

WHY SMARTZYME™ IS THE SAFEST ALTERNATIVE TO POTENTIALLY TOXIC FISH OIL

You may have seen a farmed fish fillet with thick white stripes like the ones below. They are trans-fats, or saturated fats that are solid and accumulate not only in cold water fish, but even at body temperatures of mammals. Their appearance means that even though Omega 3 fish oil may have been added to their feed, the feed did not include DHA metabolic producing enzymes which act to convert this harmful saturated fat into healthy DHA laden fats.

DHA, the most important poly-unsaturated fatty acid (PUFA), is liquid even at temperatures below -40°C. That explains why DHA is called “Nature’s Anti-freeze”. It works to melt bad fats to keep them from accumulating in the body.

Farmed fish has less DHA content than wild fish, even though fish farmers add expensive Omega 3 fish oil additives to their feed. Salmon is a carnivorous fish. Wild salmon produces DHA internally, because the fish acquires DHA producing enzymes through their food chain. The \$10 Billion Omega 3 Oil Industry doesn’t want you to know this.



To give you a little background:

No multi-cell organisms, neither humans, animals, fish, nor krill, nor any land plants, possess the DNA sequence needed to produce the metabolic enzymes that synthesize DHA. These enzymes are acquired through the food chain.

For a long time the western scientific community firmly believed that all proteins are digested into amino acids and reassembled as endogenous protein by our DNA. However, recent discoveries revealed that an organism’s cells have the mechanism to acquire whole proteins without disassembling the structure. The effect of exogenous enzymes to the organism are slowly becoming elucidated, though we still don’t know how and where humans gain such enzymes that allow for the synthesis of DHA. It is possible that such enzymes are transferred by colostrum from generation to generation.

We believe modern pets, farmed animals (including cultured fish) and humans are especially vulnerable to the lack of DHA and the metabolic DHA synthase enzymes. The lack of these enzymes come about because we are dependent on modern processed foods, which do not contain such undenatured enzymes.

Further supporting our concept is the fact that some dinoflagellates (like the kind of phytoplankton we grow and which is the basis of our product SmartZYME™), have longer DNA chains than those of humans. It tells us that multi-cell organisms have long ago, through the process of evolution, farmed out the production of such enzymes and DHA to single cell phytoplankton and instead focused on the assembly of the building blocks of the body structures. Fortunately, these phytoplankton (algae) and the enzymes are ubiquitous in world oceans¹. However, not all dinoflagellates have these DHA producing enzymes. We grow a species that produces only DHA without producing other PUFAs.² Further, because we do not use heat in any part of our growth and production process, the metabolic enzymes to produce DHA are preserved intact, active, and undenatured. We believe DHA supplementation by extracted, purified, and over-processed finished oil products, whether fish or algal sourced, is neither natural, nor safe, and is unsustainable because it greatly upsets the natural ocean ecosystem.

Dirty Secrets of Omega 3 Industry: What they don't want you to know.

DSM Bioscience, p.k.a. Martek Bio-Science invented the method to produce DHA triglyceride oil from *C. cohnii* in 1992, in order to supply “Infant formula and baby food containing docosahexaenoic acid obtained from dinoflagellates.^{3,4} Thus, the market for DHA oil for infant formula, and the identified need for DHA for optimum brain function was born. This paved the way for fish oil to be extracted and sold to supplement DHA nutritional needs. DHA was known to be rich in cold water fish, yet fish oil naturally has much more EPA than DHA. EPA offers no unique health benefits that are not also provided by DHA. Fish oil producers (the Omega 3 industry) knew that DHA was the most⁵ important Omega 3 fatty acid, but were not able to separate EPA from DHA to produce Omega 3 oil. So instead, they spent millions of dollars in research to establish the values of

¹ Samples of natural *C. cohnii* (*Cryptocodinium cohnii*) cells deposited at ATCC are isolated throughout the world.

² USPTO 5,397,591 Kyle; David J et.al (*Martek patent*) discloses the method of producing DHA using *C. cohnii*, by feeding glucose and Yeast Extract only. No other polyunsaturated fat is being fed. The fatty acid composition of *C. cohnii* is described as “15-20% myristic acid (C.sub.14:0) 20-25% palmitic acid (C.sub.16:0) 10-15% oleic acid (C.sub.18:1) 30-40% DHA (C.sub.22:6) 0-10% others” and our experience with our strains generally concur. It contains negligible amount of EPA (0.1%) and no ALA. The fact that there is no other PUFA in the fatty acid composition shows DHA is made directly from ketones. (similar to Polyketide Synthesis) without the intermediary PUFA.

³ibid Footnote 1.

⁴ In US patent law, a naturally occurring organism is not patentable, so the inventors at Martek had selected and separated fastest growing strains and re-deposited to ATCC the repository library. There are many other strains of *C. cohnii* deposited at ATCC from sources around the world.

⁵ In our opinion “the only” important fatty acid, because DHA has all the benefits of other omega 3 fatty acids, as well as unique benefits to cognitive function, or cell signaling function that no other PUFA offers.

EPA to create the market for “Omega 3” fish oil. And then had to artificially “over-concentrate” the amount of DHA in their finished products^{6,7}.

In subsequent years, Martek was awarded additional patents relating to *Schizochytrium sp.*; (another dinoflagellate), in which the DNA from another species (*C. Cohnii*) was genetically transplanted to a sample strain of *Schizochytrium* to enhance its DHA concentration. They named this the Polyketide Synthase Enzyme⁸. Interestingly, Martek has been silent about the *C. cohnii* DHA synthase enzyme, probably because it is not patentable. The current \$10 B market for DHA/Omega 3 grew out of Martek’s successful invention of “single cell oil”, but remains an imperfect solution to DHA nutritional supplementation, though it has been widely relied upon because no safer, better alternative existed.

Fish Oil Oxidation⁹ and its Dangers

Fish Oil is an unsafe solution to Omega 3 supplementation because it is very susceptible to oxidation. Fish oil can become oxidized much sooner than the container’s stated product “expiration date” once the container seal is opened. The opening of the container causes potentially devastating neurological effects to any pet or person who consumes it, that may outweigh any intended health benefits. The toxicity of oxidized fish oil Omega 3 is more than double that of algae based DHA, because of the much larger amount of EPA and oxidation sites present in fish naturally, though extracted algal DHA oil is not immune from damaging oxidation. Like any other PUFA, once EPA becomes oxidized it turns from anti-oxidant to oxidant that can generate neurotoxicity in any pet or person who consumes it.¹⁰ Even fish oil encased in gel caps do not provide sufficient oxygen barrier protection. Due to the distribution and shelf life requirement, fish oil producers need to infuse tocopherol acetate, (oil soluble antioxidant synthetic Vitamin E) to protect the PUFA

⁶Excess Omega-3 Fatty Acid Consumption by Mothers during Pregnancy and Lactation Caused Shorter Life Span and Abnormal ABRs in Old Adult Offspring Neurotoxicol Teratol. 2010 Mar-Apr; 32(2): 171-181.

⁷ EPA’s unique importance and necessity over other Omega 3’s is not well established. and unlike ALA, it is not an intermediary that leads to the production of DHA. It is just a byproduct.

⁸USPTO7,214,853, USPTO7,217,856, titled “PUFA polyketide synthase systems and uses thereof” and USPTO 7,271,315 under the title of “Schizochytrium PKS genes” We suspect this gene is transplanted from *C. cohnii*, because *Schizochytrium sp.*’s fatty acid profile usually involves other PUFA. This patent actually confused the market followers to pursue natural *Schizochytrium sp.* rather than *C. cohnii*. Other than Martek deposited strain, *Schizochytrium sp.* do not have PKS Synthase enzyme So we know none other than *C. cohnii*, no natural PKS synthase type DHA enzyme is known.

⁹ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3657456/>

¹⁰Excess Omega-3 Fatty Acid Consumption by Mothers during Pregnancy and Lactation Caused Shorter Life Span and Abnormal ABRs in Old Adult Offspring Neurotoxicol Teratol. 2010 Mar-Apr; 32(2): 171-181. We suspect this experiment done in 2009 did not expect the oxidation effect and might not have controlled oxidation. It may be showing the negative effect of excess amount of oxidized Omega 3 rather than that of clean Omega 3.

molecules from oxidation. Tocopherol oxidizes at a lower potential than PUFA. It thereby acts as an antioxidant (or oxidant absorber). However, once oxidized, tocopherol loses its capacity to protect the PUFA from oxidation. PUFA peroxidation is a chain reaction that involves the covalent double bond sites of each molecule. Fish oil producers intend to add enough tocopherols to extend the packaged shelf life. While shelf life is determined by the amount of peroxide in the oil in the package, it does not account for any added oxidation that might occur after the seal is broken and the contents are exposed to the air. Recent reports show some fish oils tested have unacceptable levels of oxidation within 90 days of package opening, (well within the stated shelf life)^{11,12,13,14}. Extracted oil, both fish and algal sourced, is an unsafe, imperfect and flawed solution to DHA nutritional supplementation. This is true not only because it is so easily prone to oxidation, but also because any DHA producing metabolic enzymes that the fish may have acquired from eating the ocean algae, or that algae may naturally process, are stripped by the extraction process.

A Safe Alternative to Potentially Toxic Fish Oil

SmartZYME™ is fresh, whole cell DHA nutrition with preserved active metabolic enzymes. These enzymes are critically missing in modern diets as they can constitutionally remedy many adverse health conditions caused by metabolic imbalances.

Moreover, unlike other phytoplankton that produce Omega 3 PUFA, including DHA¹⁵, **SmartZYME™**'s metabolic enzymes convert glucose directly to pure free-DHA and DHA laden good fats. This direct conversion is unique to **SmartZYME™**'s cell species. Research shows higher levels of DHA in the body increases the basal metabolic rate (BMR)¹⁶. This means **SmartZYME™** can be used as a remedy to modern metabolic diseases such as Cushing's Syndrome, Metabolic Syndrome, diabetes, fatty liver disease, etc. in addition to a direct remedy to cognitive decline or even damage caused by consuming oxidized fish oil. Like other Omega 3 oils, DHA is beneficial to cardiovascular health, reduces

¹¹SO HOW LONG DOES FISH OIL LAST ONCE YOU OPEN IT? THE WRONG ANSWER CAN CAUSE SERIOUS HARM TO YOUR PET! Rodney Habib <https://www.planetpaws.ca/2015/08/02/fish-oil-pet-health/>

¹² Biochemical and Biophysical Research Communications (12/21/2016) Mason, R. Preston; Sherratt, Samuel C.R., Article URL <http://www.sciencedirect.com/science/article/pii/S0006291X16321878#MMCv...>

¹³ Boran, Gökhan, Hikmet Karaçam, and Muhammet Boran. "Changes in the quality of fish oils due to storage temperature and time." Food chemistry 98.4 (2006): 693-698.

¹⁴ Effects of fish oil with difference oxidation degree on growth performance and expression abundance of antioxidant and fat metabolism genes in orange spotted grouper, *Epinephelus coioides*, Di Liu Shuyan Chi Beiping Tan Xiaohui Dong Qihui Yang Hongyu Liu ...Aquaculture Research <https://doi.org/10.1111/are.13883>

¹⁵ Most algal species that have DHA in its fatty acid profile have multitude of PUFAs including EPA, ALA, along with some DHA as well, which suggests, these smaller molecule PUFAs (ALA and EPA) are intermediary pathways for, or byproducts of DHA.

¹⁶ [ncbi.nlm.nih.gov>PMC4682991](https://pubmed.ncbi.nlm.nih.gov/PMC4682991). 12/15/17.Omega 3 FA Supplementation for 12 Weeks increases EMR (BMR)

inflammation, improves mobility, helps skin and coat issues, etc. as long as it is clean and fresh, and unoxidized¹⁷.

Like modern engineering, modern (Western) human and veterinary medicine focuses on "solving problems", i.e. removing or repairing symptoms. **SmartZYME™** is not meant to be a medicine to cure a particular disease, but rather is a component of healthy, balanced, wholesome nutrition to contribute to better pet vitality, health maintenance, and disease prevention.

Illnesses potentially caused by consuming oxidized extracted Omega 3 oil provide an opportunity for **SmartZYME™** to directly remedy such adverse health conditions. We have received testimonials showing not only mobility improvement, but cognitive uptake, as well. The phospholipid DHA inside **SmartZYME™** is highly bioavailable and fast acting to correct conditions caused by metabolic imbalances, and the enzymes work to multiply its long term benefit.

ABOUT US AND THE BEGINNINGS OF SmartZYME

In pursuit of high lipid value phytoplankton, Field Energy (FE), a Connecticut LLC asked NCMA at Bigelow Laboratories, in Boothbay, Maine, in late 2016, to conduct DHA lipid concentration profile studies of a species of green algae called *Pavlova s.p.* that we knew to be a high value DHA producer. We selected 10 *Pavlova s.p.* strains, to benchmark against the species *C. cohnii*, that Martek patented for its Single Cell Oil. We were astonished at the results. *C. cohnii* showed an extremely fast growth rate, and unbelievable concentration of DHA (51%). Based on these findings, FE abandoned further work with *Pavlova s.p.* and instead focused on the growth of *C. cohnii*.

Due to the heterotrophic nature of *C. cohnii*, and contamination concerns, FE developed the low CAPEX plastic fermentor system called SPAGS, that is currently patent pending and created FPN LLC d.b.a PhytoSmart together as a joint venture (JV) with Bigelow Labs. However, Bigelow's inability to accommodate the "for profit" business structure of the JV ended our collaboration after PhytoSmart was forced to forfeit an approved SBIR program due to Bigelow's 501(c)3 status. PhytoSmart continued alone to develop the growth system; first as a tenant at Maine Aquaculture Innovation Center (MAIC) housed at U. Maine's Darling Marine Center (DMC), in Walpole ME, and currently at TechPlace, Brunswick, ME. This relocation was necessary to accommodate PhytoSmart's "21st

¹⁷ "Excess Omega-3 Fatty Acid Consumption by Mothers during Pregnancy and Lactation Caused Shorter Life Span and Abnormal ABRs in Old Adult Offspring Neurotoxicol Teratol. 2010 Mar-Apr; 32(2): 171-181. This experiment shows the adverse effect of Omega 3, but rather we suspect that the fish oil that the experiment used may have been oxidized, and the adverse effect is from the oxidation, rather than the Omega 3 oil use. Note that this experiment is conducted in 2009. **Are footnotes 10 and 17 the same?**

century” power requirements. In 2017, PhytoSmart received funding from Maine Technology Institute, to pursue yield maximization parameter development for this species.

Initially as a technology follower, PhytoSmart intended to extract DHA oil with cleaner, low temperature methods using supercritical CO₂ extraction technology. The low temperature extraction method was intended and did keep the DHA Synthase Enzymes intact in the spent biomass. The direction of the business was B2B to develop large quantity production capacity using SPAGS.

With the twist of fate, that often happens during development of game changing discoveries, PhytoSmart found the consumer market niche untapped and wide open. Refocusing to the B2C market, PhytoSmart realized that the market was already flooded with extracted Omega 3 oil that is an imperfect solution to DHA nutrition due to damaging oxidative nature. In order to develop a clean delivery system that is not vulnerable to the oxidation, PhytoSmart chose to package its *C. cohnii* whole cell biomass as a fresh, whole cell, functional treat with the activity of the synthase enzymes preserved. PhytoSmart markets this *C. cohnii* product under the name **SmartZYME™** that has a high concentration of DHA in its phospholipid, and DHA synthase enzymes within.