alot, so his iron requirements are higher, but in the last 3 months of his diet experiment, **despite** having taken supplements and using other strategies for increasing his iron, his iron level halved ...again.

Sure, iron absorption is great, but what about cancer? [One of the initial studies](#) looking at that idea that heme iron causes cancer, fed calcium deficient rats a heme iron rich diet and found that indeed these rats developed precancerous lesions in their colon. ...but if you gave these calcium deficient rats some calcium, they had no such increase in precancerous lesions. There's another interesting thing about this study, as it says: "*[the rats were] given control diet before being injected i.p. with .dimethylhydrazine* (Dimethylhydrazine is a carcinogen, a cancer causing substance). ...*We chose to initiate all rats with the carcinogen, [because another study found] that a [high heme iron diet] does not [cause colon cancer] in rats.*"

[Here's another study](#) where they say heme iron promotes colon cancer in mice, yet again the mice were first injected with ~~azoxymethane~~, an agent known to cause colon cancer. In fact, in that WHO report that told us processed meat causes cancer, ~~is a study that found that bacon protects against azoxymethane induced colon cancer.~~ Actually, the report even says "*There is inadequate evidence in experimental animals that red meat or processed meat cause cancer,*" ...but, haem is listed as a mechanism by which meat causes colon cancer.

"As of this coming September, Meatless Mondays will be in effect in all 1800 New York City public schools. And we are proud of that." [\[Video, article\]](#)

[A different WHO report found that globally](#), 47% of iron deficiencies come from pre-kindergarten children. Unfortunately, iron deficiency anemia in growing children has been associated with cognitive deficits due to abnormal brain development [\[38,39\]](#)

[\[Simpsons SE04EP10 - "Lisa's First Word"\]](#) "Oh Boy, liver! Iron helps us play!"

But, maybe more importantly, iron is crucial for children to have even *before* they're born.

[Bradley Peterson](#), director of the Institute for the Developing Mind at Children's Hospital Los Angeles in California, wanted to see why low iron levels in children are correlated with lower IQ and poor concentration. Peterson and his colleagues used an MRI to see what was happening in the brains of newborn infants and 40 healthy adolescent mothers — a group known to be at high risk for iron deficiency. Unfortunately, it looks like iron supplements don't cut it for pregnant women. **Despite taking prenatal vitamins with iron**, 58% of the women had iron levels below normal.

The brain images that his team took showed a correlation between neuron complexity in an infant and the amount of iron in the mother's diet, meaning: "*The higher the iron intake throughout pregnancy, the more mature or the more complex the grey matter [of the brain] was at the time of birth.*"

Clearly, iron is especially important for mothers and their children. And, the iron *source* is very important too. As [this paper](#) explains, "...during pregnancy there appears to be preferential fetal use of maternally ingested iron derived from a dietary, animal-based heme source..."

Due to heme iron's superior absorption, [this review](#) found that despite heme iron constituting only one third of the iron that is actually digested, it makes up two thirds of the average person's total iron stores.

[This review of 13 studies](#) found that people who don't eat meat, people who don't have a steady supply of heme iron, had consistently lower levels of iron and had consistently higher rates of anemia - this was especially the case for women who could become pregnant.

So what about the iron overloaded guy with only 5 years to live? The long distance runner Aaron Gordon was suffering from a genetic condition called "hemochromatosis." where your body holds onto too much iron. Iron is good, but we really don't want our bodies overloaded with it - hemochromatosis causes various problems like metabolic issues, liver damage, heart palpitations and more. This condition is found commonly [adult men](#) with [North or West European](#) ancestry - but around only 0.5% of those men actually suffer from the condition, though the risk does increase with age.

However, there is evidence that iron accumulates can accumulate with age, even in [people without hemochromatosis genes](#). [Dr. Leo Zacharski says](#) increasing concentration of body iron is *common* with aging.

Though accumulating too much iron might be the consequence of an unhealthy lifestyle. There seems to be an association between iron and obesity. Two studies, one looking at a Japanese population and a Mexican population found that the body's storage form of iron, ferritin, correlated with visceral fat and insulin resistance. [\[R,R2\] Paul Adams](#), professor of medicine at the University of Western Ontario says "*In a large multiethnic population, the most common causes of elevated ferritin, [the storage form of iron] levels are likely obesity, inflammation, and daily alcohol consumption.*"

So, should adult men or post-menopausal women avoid meat or iron rich plant foods to prevent iron overload just in case? Well, [Chris Masterjohn, PhD in nutritional sciences](#) recommends specifically not to lower iron rich foods in your diet even if you *have* hemochromatosis because those foods often have very valuable nutrients packed with them like copper, zinc, vitamin A, and vitamin B12.

The reason hemochromatosis is more prevalent in men is because premenopausal women lose a lot of iron through a monthly involuntary loss of blood. The key treatment for people with iron overload is phlebotomy - therapeutic blood removal or blood donation. The rusting long distance runner Aaron Gordon had his life saved and his health returned to normal with one of the oldest medical practices - blood letting.

But here's the thing: Why was bloodletting so popular in so many places [for so long](#)? It's thought to have been around as a medical practice for as long as 5000 years up until the

late 1800's. In the 18th and 19th century, pretty much any ailment you had from hypertension to headache to shortness of breath, the cure would be blood letting.

In the earlier mentioned book, survival of the sickest, Dr. Moalem says that surely blood letting must have conferred some benefit since it was so widespread and practiced for so long.

In this short book by P.D. Mangan, prefaced by Dr. Leo Zacharski, he lists various studies on the detrimental effects of excess iron in people without hemochromatosis, for example studies that show blood donors have lower rates of heart disease and cancer. One study showed therapeutic blood letting improved biomarkers for patients with non-alcoholic fatty liver disease, a condition that commonly appears with diabetes.[\[R\]](#)

Maybe all those blood letting patients from the past didn't understand improvements in biomarkers, but found that they felt a little better.

So, why wouldn't the body be adapted to deal with excess iron?

For 99.6% of human's existence we were hunter gatherers until we figured out agriculture. And, back when we were still hunter gatherers we had to have ingested a ton of heme iron in the form of hunted animals. [A paper by Loren Cordain](#), supported by [fossil isotope data](#), found that a majority of hunter gatherers were getting 56 to 65% of their nourishment from animal foods with at least 20% of calories and as much as 50% of their calories coming from animal protein. That's a lot of heme iron.

So there's two ideas to consider:

First, it could be the case paleolithic humans were at far higher risk of being low on iron, so having a mechanism by which the body could dispose of excess iron wouldn't be worth having. Being infected by [hookworms](#), roundworms, bacteria like H. Pylori and other pathogens, getting wounded from accidents or animals, having malaria, ticks, leeches and so on would all be great ways to lose blood and iron.

In fact, [the inuit](#), despite eating a heavily fish and animal meat based diet, a big concern for them is anemia despite abundant intakes of heme iron.

Some of the proposed reasons are flatworm and hookworm infection, H. Pylori infection, gastrointestinal bleeding and their vitamin intake being disrupted by the incorporation of modern high-starch foods to the diet.

On the other hand, [this paper](#) suggests that after the agriculture gave us iron poor diets 10,000 years or so ago, our genetics started developing ways to hold on to that iron for dear life.

There are still several question marks orbiting the topic of iron overload but we can safely say a nuanced approach to dietary iron is very important. Growing people surely need *more* easily absorbed iron, but older people might be tempted to avoid good sources of heme iron for some

of the reasons I talked about. But, older people are at risk for sarcopenia, muscle wasting, which is [linked to](#)<sup>[R2]</sup> a higher risk for death from all causes. Iron isn't the only thing in meat that's easily absorbed. Several studies have shown that the more easily absorbed animal protein is good for maintaining muscle mass in the elderly. [[R](#), [R1](#), [R2](#), [R3](#), [R4](#), [R5](#), [R6](#), [R7](#), [R8](#), [R9](#),[R10](#), [R11](#),[R12](#), [R13](#), [R14](#)][Spotlight:

*\*“In addition to digestibility issues, it was reported that the dietary protein–derived AAs from the plant-based proteins soy and wheat are more readily converted to urea when compared with the ingestion of milk proteins ([56](#), [57](#), [58](#), [59](#)) This would ultimately lower the potential of these plant-based protein sources to stimulate the skeletal muscle anabolic response.”[Quote source - [R15](#)]*

Before we forget about the heme in heme iron, let me just add that heme itself is essential for a ton of things. Heme of course is the reason your blood can carry oxygen, it's also essential for many other things like [electron transport](#) and energy generation, regulation of your circadian rhythm and it is important for several enzyme systems for example the detoxification enzymes in your liver<sup>[R]</sup>. In fact, one component of cognitive decline<sup>[R]</sup> and Alzheimer's disease is thought to be a heme deficiency [[R1](#), [R2](#)]. Research has found that hemoglobin and heme itself help reduce inflammation in the brain and clear out the problematic amyloid plaques found in the brain of Alzheimer's patients.<sup>[R]</sup>

But you don't have to get your heme from the diet, your body makes it.

Though process to create heme requires 8 enzymes and uses up the main protein for collagen, glycine, as well as vitamin B6, zinc and of course, iron. What's funny is all those nutrients are in meat.

In any case, it seems like the times have changed. Whereas a doctor from the American College of Obstetricians and Gynecologists [said in 2017](#) that yes absolutely you can have a healthy pregnancy without meat, a 1946 [paper from the Journal of the American Medical Association](#) was recommending pregnant women to add an extra generous portion of meat to their typical diet.