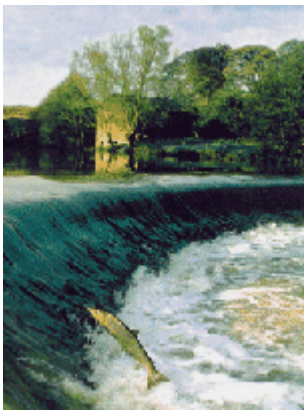
Natural Omega-3s Seen Superior to Standard Supplements

Salmon and their natural oils seem to offer an omega-3-absorption advantage vs. standard fish oils

By Craig Weatherby and Randy Hartnell, Vital Choices Newsletter, September 4, 2005



Many nutritional supplements come in an array of competing forms, and their marketers strive to convince consumers that their product offers superior absorption or efficacy.

The long list of controversies includes chromium (picolinate vs. polynicotinate), OPCs (grape seed vs. pine bark), vitamin C (ascorbic acid vs. Ester C®), calcium (carbonate vs. citrate), ginseng (Asian vs. American) and echinacea (E. purpurea vs. E. angustifolia).

It's almost enough to make one swear off supplements. But in most cases, reasonably clear answers to questions about relative absorption and efficacy of different supplement forms are available … if you have time to track down and decipher the scientific papers.

What about omega-3s? We explained the several important distinctions between plant-source and marine omega-3s in a recent issue (see "**Beware the Omega-3 Bait-and-Switch**"), but there are also distinctions among fish oil supplements.

Fish oil supplements: the distillation distinction

Omega-3s from fish oil (EPA and DHA) come to consumers attached to one of two kinds of molecules —triglyceride esters or ethyl esters. Omega-3 triglycerides are esters formed from the joining of glycerol to three omega-3 fatty acids. The ethyl ester form of omega-3s found in standard fish oils results when EPA and DHA are extracted from their natural glycerol structure by means of "trans-esterification" with ethanol.

For convenience, we'll refer to triglyceride and ethyl ester "forms" of omega-3s, but it is more accurate to think of them as two different omega-3 "packages".

The body recognizes both forms (triglyceride or ethyl ester) of fish-derived omega-3s, and it uses enzymes to switch omega-3s from either package to another as needed to serve different metabolic functions. Almost all of the long-chain omega-3-fatty acids (EPA and DHA) in fish—and in our unrefined salmon oil—occur in the triglyceride form.

In contrast, almost all fish oil supplements—except our unrefined salmon oil—contain the ethyl ester form of omega-3s. This is because nearly all fish oil supplement makers--for reasons that will become clear—put their oil through a process called molecular distillation (or, less commonly, supercritical carbon dioxide extraction).

The chief purpose of molecular distillation is to remove the industrial contaminants (e.g., heavy metals, dioxins and PCBs) present in the commodity fish oils most supplement makers use, and concentrate the "star" omega-3 molecules, EPA and DHA. In this model sterility overshadows efficacy, and potency surpasses natural balance and wholeness. (As we'll see, the "potency" acquired via concentrating the omega-3s in fish oil may be inconsistent or even illusory.)

How does molecular distillation work?

Molecular distillation removes omega-3-fatty acid molecules, intact, from their natural glycerol companion molecule via a process called re-esterification, which places the omega-3s in an ethyl ester package. In most cases, molecular distillation involves flash-heating the oil to high temperatures (about 460° Fahrenheit; 260° centigrade) in the presence of a vacuum. Some call ethyl ester omega-3s synthetic, but this is not entirely accurate. The body also re-esterifies fatty acids as needed to suit various purposes.

(Note: A very small portion of supplemental fish oil is produced using a modified distillation processes that yields triglyceride-bound omega-3s, but they may not be identical to the omega-3 triglycerides that occur naturally in fish.)

Does this distinction between the chemical packages in which omega-3s can be consumed produce meaningful physiological differences? It appears so.

A literature search on PubMed—the world's largest biomedical database—reveals only five clinical studies designed to determine which form is better absorbed by the human body. In each case, the investigators gauged absorption rates by looking at the blood levels of EPA and DHA that result from ingesting the two divergent forms of marine omega-3s: the ethyl ester form in most capsules on the market, and the triglyceride form that occurs naturally in fish and Vital Choice Salmon Oil capsules.

Natural fish oils exhibit absorption edge in four head-to-head trials. Results were mixed among the four clinical studies that compared the two forms of supplemental omega-3s, but the natural form came out ahead, overall:

- Two studies produced neutral results, with the two forms of omega-3s absorbed equally well.
- Two studies showed that triglyceride omega-3s produce substantially higher blood levels of omega-3s.

The contributors to a Wikipedia encyclopedia entry on omega-3s came to the same conclusion regarding the available evidence: "Of the four studies that compare bioavailability of the triglyceride form of fish oil vs. the ester form, two have concluded that the natural triglyceride form is better, and the other two studies did not find a significant difference. No studies as yet have shown the ester form to be superior although it is cheaper to manufacture."

Why should studies comparing rates of omega-3 absorption from ethyl ester and triglyceride type supplements produce different results? At least in part, the answer may lie in the dietary context—high-fat or low-fat —accompanying supplemental doses of omega-3s.

Standard supplements need fatty food to match omega-3 uptake from natural oil

The makers of concentrated omega-3 supplements often tout the artificially high concentrations of omega-3s (EPA and DHA) as a benefit of their distilled fish oils.

However, the results of one of the trials mentioned above—an intriguing investigation in Utah—suggest that the full range of fats in wild salmon (and in our unique, un-distilled wild sockeye salmon oil) enhance absorption of omega-3s.

The Utah team performed two studies intended to compare the absorption of ethyl ester omega-3s and natural triglyceride omega-3s. The first study showed much higher absorption of natural triglyceride omega-3s, while the second showed that *the ethyl ester omega-3s in distilled fish oils were poorly absorbed unless taken with a high-fat meal*.

The authors came to this conclusion: "Absorption of both EPA and DHA from fish oil ethyl esters was increased three-fold [i.e., by 300 percent], to about 60%, by co-ingestion with the high-fat meal indicating that absorption of fatty acid ethyl esters is highly dependent on the amount of co-ingested fat."

Put another way, only 20 percent of the omega-3s in the standard, ethyl ester form were absorbed, unless they were taken with a high-fat meal, which raised the absorption level three-fold, to 60 percent … at the cost of having to ingest an extra 324 dietary calories: 72 calories in the low-fat meal versus 396 calories in the high-fat meal.

In contrast, the absorption of both fish-derived omega-3s (EPA and DHA) in their natural triglyceride form was substantially greater in either context (high-fat or low-fat): absorption of DHA was equally superior with either low-fat meals or high-fat meals, while participants' absorption of EPA increased from an already-high 69 percent to 90 percent when taken with a high-fat meal.

In other words, standard, distilled fish oil in the ethyl ester form doesn't give consumers the benefit of needing to

consume fewer calories per mg of absorbed omega-3s: instead, it gives them much less absorbed omega-3 unless they take the capsules with a high-fat, higher-calorie meal.

These findings also indicate that, at least with regard to the critical issue of absorption rates, whole fish oil offers a substantial nutritional advantage. You can eat as lean and low-fat as you like without suffering a significant loss of the omega-3s you've paid to get.

Absorption study # 5: Whole salmon beats standard supplements
Perhaps the most interesting and significant study on this subject (Visioli F, et al, 2003) compared absorption of omega-3s from salmon—that is, in the triglyceride form—with absorption of ethyl ester omega-3s from distilled fish oil supplements.

Daily for six weeks, volunteers recruited by researchers at Italy's University of Milan consumed roughly equivalent doses of omega-3s from one of two sources:

- Salmon (three ounces) containing 383 mg of EPA and 544 mg of DHA; or
- Distilled fish oil containing 450 mg of EPA and 318 mg of DHA in the ethyl ester form (taken either in one dose or three equally divided doses).

The team also reevaluated data from a previous study carried out with the same design, but using fish oil capsules that delivered much higher doses of omega-3s (2,580 mg per day of EPA and 1,920 mg of DHA).

The results were clear, and favored salmon as a source of well-absorbed omega-3s. As the Italian team said: "We provide experimental evidence that n-3 fatty acids from fish are more effectively incorporated into plasma lipids than when administered as capsules ... increments in plasma EPA and DHA concentration [i.e., omega-3 blood levels] after salmon intake were significantly higher than after administration of [fish oil] capsules. The same increments would be obtained with at least two- and nine-fold higher doses of EPA and DHA, respectively, if administered with capsules rather than salmon."

The presence of other factors in salmon or salmon oil (including—such as the various carotenoids and dozens of other fatty acid molecules) found in our unrefined sockeye oil from wild Alaskan salmon—might be responsible for the large absorption advantage recorded in Milan.

That's a question for other researchers to tackle. In the meantime, it's reassuring to know that the balance of evidence indicates an absorption advantage for omega-3s in the "natural" triglyceride form found in salmon and in our unrefined salmon oil.

What about safety?
Conventional wisdom holds that molecular distillation of fish oils is the benchmark for safety, with seemingly no consideration given to its impact on the oil's nutritional value or efficacy.

While contaminants are a legitimate concern, the evidence sited above indicates that molecular distillation exacts its own deleterious toll on the oil in exchange for the elimination of hazardous levels of contaminants. The key words here are "hazardous levels." Modern technology is capable of identifying amazingly tiny amounts of these substances—in the sub parts per trillion range. Even though there is no definitive evidence of health risks from such minute levels of various contaminants, much is made of them.

Because reliable evidence does not yet exist, cautious regulators issue inconsistent guideline safety levels that are a mixture of conjecture and good intentions padded with extremely large safety margins.

For instance, the U.S. Environmental Protection Agency (EPA) "maximum safe level" for PCBs—0.02 ppb per kg (2.2 lbs.) of body weight per day—is 300 times lower than the lowest dose at which subtle health effects have been seen in the offspring of laboratory monkeys fed PCBs. And the daily intake guideline for PCBs set by Health

Canada (their equivalent to the U.S. FDA)—1ppb per kg (2.2 lbs.) of body weight per day—is 50 times greater than the EPA's. (Our Alaskan sockeye oil tested at 0.006 ppb TEQ per gram fish oil.)

A word about the safety of Vital Choice Salmon Oil

According to the WHO guidelines, you have no reason to be concerned about the safety of our un-distilled Alaskan Sockeye Salmon Oil, which comes from some of the purest, omega-3-rich fish in the sea. While our oil may contain higher percentages of contaminants than distilled oils, the difference in actual amounts of these chemicals is truly insignificant. The gap looks bigger when you calculate it as a percent of total oil, because distilled oils often have levels of contaminants even closer to zero than ours do.

What is a part per trillion?

A little perspective is in order ... one part per trillion is a million times less than one part per million. Or look at at this way:

One part per million = one second in 11.6 days.

One part per billion = one second in 31.6 years

One part per trillion = one second in 423 lifetimes, or one square inch in 250 square miles

A single teaspoon of salt in Lake Superior would equal a few parts per trillion. It's hard to imagine anything being hazardous in such vanishingly small amounts.

In terms of the amounts of dioxin-type contaminants, the difference between our salmon oil and standard distilled fish oils is an insignificant one or two parts per trillion (ppt). Why do we say that this difference is insignificant? The World Health Organization (WHO) recommends that the daily toxic equivalent (TEQ) intake of dioxins and furans not exceed two parts per trillion per kilogram of body weight. Two tests of our Alaskan Sockeye Salmon Oil by different labs have averaged 2.5 TEQ for dioxins and furans (1.8 and 3.3 ppt). This means that a 150 pound (68 kg) person could safely consume 136 ppt per day. To reach this declared-safe intake level, you'd have to take 50 grams of our sockeye salmon oil every day (the amount in 50 of our 1000 mg capsules).

In the necessary balancing act between risk and reward, it seems clear that the likely advantage in absorption of health-promoting, anti-cancer omega-3s offered by our natural oil vastly outweighs the relatively insignificant difference in contaminant levels.

The results of the five available absorption studies suggest that manufacturers of standard, distilled fish oils sacrifice a great deal of practical nutritional impact (i.e., omega-3 absorption) in pursuit of functionally insignificant increments in contamination-reduction. However, for most manufacturers, it is an unavoidable trade off. This is because the cheap, commodity fish oils commonly used—which come from farmed salmon, menhaden and other diverse fish caught anywhere and everywhere—must be distilled to remove the markedly higher levels of contaminants they typically contain.

While we understand that intuitively, 'cleaner seems better', the case of fish oil supplements is more complicated than that. Ultimately, only you and your health care professional can decide whether a natural and balanced oil is better for you than the "new and improved" versions promoted by the modern day omega-3 marketing machine. We are pleased to be able to offer you a unique, natural, safe alternative.

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