Algal oil as a possible source of omega-3 fatty acid DHA to improve blood lipids in people without heart disease

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Supplementation with the omega-3 fatty acid docosahexaenoic acid (DHA) from algal oil may lower blood triglycerides (TG) and increase both high-density (HDL) and low-density lipoprotein (LDL) cholesterol in people without coronary heart disease (CHD). These are the results of a recent meta-analysis by US researchers from the Cleveland Clinic, Harvard School of Public Health, and Brigham and Women's Hospital.

DHA and EPA (eicosapentaenoic acid) are omega-3 fatty acids found in fatty fish such as salmon, tuna, and mackerel. Both fatty acids are recommended for consumption, but recommendations are higher for those who are pregnant, lactating, or at risk of CHD. Wild fish obtain these omega-3 fatty acids from the marine algae on which they feed. However, these fish populations are severely limited due to overfishing and other reasons. Aquaculture (fish farms) has tried to fill the gap and provide an alternative source of fish, but there are environmental concerns surrounding its practice.

Recently, the oils from marine algae have been extracted to develop DHA supplements. However, their effect on CHD risk factors has not been extensively evaluated. Therefore, the authors of this study conducted a meta-analysis of 11 randomised, controlled clinical trials that analysed the associations between algal oil and cardiovascular risk factors such as high blood pressure or high TG.

The studies dated from 1996 to 2011, and there were 485 participants in total. The mean age of the participants was between 24 and 59 years, and most studies lasted 6 weeks. All algal oil supplements used contained no or negligible amounts of EPA. The main study outcome assessed in the meta-analysis was the effect of algal oil supplementation on TG, HDL and LDL cholesterol levels.

The researchers observed a 15% decrease in TG, a 5% increase in HDL cholesterol, and an 8% increase in LDL cholesterol in participants supplemented with algal oil. The action by which DHA is thought to decrease TG levels in turn increases LDL cholesterol levels. The mechanism by which HDL cholesterol is increased by DHA is not known.

Whereas an increase in blood LDL cholesterol may be considered undesirable, it should be noted that DHA can also increase LDL particle size. This is important in that especially small, dense LDL particles are associated with an elevated CHD risk. Increasing the size of LDL particles may therefore partly offset the risk linked to higher LDL cholesterol levels in the blood. To fully assess CHD risk, one needs to consider additional parameters including blood pressure and markers of inflammation. Overall, the effects seen are comparable to what has been observed with fish oil supplements.

The median dose of DHA in the analysis was 1.68 grams per day. This corresponds to a true supplemental dose rather than an amount commonly achieved by diet. For comparison, the adequate dietary intake for

adults set by the European Food Safety Authority for EPA and DHA combined is 0.25 g/d. Pregnant and lactating women should get an extra 0.1-0.2 g/day of preformed DHA, and a daily intake of 0.05-0.1 g/day DHA is considered adequate for older infants. Europeans consume about 1-2 servings of fatty fish (such as tuna, salmon, mackerel, herring) per month even though the recommendation is 2-3 servings per week. However, with diminishing fish stocks, alternative sources of EPA and DHA become more and more relevant.

Algae are currently being bred to produce DHA-rich algal oil, which can be used to fortify foods or make supplements. Foods already being fortified include infant formula, olive and canola oils, and soy milk. If someone takes the supplements, they should be monitored by a physician to prevent adverse reactions, especially people with CHD risk factors who may be taking other medications.

The authors noted as limitations that the number of available studies and participants involved was small. They also called for more independent research to strengthen the evidence base. However, they did find that DHA supplementation from algal oil may reduce TG levels and increase HDL and LDL cholesterol levels in people without CHD. Compared to fish oil, algal oil maybe an equally effective yet more sustainable source of omega-3 fatty acids. In general, supplements are meant to close nutrient gaps where recommendations are difficult to achieve. Striving for a healthy, balanced diet should remain the primary goal.

For further information, see

Bernstein AM et al. (2012). A Meta-Analysis Shows that Docosahexaenoic Acid from Algal Oil Reduces Serum Triglycerides and Increases HDL-Cholesterol and LDL-Cholesterol in Persons without Coronary Heart Disease. J Nutr 142(1):99-104.

Scientific Opinion on the substantiation of health claims related to docosahexaenoic acid (DHA), eicosapentaenoic acid (EPA) […] pursuant to Article 13(1) of Regulation (EC) No 1924/20061. EFSA Journal 2011;9(4):2078.