

Brain Gut #5: Paradigm Drifts Paradigm Shifts–Epi-Paleo Rx

Readers Summary:

1. What are the implications of Brain Gut 4 and 5 for modern humans?
2. How does environment signals get translated into the language of biochemistry?
3. What makes shellfish so damn special to humans?
4. What are the brain specific nutrients of the Epi-Paleo Template?
5. Do you think of food as hormone information and electromagnetic fingerprint or as metabolic fuel?

Geeks: The implications of Brain Gut 4 mean that to develop a brain seafood is required part of the program to maintain it. Nutrients and many other environmental factors have also been found to influence epigenetic programming of our DNA either directly or indirectly via metabolic sensors. Peroxisomal proliferator-activated receptors (PPAR's), the vitamin D receptors, and the retinoid X receptors (RXR), and the retinoic acid receptors (retinol) (RAR) are all examples of the nuclear receptors that interact with the brain cell membranes to control inflammation and metabolism all over our bodies. It turns out that PPAR's are the receptors that are at the crossroads of where inflammation and metabolism actually cross at cell membranes where DHA is buried. These are specialized lipid sensors (antenna) that pay attention to our balance of omega 6 and 3 levels. 3% of the human genome is directly or indirectly controlled by the endocrine functions of the Vitamin D system. This shows you how environmental signals are intertwined with the expression of DNA in humans by way of the mitochondrial matrix and the antenna's on our surfaces. The Epi-Paleo Rx controls

inflammation at a hormonal level in the brain (mitochondrial matrix) better than the more famous paleo diet.



Non Geeks: What we eat is really damn important when you have 3 lbs of lipid in your head called a brain. If you eat outside our design you get sick.

Levee 13 in the Quilt talks in depth about the effects of certain lipids on PPAR. It turns out DHA/EPA have massive effects upon it. Moreover, it also turns out that fish based PUFA (DHA) is also a ligand of retinoid X receptors (RXR), and RXR binds most of the forms of Vitamin A in our bodies.

Remember from the Hormone 101 blog to make hormones we need Vitamin A and T3 to be present in good concentrations to convert LDL cholesterol to pregnenolone. Pregnenolone then undergoes transformation to the rest of hormone chain in humans, provided ***cytokine levels are low***. That hormone chain ends in Vitamin D production making it an ideal way to tell us what is going on in that engine.

DHA, the fat in shellfish and seafood, has direct epigenetic effects on human epigenetics: Think Levee 14 of the Quilt

Geeks: Not only does diet induce immediate changes in DNA activation but it changes its genomic expression by altering the organism's hormonal status to change the genomic body plan. This is how epigenetics controlled the growth of the human brain, spine, gut, and hind limbs. These are the things that separate us from primates. It is not clear that our genes

are not where our major differences are found. Humans are the only mammals that can induce DNA changes just by the way we think. We know that DNA activation and expression occurs with thoughts from functional MRI data and PET scans on human brain function.

Non Geeks: The food we eat completely determines what kind of health we will have because of the way Mother Nature created us.

Many people in the paleosphere call this area the mind/body connection, but I find this to be a misnomer. The mind is the sum total function of the central nervous system (CNS) and its endocrine secretion is called a thought. That secretion can directly upregulate DNA and RNA activity with gene expression and protein formation. This means that a thought has a tangible action. ***This ability is found in the biochemistry of the DHA molecule itself.***

*Few people realize the possibility is that DHA **in vivo** plays a more direct role in neuronal signaling, in which some special properties conferred on the membrane by DHA chains exert an influence on membrane electrical phenomena (Bloom et al. 1999)*

This implies that the DHA molecule itself has some special electrical abilities and can exert quantum effects in vivo.

The 6 double bonds in DHA allow for its electron cloud in the molecular structure of DHA to become a very special fatty acid with respect to unique properties. Humans exploit those advantages more than any other mammal on this planet. It has been put forth that some polarization of **π -electron clouds** might occur in the DHA structure, and perhaps even be transmitted from one double bond to another, either within a given chain or between neighboring chains in the membrane.

This means that DHA has different properties in the lipid structures of the brain than it does when a researcher studies it in the lab. It implies these effects are lost when fish oil is in a pill form outside of its evolutionary package of shellfish. This is why supplementation falls far short of

eating fish. But why you ask?

When DHA molecules are adjacent to each other in a tissue like a brain the **π -electron clouds** actually are closer together in space than they are when the DHA molecule is alone by itself in a pill or in a liquid state. This unique ability allows for DHA in a membrane to become to its own receptor in a membrane to allow for amazing electrical abilities. This is why DHA is so special and has been conserved by evolution in the nervous system of all life forms and not replaced with the more common land-based form of PUFA's like DPA we mentioned in Brain Gut 4.

The molecular magic is so impressive, that Roger Penrose has shown how consciousness can be explained by the ***quantum effects of this one fatty acid***. In this molecular arrangement, it would allow for gamma coherence of the neural microtubules found in the brain's substance. This chemistry explains the effects of anesthesia and of consciousness, which have not been well described anywhere else in the biologic sciences. It appears the brain is built upon a special fat that allows for quantum effects to happen routinely. These measurements have actually been made in vivo in NMR experiments and electron tunneling experiments. These tunneling of electrons is also found to happen in mitochondrial electron transport respiratory chains as well.

Many bloggers, so fond of bone collectors data, laughed at my ideas of quantum biology in the evolution. Now you know why they do. They don't get it and never have. Just like their mentors and idols and the scientists that created the modern evolutionary dogma we all believe today. Today, we need to question that too.

Moreover, this evidence that these things happen within nanoseconds in the cell membranes of neurons are found in vivo experiments done in medicine daily according to functional MRI data, and EEG strips in all of us that doctors order daily. These abilities are also unique to humans. It's nothing short

of amazing to think evolution can move that fast on a micro level but still not affect the phenotype of the organism in any great macro way. Another paradox of life revealed I guess done by DHA in vivo.

Geeky Inflammation Link: We also know today, that epigenetic modifications usually involves activation of NF kappa beta at some point in the biochemical pathways of life. Therefore we must, consider inhibitors to NF kappa beta in future additions to "The Quilt". We now know that DHA is **one of those inhibitors** of NF kappa beta. This implies a diet high in DHA not only is required for a complex nervous system but it also predicts excellent longevity because of its intranuclear effects on the main "**911 controller**" of the cytokine storms that cause inflammation and neolithic disease. These findings are nothing short of amazing, and help explain why brain DHA levels correspond directly to leptin levels and of mankind's underlying hormone balance on labs.

Non Geek: DHA has the built-in ability to be super flexible for cell signaling and highly conductive electrically, but it protects itself from oxidation because of the quantum effects of its electrons. Paleo dogma tells you PUFA's are bad. Well DHA is a very unstable PUFA outside the brain, but because of those 6 double bonds and its special electron cloud when it is densely packed together, it becomes a PUFA superman chemical.

Outside of the body, it is Clark Kent because of a loss of quantum effects on its electron clouds. Remember when people made fun of this post? Be careful what you call bullshit on when you are not aware of what you really do not know. Food and their electrons matter more than anyone in Paleo could imagine. I was giving a huge hint back then.

Is DHA ancient even for Mother

Nature time frames?

It turns out from molecular biology we have learned, that DHA, Vitamin A, and Vitamin D are all 'molecular dinosaurs' as environmental signals to the all neural structures in life. DHA and vitamin A, in particular, have **600 million years molecular history** as sensors in the visual system of all species known to exist in Earth's history.

A report in 2002 by the United Nations Children Fund showed that brains worldwide are being deflated because of a shortage of certain dietary nutrients like iodine, iron, vitamin A and zinc (Ramkrishnan 2002). They reported that **malnourished humans have smaller brains** in size and reduced cognitive abilities by 5-7 IQ points when iron is deficient. 13 IQ points is the cost of a low iodine level. I see this daily on MRI scans in my clinic. **We are what we eat.** When a human brain is 'ill fueled' these days we have the capability to measure it with an MRI or a neuro-cognitive test. The evidence worldwide is that we are a species in decline because we are drifting further from the diet that caused our brains to form initially. I mentioned this in my Paleo Summit talk with Sean Croxton. Well, here is that proof of that statement I was criticized for back then.

When you eat "food-like products" you acquire illness like diseases!

We have moved more to a diet designed to put empty carbohydrate calories into our guts with synthetic man made oils or oils of plants. These moves may help spread out resources to avert hunger worldwide, but they have led to a mediocrity of our species in the last 100 years. We may not die of starvation but we are causing our '**cognitive de-evolution**' decade by decade. This is obvious when you look at the recently rising prevalence and incidence of autism, ADHD, AD, and Parkinson's disease. DHA concentration is directly

correlated with disease. A key characteristic of DHA ($\omega 3$) deficiency is reduced learning capacity and behavioral pathology seen in humans. This was first described by Michael Crawford in London. The behavioral pathology in a $\omega 3$ deficient primate was also shown in Dr. Joseph Hibbeln's work at the NIH USA (Hibbeln *et al.* 2005, 2007). It is clear that DHA is directly tied to human brain power. Nothing else in biology accounts for it. Dr. Remko Kuipers work is also important here and his upcoming talk at AHS 2012 should be a must hear!

Saving Darwin's Reputation?

Moreover, it perfectly vindicates Darwin. Charles Darwin in *The Origin of Species* (1868) stated there were two forces in evolution, **natural selection** and the **conditions of existence**. Of the two, he said, **the latter was the most powerful**. Most people know about natural selection but few know about the latter. It turns out Darwin was more right than even he knew. This belief almost cost Darwin his legacy because he spent the rest of life looking for 'epigenetics' in an idea labeled "Pangenes". He believed that Pangenes were responsible for translated environmental influences that have now become known as epigenetics today.

However, Weismann (1893) rejected this view completely, in the all-sufficiency based on experiments in which he cut off the tails of breeding rodents (experiments wrongly tied to Lamarkian ideas incorrectly) and observed that subsequent generations still produced tails. That set in train the present paradigm of the **modern synthesis of evolution**, and genomic determinism within which the DNA is seen as the sole dictator of difference and evolution, and to the notion of the "Selfish Gene" was set forth by Dawkins recently.

Non geeks: Genomic determinism means DNA and genes control everything. Today we know that it's 180 degrees opposite

that. It is all about epigenetics. This means we have total control of our DNA if we learn how to use it.

In 2003, the Duke experiments I mentioned in earlier blogs, like CPC #4, they showed that epigenetics is how "**conditions of existence**" are readily translated in the mammalian clade by acetylation and methylation patterns on their DNA.

Moreover, the evidence on omega 3 marine food consumption was overwhelming. We found in human diets during pregnancy directly affected childhood intelligence and behavior measured at 8 years of age postnatally. **This data should act as a constant reminder that *H. sapiens* is also subject to Darwin's conditions of existence (Hibbeln et al. 2007).**

You rarely hear that in 'paleo land/LCHF'. Every mother needs to know that data.....what they do and eat primarily determines what kind of brain their child will ultimately have. If it is paleo, it is good, but it is not optimal or close to optimal for a human nervous system. This data shows us that mankind is among the most sensitive mammals to dietary epigenetic influence, whether we choose to believe it or not. What your grandmother and mother does during pregnancy has huge implications for your brain.

Let us look at what is required to make a brain from an evolutionary nutrient perspective.

Given what we learned in Brain Gut-4 we know we need a constant large stable of DHA to keep the brain running optimally. Now let us look further for the evidence of what else we need from a diet and where we find it in abundance and see if there are any connections to be made.



12 STEPS to the Epi-paleo Rx for Humans

Think of food as hormone information, not as a metabolic fuel. Think of the Epi-paleo template as human jet fuel for the human nervous system.

1. We need a constant source of DHA and EPA to be present in food and not supplement form to support the metabolism and structure of the brain. DHA has many double bonds in its chemical structure making it inherently unstable outside of its chemistry outside of its dietary carriers in seafood. It is best to eat it, and not supplement it. for optimal health. there is substantial data from Dr. Patricia Kane's lab at Johns Hopkins that fish oil may be quite dangerous for our EFA

ratio's in cell membranes of neurons. If you do supplement it for any reason you should refrigerate the DHA or freeze it.

2. Recognizing that constantly providing a new source of DHA can power the brain to more optimal performance. The ratio for optimal cell membrane EFA's is 4:1 at all times in human biologic systems. This balance is critical for optimal system performance in all tissues but is especially true in the central and peripheral nervous system that have massive amounts of excitable membranes. This means that we are adapted to a diet high in shellfish and we likely have adaptations to assist in its collection from the environment.
3. If the brain is in optimal form the things it controls are also working well. The systems inherent design implies **we are only as strong as our weakest link in this blueprint.**
4. If the brain is working optimally than it means by definition that inflammation levels are low system-wide not just in the brain.
5. With low levels of inflammation leptin and all the distal hormones in the metabolic chain remain in allostasis without the need for exogenous intervention. This implies that understanding hormone allostasis and function is critical to understanding how to treat illness and disease. This is a major point lacking in modern medicine disease management.
6. Brain-selective nutrients must be in constant supply to maintain optimal brain function in connecting it with the environment the human is in. The brain must connect via the thalamus to the Earth's magnetic resonance and via the eye and skin via the sun. This means 3-5 days per week at least one meal needs to contain a food source that has access to these nutrients. Think levee one from the Quilt.



The Key Mineral to Human Development: Iodine

A. Iodine is so important that worldwide national governments mandates have created laws to make sure it is in the food supply of humans. No nutrient is more important to a species with a Ferrari engine in its cranium like we do. The fastest way to suboptimal performance for a human infant is to deplete its iodine source. That disease is cretinism. Iodine is abundant in shellfish, fish, and coastal plants, algae, and seaweed. A good Iodine source is also found in eggs, **while meat and nuts are a moderately good source.**

Iodine best food source by seafood by a longshot. Iodine is the power of thyroid hormones, T4 and T3. T3 is

critical for brain development but it is critical also for alterations made in embryogenesis to the limb buds as well. This is another area where humans are distinct from primates. Hind limbs were already present and just had to lengthen under the influence of massive dietary sources of T3 from shellfish, while the difference's in the brain required massive amounts of iodine and DHA to pull off. This is why bipedalism appeared first in the fossil record before encephalization. The bone collectors are still whistling Dixie over this one.

Iodine has been established as a penultimate mineral for fetal brain development in the literature for humans. Low iodine levels specifically impair ketone body formation that directly inhibits myelination in the human brain. This means all hypomyelination states: IE Multiple sclerosis is tied to a loss of iodine at some level.

Moreover, hearing and acoustic defects are very common in low iodine states. The reason is simple, the auditory cortex of humans is the area of highest metabolic demand (Sokoloff, 1991). Iodine depletion causes demineralization of the Organ of Corti in the inner ear to cause sensorineural deafness. (Goldey et al, 1995). If you can't hear, you can't assimilate speech or speak well. These are other unique human abilities too.

We know that homo habilis had evidence of an enlarging area of its surface brain where the modern human speech areas were. This means that iodine had to be present in great quantities during early neurulation of the auditory and language centers in our ascent from primates. Moreover, when iodine is depleted from pregnant women it does not allow for expansion of the neuronal pool. This implies that iodine is the major driver to all encephalization. The bone collectors see no evidence of this because they are looking at bones and not how human brains form. We also know in amphibians that tadpoles

become frogs via a process called metamorphosis when iodine is in high quantities in the form of the bioactive form of T3 from the thyroid. There is much evidence of the power of iodine and the thyroid hormones from shellfish.

The evidence is steep that early homo had to have constant access to the water at all time to get iodine in large quantities. Here is another fact we know about modern humans that is instructive. We know that brain growth is stunted by two major factors. One is dietary a poor nutrient density from the diet or from a disease that inhibits the ability to absorb, assimilate or retain that nutrient. This implies that the diet and the gut are intimately tied to the formation of the human brain from the modern evidence of how our brain works today. You would never guess this from modern medicine because they do not see how a gut could possibly be related to brain growth or function. **They are tied together by the evolutionary creation of where form meets function.** Human nutrition is where there is an intersection of diet and metabolism. It is where environment meets the body.

This is the perfect definition of modern-day epigenetics.

Humans have no mechanisms **to conserve** iodine in deficient states. This implies it **had to be abundant** in their evolution from an ape. It also implies that humans likely evolved close to shorelines where hydrology favored iodine deposition. Modern medicine still does not know how we absorb iodine in the body from the gut. If you look it up you will see this is true. I have a cite below that talks about it. I found out during some radionuclide Iodine studies I ordered on some patients that the isotopes of iodine seemed to bunch up in places in the gut that corresponded to the gut lining and paracellular pathway in enterocytes. This implied to me, that maybe

the leaky gut was the designed to increase our ability to absorb iodine tremendously to fuel alterations to the primate brain and the mammalian body plan to give us some of the unique morphology that humans have. Iodine is needed to form T4 and T3, which were the transforming hormones that altered our new genes for brain growth and the older genes that control hind limb development to allow for bipedalism.

B. Iron is an essential mineral in the heme molecule of hemoglobin and the cytochrome proteins in our mitochondria to make energy. hemoglobin is composed of the red blood cell that carries oxygen in the bloodstream. The brain gets 20-23% of the cardiac output of every heartbeat. No organ comes close to that consumption. This means the brain needs to have adequate sources of iron to make sure hemoglobin and oxygen are constantly delivered to the brain to maintain performance. Seafood and animal offal are excellent sources of this nutrient. Moreover, iron is better absorbed from fish or meat than other sources by the human gut. People who do not eat enough iron can suffer from iron-deficiency anemia. Worldwide, about 1 billion people have iron-deficiency anemia, and about 2 billion people are deficient in zinc (Muller et al., 2005). Iron also facilitates the conversion of T4 to T3 the active thyroid hormone in the body. This makes it very critical for humans. Iron is also vital for temperature control in humans as well because of the effect of T3 on UCP's. Now go back and re-read the magic in Hormone 101 blog now!

In the USA today 20% of women are iron deficient when MD's check their ferritin levels. Globally, iron deficiency is the major cause of neuro-developmental delay in malnourished children (Pollitt, 1993) Iron is also a cofactor in the receptor of two major brain neurotransmitters, dopamine, and GABA and this leads to

cognitive decline.

C. Zinc is critical in infant brain development because of its rapid growth. Zinc is the one mineral that is highly concentrated in the brain. The highest density is found in the mossy fibers of the hippocampus. Why is this important? The hippocampus is where humans learn by making new neurons and connections in their rapidly growing brains. Zinc deficiency is felt to be tied to autistic spectrum disorders because of this unique characteristic. Zinc is needed to get enkephalin to bind to its receptor too. We need Zinc to also make norepinephrine in the brain. The biggest need for zinc is in the lipid structure of the brain. We can not make or utilize the PUFA's of the brain without Zinc. This is especially true of Arachidonic acid. Zinc is a cofactor in testosterone and estrogen production which is critical in directing specialization of the brain from male to female in its function. The most important hormones, leptin, and adiponectin are both sexually dimorphic.

This mineral also helps with immune function and is essential for healing of wounds, development of sexual organs and bones, immune function, storage/release/function of insulin, and cell membrane structure and function (Wardlaw and Smith, 2009) **Meat is a good source of zinc, but shellfish is a far superior source of it.** Oysters are the best dietary source and they are found in shallow coastal beds. Connecting any dots yet?

D. Selenium is critical in the brain because of two major ties physiologically. One is the formation of glutathione peroxidase which protects the brain from oxidative damage of glycation and lipid peroxidation of its DHA in cell membranes. DHA is very susceptible to peroxidizable agents in the eye and the brain. Selenium also supports brain and thyroid iodine in metabolism as well. It helps

the conversion of thyroid hormones to active T3 outside the brain. Iodine cannot be added to T3 without Selenium levels being optimal. This is why we always recommend using selenium before using iodine in supplementation. Hemoglobin production also requires selenium. The brain requires high oxygen tensions to function optimally.

Fish and shellfish are ideal sources of Selenium, while meats are a decent source.

E. Vitamin B-12 helps the body maintain sheathes around nerve fibers, to activate another B-vitamin called folic acid and participates in many cellular processes (Wardlaw and Smith, 2009). It is found exclusively in marine and animal products. **Many people seem to be unaware of how good marine sources of B12 actually are.** Generally, it is not difficult to get enough vitamin B-12 in an Epi-Paleo diet. A 100-gram serving of clam, oyster, mussel, crab and several other shellfish types of meat will provide more than the Dietary Reference Intake (NAS 2004) of this vitamin that can be found on Table 7 in the Food and Nutrition Board report to the federal government in 2004.

F. Copper is also an essential mineral in the diet because it helps to form hemoglobin and collagen (a ubiquitous protein in the body). It is also a part of several enzyme systems, including those that prevent oxidative damage to cell membranes. This is extremely important in the human brain because of the sheer amount of cell membranes in the brain. Copper's major brain effect, however, is in the lipids of the myelin sheath that protects the signal transmission. When copper is depleted we see hypomyelination in brains and on MRI's Menke's disease is an example of a human disease tied directly to copper depletion. People with MS look a lot like those with Menke's in many respects. Lastly, copper helps to regulate neurotransmitters. (Bryd-Bredbenner et al., 2009). Copper is a cofactor for tyrosine hydroxylase

to make dopamine. It is a cofactor of dopamine beta-hydroxylase that converts dopamine to norepinephrine. It is also a cofactor in monoamine oxidase which inactivates NE, serotonin, and dopamine. During evolution and massive brain growth, we increased our needs to make connections in fiber tracts and our needs to protect massive amounts of lipid membranes that would damage these delicate structures. Copper was critical in making this possible. Copper is even used as a cofactor in cellular respiration. **The copper concentrations in shellfish indicate that the flesh of squid, lobster, oyster and several other shellfish are excellent dietary sources of copper. Once again, we find only offal is a good, not optimal animal source.**

Seafood is crushing animal products in brain nutrient density across the board. Have you stopped to wonder why yet?

Truth Bomb Alert: No theory is too special to question: This includes the religion that is paleo is becoming.

If you do not believe what I am laying out here in excruciating detail, I would suggest you read pages 108-113 in Loren Cordain's latest book, The Paleo Answer.

I do not need to write a **new Epi-Paleo Rx diet book**, because, in those tables, he clearly makes the case for me about my ideas. That is, seafood exceeds anything in the paleo answer/solution/blueprint/template in terms of nutrient density for building a HUMAN BRAIN. I am highlighting this for you because it points you to the scientific truth, that to make a human brain, you need to have a unique mix of nutrients. They are provided in dense quality by shellfish and seafood, **and not in a purely land-based animal diet.** That proof was laid out in Brain Gut 4. Take a look at the 'Denise Minger' section of that blog for a refresher.

This data implied to me, any species with a large brain that consumed huge amounts of energy would have to have and eat a stable nutrient dense diet as its brain evolved. They would also have to have some unique adaptations to absorb those nutrients in their guts too. You and I are both humans, and we fit that bill. The **Epi-Paleo Rx** has buried the work of Cordain since 1999 and uncovered in Dr. Cunnane's work in 2005-12. **All I did, was uncovered that glaring fact.** It's time we all took a look to see what the data really says instead of just believing what has been published about the findings.

7. Brain-selective nutrients act in concert with our optimal gut microflora to have direct effects on genes that control the mammalian body plan and the retroviral genes that caused encephalization to occur. These nutrients are the once that sculpted our body plan from the transitional apes. This predates the Paleolithic. So why are we so enamored with the Paleolithic as modern humans? Should we not be striving for optimal human fuels or just merely better than the crap we are being fed today by the USDA?

8. Iodine is critical to any optimal health platform because of its effects on free T3 and TSH. There are special adaptations made for the collection of Iodine in the human system because of it. I believe it is absorbed best because the gut is semipermeable due to the fact humans have zonulin and primates do not. This also happens to help humans absorb DHA in high volumes as well. Thyroid hormones, including the prohormone thyroxine (T4) and its active version T3, are important regulators of vertebrates neurodevelopment. Specific transporters and deiodinases are required to ensure T3 access to the developing brain. T3 activates a number of differentiation processes in neuronal and glial cell types by binding to nuclear receptors, acting directly on gene transcription in the developing brain and neocortex of humans.

9. The brain has its own thyroid hormone system to make sure

it is ideally formed while in the protective cocoon of the placenta and is optimally maintained postnatally. The effect of low Iodine levels on humans after birth is dramatic and has lifelong effects on many organ systems. Cretinism is the result of low iodine during and after pregnancy and is very common worldwide in humans living far away from marine environments. This is also true of the other brain selective nutrients but most prominent in Iodine. Today most of those organ dysfunctions remain in our blind spots. The standard western diet is very low in brain forming nutrients and maintenance nutrients and this is why we are seeing massive spikes in Autism and Alzheimer's disease respectively. One is a developmental epigenetic disease (Autism) and the other is the result of a lifelong deficiency of brain-forming nutrients with a substitution of PUFA and carbohydrates. This leads to protein conformation problems and breakdown of the critical cell membrane EFA ratio's in the brain to rapidly change electrochemical gradients of excitable membranes that the brain requires for functioning. Cognitive decline is directly tied to these system failures. This in turn directly affects the cerebral metabolic oxygen consumption. This is why AD is associated with low acetylcholine levels in synapses and low EEG patterns and low blood flow on perfusion and metabolic studies. Synapses use more O₂ than any part of the lipid membrane and they are overloaded with DHA. This would seem incongruent because DHA is so susceptible to oxidation in the lab setting because it has 6 double bonds in it.

I did my residency at LSU, where Dr. Nicholas Bazan (ophthalmology researcher) found that we make derivative docosanoids from DHA that are profound brain antioxidant. This means that this PUFA is not only a great electrical conductor when stacked against each other, but it is also an amazing insulator for ROS. These derivatives are called neuroprotectins (NDP1). When the brain loses its DHA levels substantially, it becomes more susceptible to oxidation and protein folding malformations. This is seen in

Alzheimer's disease and aging. The molecular design of DHA, the polyenoic fatty acid most susceptible to peroxidation and located in regions of the most intense oxygen use in the central nervous system, is a remarkable feat of Mother Nature.

Now you know how she did it. DHA is quite special, in fact, more special than most knew for human speciation.

The brain is the ultimate energy hog for nutrients and oxygen. It has no tolerance for lacking in either. If it does not get either, cognitive performance declines rapidly. We also know that when DHA levels fall (AD) cognitive function drops as well. When these changes occur they are usually seen with atherosclerosis of the vertebral and carotid arteries that feed the brain blood and oxygen.

10. These brain selective nutrients are provided in abundance to humans because of special physiologic and morphologic adaptations made in the human gut. These are not found in primates because they have no need for them because they do not encephalize much postnatally. The gut is designed to be naturally semi-permeable to brain selective nutrients. The blood-brain barrier also has special features to allow easy passage of some lipid nutrients, like DHA, and block out the passage of most other substance to protect its performance.

11. The parasympathetic nervous system controls the connections between the gut and the brain. On each end of this conduit are two specialized membranes to control the optimal health milieu of both the gut and the brain at all times. The policeman of this system is the vagus nerve. Its connections to both systems are intricate and vast in humans compared to a transitional ape. The leptin receptor is the thermostat of this system's efficiency. Like a thermometer uses mercury to record the temperature levels, inflammation is the leptin receptors' mercury. Inflammation is what destroys the hormone response by lowering T3 and stopping the conversion of LDL cholesterol to the steroid pathways.

Massive Importance #1: This makes reading the steroid pathways response to inflammation the Rosetta stone for human health monitoring. This implies that we need to think of food as hormone information, not as a metabolic fuel. Think of the Epi-Paleo Rx as human jet fuel for our nervous system. We go as our brain goes. Think of the GI tract as a metabolic computer which adjusts your physiology in response to the nutrients it detects. This is how the Brain-Gut axis works in humans.

12. Cooking of these marine food sources impedes their optimal usefulness to the optimal system functioning but it can easily be overcome by increasing those nutrients from other less dense sources or increasing the volume of cooked seafood eaten. One small example of the effect of cooking is the formation of estrogen in humans. When there is a large volume of undercooked or raw seafood eaten consistently it favors the formation of a special estrogen called estriol (E3) by our gut flora. Estriol is secreted normally during pregnancy in humans to protect the fetus. During the rapid growth spurt of a fetus, a big risk to the system is uncontrolled growth in a highly charged, growth environment in the placenta. This process is commonly known as cancer. Estriol (E3) is the weakest of the three major estrogens in humans and has the most deuterium in it. In fact, it is **1,000 times weaker in its effect on breast tissue**. Vitamin D also protects the breast against cancer development. Vitamin D is found in great concentrations in many kinds of seafood. Weston A. Price mentioned it many times in his writings. What most forget is Price's observations were made in people who ate their food in natural environments outside not affected by a power grid or technology. Vitamin D was found to be exceedingly important in breast cancer prevention in 2009 and the link further cemented recently when the JAMA linked artificial light to breast cancer risk as well. Estriol is the estrogen that is made in large quantities during pregnancy and has potential protective properties against the production of cancerous cell

transformation. This is the evolutionary protection of fetal structure by estriol in a highly powered growth state.

Raw seafood will limit the production of estradiol and estrone by the gut flora, and this confers major advantages to human females as they age. These are commonly found in humans who eat large amounts of undercooked seafood. This is one reason Asian women have markedly lower rates of breast cancer compared to western women. Both of these estrogens are been shown to have links to many human diseases when other systems are out of their allosteric hormonal balance. Food is either a slow killing poison or a healing miracle for humans.

Summary

In 2005, Dr. Cunnane found that eating one kilogram (1/2 pound) of shellfish from mollusks and crustaceans is all that is needed to meet these requirements to fuel human brain growth. Shellfish happens to be found in shallow water sources and was known to be abundant in the Rift Zone coastal fossils. Cunnane's data also was in line with what Cordain reported from 1999 to 2005, but Dr. Cunnane went further with this data.

He showed that it would have been impossible to form the size of the current human brain without a seafood source because DHA was the critical element to its construction. **Meat does not contain enough DHA to form a human brain.** This implies paleo alone is not enough. This is why the internet forums are loaded with people not hitting their targets. The evidence for that is found in the brain to body ratios of all land-based mammals on this planet. It seems today many are blinded to this science. This insight might have hit the bone collectors or the early paleo supporters, if they had examined closely, what really separates us from primates, instead of assuming what has been published in the literature was factually correct.

One thing that was very concerning to me in Cordain's and Eaton's 2005 paper listed in cite 8, is that it was not just based on the facts that we know to be true today. It was based upon a belief that their theory was based upon only. This reminded me of Cordain's stance on saturated fats in his first paleo diet book, that now has evolved, but not for the correct reason in my view, and I expect his views to change on this soon as well. In fact, later that very same year, Dr. Cunnane published a landmark paper (cite 9,10) that showed what Cordain and Eaton wrote was just not factual about DHA biochemistry and human brain evolution. Dr. Cunnane has spoken about this incongruity many times since 2005 and has given an amazing amount of data to refute Cordain and Eaton when it comes to human brain evolution and diet. This is one area where the paleo answer is trumped by the **Epi-Paleo Rx**, as I have outlined here. **Again these are not my ideas of theories.** I am merely shining a light on what is published for you to examine critically. Only your health and longevity may be at stake if you chose to ignore it.

It appears we evolved on this shellfish/seafood template and we have been evolving away from it as we moved from our coastal existences throughout our history. The paleo diet is good enough to sustain us today compared to a SAD, but it is not optimal for making or maintaining the human brain. This has huge implications for many people with neurodegenerative conditions (or diseases that are linked to organs from ectoderm in the embryo) that I treat daily. I think a combination of these diets were mixed as man began to move around the globe to populate it. Interestingly today the world health organization still lists over 1 billion humans suffering from low iodine issues because they live inland and are landlocked. This finding, today, supports Dr. Cunnane's research findings of what is needed to build a human brain from our diet.

The classic neurodegenerative disease of modern man is

Alzheimer's disease. After reading this blog you should realize precisely why it is overwhelming for modern humans.

They have a huge deficiency of all the brain specific nutrients in their diet while they are eating foods that are man-made that steepen the onset of the disease, namely refined carbs, grains, and industrial PUFA's that are oxidized easily.

Read this on Alzheimer's Disease for more details about this disease.

Where we came from initially had to be the seacoast because there are no sources of several of the brain specific nutrients in places inland and over mountains. This also follows how Homo migrated out of Africa by following coastal waters. There is a lot of evidence that we brought elephants with us on that journey to make passage. And yes, you can fish off the back of an elephant in case you were wondering and dive for oysters too.

So after 5 parts of this series what was Homo's solution?

Paleo or Epi-Paleo... you decide.

I just want to point out what we know now. It might have implications for you now. Optimal is a road that breaks free of the land-based solution to diet. My e-cookbook reflects what the science is pointing me too. What is good for our brain appears to be good for all human biology.

It's funny how form meets function in evolution, no?

Learn about the **Epi-Paleo Rx**.

Leave a Comment

More Support: Webinars by Dr. Kruse

- Epi-Paleo Rx (July 2012)

Your Shopping List for this Post

- Optimized Cooking (eBook)

Additional Resources

- Brain Gut 4: What was Homo's Solution?
- Brain Gut 6: Epi-Paleo Rx
- Vitamin D: The Sunshine of Your Life?
- The Quilt: PPAR
- The Quilt: Epigenetic
- Hormones 101: Clinical thoughts revealed
- My Leptin Prescription
- Do Food Electrons Impart a Quantum Effect?
- CPC #4: Evolutionary Friend or Foe?
- Can't Remember? Is your Protein Bent?

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- <http://foodconfessional.wordpress.com/2008/04/16/meat-nutrition-information/>
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- <http://paleohacks.com/questions/117616/been-on-paleo-for-3-months-now-starting-to-feel-very-bad#axzz1ykWpDHq> (Faileo)
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