

IS THE FISH OIL OBTAINED BY SUPERCRITICAL FLUID EXTRACTION (SCFE) HEALTHY?

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Abstract:

Fish oils are a rich natural source of long-chain polyunsaturated fatty acids (PUFAs), especially those of the omega-3 series, mainly eicosapentaenoic acid (EPA) and docosahezanenoic acid (DHA). Looking for natural sources of omega-3 fatty acids, designing new methods and developing better extraction methods for obtaining omega-3 fatty acid and trying to include omega-3 fatty acids in food product of regular consumption are really demanding and challenging tasks. Super critical fluid extraction (SCFE) was employed to extract fish oil using carbon dioxide (SC-CO₂). The results showed that the extraction oil yield was ranged between 4.00% and 7.00% depends on the types of fish and also various parts of the fish showed a range of amount of oil yield. Most of studies used the parameters of extraction such as temperature, pressure and extraction time at 55 °C, 300 bars, and 80 min, respectively. The fatty acid composition of the extracted fish oil determined using GC/MS showed that saturated fatty acids, monounsaturated fatty acids and polyunsaturated fatty acids were presented in the extracted oil. Two of monounsaturated fatty acids found in the many types of extracted fish oil, which were palmitoleic acid and oleic acid. Omega-6 fatty acid family (arachidonic) and omega-3 (EPA and DHA) were also found in many of fish varieties. The chemical properties of the fish oil including acid value (AV), saponification value (SV), iodine value (IV) and peroxide value (PV) were also investigated. The results were found to be within the range of 5.30 - 9.47 mg KOH/g oil, 195 - 235 mg KOH/g, 120 -138 g I/100g oil and 6.50 - 13.8 meq/kg, for AV, SV, IV, and PV, respectively. It was observed that though most of the results obtained were tolerable to the standard values, however some were outside the normal range especially PV that indicated such oxidation was going on. The result of AV (9.47) also indicated such hydrolysis of oil was on. From many studies it is clearly stated that the extracted fish oil using SCFE is pure oil containing many essential fatty acids, however, this paper is discussing whether such type of pure oil healthy and *tayyeib* or risky.

Keywords: Fish oil, arachidonic acid, docosahezanenoic acid (DHA), eicosapentaenoic acid (EPA), omega-3, omega-6, polyunsaturated fatty acid (PUFA).

Introduction:

Some fatty acids are known as essential fatty acids. They are actually polyunsaturated fatty acids that the human body is unable to produce and need them for metabolic functioning so they have to be taken as part of the food. Omega-3 fatty acids are a class of essential fatty acids those can be obtained from various types of food include salmon, sardines, tuna, trout, shrimp, sesame seed oil, olive oil, walnut, flaxseed oil, and canola oil.

Fish oil is especially rich in the favorable fatty acids known as omega-3 fatty acids include docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA). However, the plant sources are mainly containing alpha-linolenic acid, which is converted into omega-3 fatty acids in the body.

Literature shows that a lot of the benefit of fish oil appears to come from the omega-3 fatty acids that it contains. Fish may have earned its reputation as “brain food” because some people eat fish to help with depression, psychosis, attention deficit-hyperactivity disorder (ADHD), Alzheimer’s disease, and other thinking disorders. (Ref.) It is also used for dry eyes, glaucoma, and age-related macular degeneration (AMD), a very common condition in older people that can lead to serious sight problems. (Ref.). These fatty acids also prevent the blood from clotting easily, which might make fish oil helpful for some heart conditions. Fish oil is sometimes used after coronary artery bypass surgery. It seems to help keep the blood vessel that has been rerouted from closing up.

Of course fish oil could be obtained by eating fish; however, the way that fish prepared is essential such as broiled or baked fish appears to reduce the risk of heart disease, but eating fried fish or fish sandwiches may cancels out the benefits of fish oil or may actually increase heart disease risk.

Super Critical Fluid Extraction (SCFE):

.....of fish oil is pure but not healthy

The first phase of SCFE is the extraction phase, the crude fish oil is put under high pressure (200 to 600 bar) and at temperatures between 30 and 150° oxygen dioxide or an other chemical substance in a super critical state (not fluid, nor gas) is pressed through the cells of the fish oil until they burst open. The second stage involves the separation whereby the elements that are needed are separated out (e.g. DHA or EPA) and later it is possible to partially add things that have been lost (e.g.; vitamin E).

In their book ‘Understanding fats and oil better’ M. Murray and J. Beutler write the following about SCFE: ‘Badly informed buyers and manufacturers of supplements are lured by the low temperatures (speedy production time) during the SCFE process. In addition to mass-produced refined oil, SCFE also produces the poorest quality unfortunately. SCFE renders oil

less stable, causes greater fat-peroxidation, changes the structure of fat profiles, reduces the mineral content and fractionates triglyceride formations. Moreover, SCFA oil contains no phospholipids (e.g. lecithine) and vitamin E.

SCFA is more dangerous for polyunsaturated fats than using Hexane (solvents) for extraction. This method produces a technically pure but refined product like white sugar and white bread. But this pure product is anything but healthy; it lacks its friends (the micro-nutrients that are attached to it in nature).

Despite the consequences of what producer/company would have us consider; if someone supports pure nature he certainly cannot promote pharmaceutical fish oil.

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