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## KRILL OIL - SUPERIOR SCIENCE OR SUPERIOR MARKETING?

### A SCIENTIFIC CRITIQUE OF THE MERCOLA.COM KRILL OIL INFOMERCIAL

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We have had a few questions about the recently released infomercial by mercola.com claiming the superiority of krill as a supplement for EPA and DHA essential fatty acids due to claims that krill has greater bioavailability, is more effective at treating hyperlipidemia and PMS, and the fact that fish oil is dangerous due to toxic levels of contaminants. There are also claims in this infomercial that fish oil is less sustainable and less environmentally friendly than the harvest of krill.

This infomercial follows the formula that all others do. First we are introduced to an "expert" who claims to be an unbiased scientist who, although he manufactures and sells krill oil, is completely unbiased in his opinions. We are led to believe that this "unbiased expert" is being interviewed by an "unbiased" health advocate who is simply conducting an interview on behalf of his followers in order to provide "unbiased" information. The truth is that in this case we are watching a scripted commercial, with all the added images to elicit emotional rather than logical responses, conducted by a retailer of krill oil in a mock interview of a krill oil supplier.

Now let's examine the claims and hold them up to scientific scrutiny. Let's start with the claim that krill oil is better absorbed than fish oil because it is in the phospholipid rather than triglyceride form. First let's start with the realization that humans have NEVER used krill as a food source and have ALWAYS consumed EPA and DHA in triglyceride form from either wild game or fish. In other words humans are genetically designed to consume and absorb EPA and DHA in the triglyceride form. While we are on the topic, this is also why it is important to consume fish oil that is kept in the natural triglyceride form rather than the biochemically altered, unnatural, ethyl ester forms that so many companies sell.

But don't these "experts" proclaim that they are scientists and that they have scientific studies to back up their claims? Yes they certainly do proclaim this. At closer examination of the issue of superior absorption (bioavailability) there has been ONE STUDY conducted on mice that had all had their gall bladders removed. A body of evidence this does not constitute! The "superior bioavailability claim is posted on both the mercola.com and on the website of the krill oil company of the "expert" who we repeatedly hear self proclaiming his scientific rigor regarding this topic. Here is the reference for the study - I actually READ IT by the way and you should too (Werner et al. Treatment of EFA deficiency with dietary triglycerides or phospholipids in a murine model of extrahepatic cholestasis. Am J Physiol Gastrointest Liver Physiol 286: G822-G832, 2004.)

To sum up they remove the gall bladders of mice and then tell us that in these mice with gall bladders removed they found that the phospholipid form was absorbed in greater amounts (just so you understand you need bile from the gallbladder to absorb triglycerides so if you remove the gallbladder this represents a surgical removal of the ability to absorb triglycerides properly!).

JUST SO YOU KNOW, THEY USED SOYBEAN OIL IN THIS STUDY!! NEITHER FISH OIL NOR KRILL OIL WERE EVEN USED IN THE STUDY!!!! The fact is that to publicly claim that krill oil is superior to fish oil in humans from this study in mice with gallbladders removed that were fed soybean oil is at the very least irresponsible and at the most fraudulent.

The FACT is that fish oil has been well documented in the peer-reviewed literature to be absorbed PERFECTLY WELL in HUMANS. Of course it has! Humans have been digesting EPA and DHA in the triglyceride form for the entire history of the human race. Genetically we are designed to and perfectly capable of ingesting, absorbing, and utilizing EPA and DHA in the form of triglycerides as found in NATURAL, genetically congruent food sources for humans such as fish and wild game.

Let's move on to the claims that Krill oil is superior for treating hyperlipidemia. The evidence for this, I mean ALL the available evidence is ONE STUDY funded by a KRILL OIL COMPANY! Bunea et al. Evaluation of the effects of Neptune Krill Oil on the clinical course of hyperlipidemia. Alternative Medicine Review, Dec 2004. This study has NEVER been replicated, it is a stand-alone study funded by manufacturers of krill oil.

Let's look at the methodology of this study. Group A got 2-3 grams of krill oil per day, this is 2-3 times the recommended daily dose recommended by Mercola for his krill oil supplement! Group B got 1.5 grams of krill oil per day - one and a half times the recommended dose. Group C, the fish oil group, was given 180 mg EPA and 120 mg DHA per day. THIS REPRESENTS LESS THAN 20% of the amount of EPA and DHA provided by one serving of Innate Choice Omega Sufficiency fish oil and less than 20% of the recommended daily intake. The strangest thing to figure out is that they claim this amount of EPA and DHA came from 3 grams of fish oil but our NATURAL fish oil provides 5-6 times this amount of EPA and DHA per 5 grams (1 teaspoon) serving?! So, what they did in this study is give an average of twice the daily dose of krill oil and ONLY 20% of the recommended serving of fish oil and then claim how superior krill oil was.

Wait though, this is not the only evidence these experts discuss on the infomercial. The self proclaimed unbiased expert on the infomercial tells us that he has genetically high cholesterol and triglyceride levels that he lowered by taking his own product. No evidence for this mind you but it is an impressive claim by an unbiased scientist after all.

Now let's move on to the claims that Krill oil is superior for the treatment of PMS. The ONE study (Sampalis et al. 2003 Evaluation of the effects of Neptune Krill Oil on the management of premenstrual syndrome and dysmenorrhea. Altern Med Rev. 8 (2): 171-9) involved 70 patients, 36 who were assigned to the krill oil group which they called the active group and 34 assigned to the fish oil group which they called the control group. How can you call the group that got fish oil the control group? These people got an intervention, they were NOT a control group. Control groups get NO intervention, they serve as a control to ensure that the results are NOT due to placebo or to error or to bias. Just the fact that they called the fish oil group the control group is VERY fishy - pun intended. Perhaps the fact that the lead researcher is also the Vice President of the company that produces Neptune Krill Oil has something to do with this??

Strangely, the subjects were not actually given the supplements for the 90 day trial. Instead they got two capsules per day for the first 30 days and then 2 capsules per day for eight days prior and 2 days during menstruation. This is not supplementation this is treatment. In previous studies showing the benefits of fish oil for PMS (which is hypothesized to be caused by inflammation secondary to EPA and DHA deficiency which leads to increased inflammatory prostaglandin production) subjects actually supplemented with fish oil normally in a continuous daily manner.

Further, in this study, just like in the hyperlipidemia study funded by the krill oil company, they give double the recommended daily dose of krill oil and less than a third of the recommended daily amount of fish oil. Even with this the study reports that "There was no significant difference observed between NKO (Neptune Krill Oil) and fish oil for the management of weight gain, abdominal pain, and swelling."

A close look at the ACTUAL results, not the ones reported in the abstract or conclusion (headlines), reveals that both the krill oil group and the fish oil group had virtually identical reductions in the use of analgesics during the first 45 days of the trial. The authors seem pleased to report that there was a significantly greater reduction in analgesic use in the krill oil group compared to the fish oil group between days 45 and 90 of the trial. However, what they report is a

RELATIVE difference not the ABSOLUTE difference between the groups. They report that the krill oil group showed a 50% reduction in both ibuprofen and acetaminophen use compared to reductions of 33% and 41% in the fish oil group, respectively. Sounds like a big difference but in actual fact the absolute difference was 0.2 and 0.48 grams of ibuprofen and acetaminophen, respectively. In other words an ABSOLUTE difference of fractions of a daily dose and remember all these figures are based on retrospective self reporting by the participants and NOT any actual objective data.

In fact, take a look at table 2 on page 175 of the study and look at the raw data and what you will find is that both the absolute and mean differences between the groups were far from noteworthy. No wonder they chose to report the relative differences! This is what the drug companies do as well. It is legal but it is highly misleading and in my opinion, and the opinion of many other scientists and doctors, unethical. Reporting a relative difference means you can, for example, report that your intervention resulted in half the deaths compared to another intervention even though out of the 1000 subjects in each group one person out of a thousand died in one group and two people out of a thousand died in the other group. This means the ABSOLUTE difference was one per thousand (one death per thousand vs 2 deaths per thousand) but the RELATIVE difference was half the death rate (1 death vs 2 deaths). This is exactly how drug companies report their data. Lies, damn lies, and statistics as the saying goes.

By the way, this is all a red herring (another pun) or a diversion anyway. The value of an EPA/DHA essential fatty acid supplement cannot be validly assessed by how much it can lower cholesterol or triglycerides, reduce the symptoms of PMS, or get absorbed in mice with no gallbladders. This would be ABSURD. EPA and DHA are essential nutrients for the human species and deficiency in these nutrients can lead to all kinds of different health issues. There are many people with NORMAL cholesterol levels and WITHOUT PMS who are SEVERELY DEFICIENT in EPA and DHA and there are many people who have high cholesterol and PMS for reasons other than deficiency in EPA and DHA. I won't comment on the mice.

The take home point is that EVERY HUMAN REQUIRES sufficient intake of EPA and DHA and that this has nothing to do with what disease they have. If they are human they need EPA and DHA in sufficient amounts - period. Taking krill oil as recommended, which provides insufficient amounts of EPA and DHA, will simply create a deficiency in EPA and DHA essential fatty acids - who cares if it does this while preventing the symptoms of PMS?

Further, there is a BODY OF EVIDENCE, actually thousands of studies, conducted by independent researchers with no affiliations to fish oil companies, that show the benefits of supplementation with fish oil. All this evidence against 3 stand alone studies funded by a krill oil company. Come on! No wonder they had to spend all that money on making a commercial; they had to fill the time with something because if they talked about the ACTUAL scientific evidence it would have taken only a few seconds.

What is ironic is that all the evidence they cite regarding the importance of EPA and DHA and the benefit of supplementation either during the infomercial, or on their respective websites, COMES FROM STUDIES ON FISH OIL and NOT krill oil. Why? Because there are only 3 studies in history that involved krill oil in humans and NONE of these had anything to do with krill oil supplying sufficient amounts of EPA and DHA!

They also claim that Krill oil is superior because it is higher in antioxidants than fish oil. At closer examination what becomes apparent is that the antioxidant levels in krill oil, although high in relative terms, are very low in absolute terms and are absolutely USELESS levels in terms of overall health for humans. If anyone is convinced that the antioxidant levels found in krill represent a significant contribution to the antioxidant levels needed by humans they have been dangerously deceived.

Wait though, maybe the antioxidant levels are important because they keep krill oil itself from oxidizing and fish oil is dangerous because it does oxidize. Well not a bad marketing strategy but

the facts just don't support this claim. I won't talk about their evidence because THEY DON'T GIVE ANY. The truth is that cheaply manufactured fish oils can indeed oxidize in the bottle or capsule. This is due to a lack of care during processing, storage or bottling. I have warned of this for years and actually must recognize that even in the infomercial they admit that high quality fish oils are safe. The problem is that they give this fleeting mention and then provide a bunch of images to convince the viewer that all fish oils are dangerous and that krill oil is superior.

The best way to determine if a fish oil is high quality and free from oxidation and mercury and other contaminants is to DEMAND THE INDEPENDENT THIRD PARTY TESTING RESULTS. There are tests to detect oxidation levels and contaminant levels and reputable companies like Innate Choice have their products tested and POST THE RESULTS.

Finally let's address the issue of sustainability and ecological responsibility. This infomercial deliberately misinterprets the facts regarding the harvest of the fish used for fish oil, at least regarding the fish used for Innate Choice. The fish we use are from the herring family (herring, anchovy, and sardine) and come from some of the most highly regulated and most sustainable fisheries in the world.

More importantly the fish oil is rendered from the remains of fish that have been harvested as part of the current catch quota. In other words we get our fish oil from byproducts of the fishery the majority of which have been traditionally put into landfills, used as fertilizer, or put into pet food or fish food. In fact a very small percentage of this material is currently being used for fish oil; there is a HUGE amount of this material available that is currently being discarded. Not a single extra fish above the current quotas needs to be caught for us to produce our fish oil and not a single extra fish about current quotas will ever be caught in order to produce our fish oil.

Now, what about the harvest of krill? There are some things that you should know before you come to the conclusion that harvesting krill is a better choice than utilizing the otherwise discarded remains of sardines. My biggest concern with the krill oil safe harvesting myth (being the son of a Ph.D. marine biologist), is that krill is the foundation of the food chain for so many oceanic species. Commercial krill harvesting has already been banned in several major oceans and the implications of over-harvesting krill are devastating. Harvesting krill is a potential ecological disaster waiting to happen. Click on this link to a recent New York Times article for some interesting and important information.

[http://www.nytimes.com/2008/05/25/business/worldbusiness/25iht-krill.1.13188108.html?\\_r=1](http://www.nytimes.com/2008/05/25/business/worldbusiness/25iht-krill.1.13188108.html?_r=1)

Please take the time to look into these issues and please take the time to read some actual scientific evidence from reputable sources. The real truth is that there are so few studies on krill oil that a scientific comparison between krill oil and fish oil is not even possible.

The indisputable fact is that the evidence for the importance of EPA and DHA is unequivocal and so is the fact that the industrial human diet is deficient and that fish oil is a safe, beneficial, and cost-effective choice for supplementation. The other INDISPUTABLE FACT is that fish oil contains MUCH HIGHER quantities of EPA and DHA than krill oil per serving. Let's do a DIRECT comparison of the krill oil being espoused in the infomercial vs Innate Choice Omega Sufficiency.



**Omega Sufficiency Fish Oil**

| Supplement Facts                 |              |     |
|----------------------------------|--------------|-----|
| Serving Size 1 Teaspoonful (5ml) |              |     |
| Servings Per Container: 100      |              |     |
| Each Teaspoonful Contains        | %Daily Value |     |
| Calories (energy)                | 40           |     |
| Calories from Fat                | 40           |     |
| Total Fat                        | 4 g          | 6%* |
| Saturated Fat                    | 1 g          | 5%* |
| Polyunsaturated Fat              | 2 g          | †   |
| Monounsaturated Fat              | 1 g          | †   |
| Cholesterol                      | 15 mg        | 5%* |
| Omega-3 Fatty Acids as TG**      | 1400-1700 mg | †   |
| EPA (C20:5n-3) as TG**           | 720-825 mg   | †   |
| DHA (C22:6n-3) as TG**           | 480-550 mg   | †   |
| Other Omega3 Fatty Acids as TG** | 200-325 mg   | †   |

\* Percent Daily Value based on a 2,000 calorie diet.  
 \*\* Natural Triglyceride Form. † Daily Value not established.



**Mercola Krill Oil**

| Supplement Facts                        |               |     |
|-----------------------------------------|---------------|-----|
| Serving Size: 2 Fish Gelatin Capliques™ |               |     |
| Servings Per Container: 30              |               |     |
| Amount Per Serving                      | %DV           |     |
| Calories                                | 10            |     |
| Calories from Fat                       | 10            |     |
| Total Fat                               | 0.7 g         | 1%* |
| Pure Krill Oil                          | 1,000 mg      | **  |
| Phospholipids                           | 400 mg        | **  |
| Eicosapentaenoic Acid (EPA)             | 90 mg         | **  |
| Docosahexaenoic (DHA)                   | 50 mg         | **  |
| Omega-6 fatty acids                     | approx. 20 mg | **  |
| Astaxanthin (as astaxanthin esters)     | 600 mcg       | **  |

\*Percent Daily Values based on a 2,000 calorie diet.  
 \*\* Daily Value not established.

|             | Innate Choice Natural Omega 3 | Mercola Krill Oil |
|-------------|-------------------------------|-------------------|
| EPA content | 900mg                         | 90mg              |
| DHA content | 600mg                         | 50mg              |

Innate Choice Omega Sufficiency offers TEN TIMES the amount of EPA and DHA per serving and, MOST IMPORTANTLY, this represents a MINIMUM amount required for human adults. If you take krill oil as recommended you get less than one-tenth the amount of EPA and DHA you require and if you want to get the recommended daily amount you need to take 10 times more krill oil which costs you ten times more than daily the required amount of fish oil!

Why then would anyone choose krill oil? Great question. It could not be for the EPA and DHA so whoever markets krill oil has to make the issue about something else like superior absorption (in mice with no gall bladders), superior cholesterol and triglyceride lowering (when you give twice the dose of krill and only 20% the recommended serving of fish oil - in a stand alone study funded by a krill oil manufacturer) or sustainability and safety (based on misleading stats and emotional pictures of mercury or fish farms). Don't get fooled. Do your research and make an INFORMED choice, not an infomercial choice.

The Krill Oil superiority myth is based on the science of marketing not the science of human physiological need, clinical benefit, or ecological safety.

Perhaps in the future there will be a body of evidence to support supplementation with krill oil; as a scientist I remain open to that possibility. However as a scientist I must also form my opinions based on available data and the indisputable fact is that there has been a grand total of 3 studies conducted on the benefits of krill oil for human supplementation. To recommend daily supplementation based on such a paucity of data is irresponsible. Most certainly there is

absolutely, unequivocally, not even close to enough evidence to suggest any superiority of krill oil vs fish oil when it comes to the benefits of supplementation in humans.

I must admit that in the past I have gotten some good information from the mercola.com website. Sadly, and alarmingly from my perspective, this information has increasingly been changing from scientific evidence from independent practitioners and scientists aimed at explaining the science of health and illness into marketing information aimed at selling products offered on the website.

I am the first to admit that I have a bias because I do own a company that sells fish oil. However, what I don't do, and will never do, is cite single studies that I have paid for as evidence for the superiority of my products. I cite hundreds of studies from independent researchers regarding the importance of EPA and DHA and the significant health consequences of deficiency in these essential nutrients. I then explain in detail why I think our products are equal to or better than any on the market and fully disclose our third party test results.

I feel this is honest and ethical and I call upon those with great influence to honor this influence by reporting the available data in an honest way. This is NOT what has occurred in the recent mercola.com infomercial and I am disappointed to see this trend. The Hippocratic oath must be applied beyond the clinic walls, it must be applied to ALL health advice, including supplementation.

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