

## Perspective

# Is the Jury Still Out on the Benefits of Fish, Seal and Flax Oils in Cardiovascular Disease?

**Xu YJ<sup>1</sup>, Gregor T<sup>2</sup>, Dhalla NS<sup>1</sup> and Tappia PS<sup>2\*</sup>**<sup>1</sup>Department of Physiology, Institute of Cardiovascular Sciences, St. Boniface Hospital Research, Faculty of Medicine, University of Manitoba, Canada<sup>2</sup>Asper Clinical Research Institute, and St. Boniface Hospital Research, Canada**\*Corresponding author:** Tappia PS, Asper Clinical Research Institute and St. Boniface Hospital Research, CR3129-369 Tache Avenue, Winnipeg, Manitoba, R2H 2A6, Canada, Tel: 204-258-1230; Fax: 204-237-0347; Email: ptappia@sbr.ca**Received:** October 13, 2014; **Accepted:** October 14, 2014; **Published:** October 17, 2014

## Perspective

In this perspective article, we present some information on the benefits of fish, seal and flax oils in the primary and secondary prevention of Cardiovascular Disease (CVD). This is not meant to be an exhaustive review, but a viewpoint that provides an indication for the recommendation of inclusion of omega-3 fatty acids in the human diet. There is now substantial evidence that omega-3 fatty acids are beneficial to maintaining human health as well as for the prevention and treatment of a wide variety of health conditions including CVD, mental and visual health, and inflammatory and other chronic disorders [1-5]. Since these fatty acids can not be produced in the human body, it has been recommended to increase dietary intake of omega-3 containing foods, such as fish, flax seed oil and walnuts. The lack of dietary omega-3 fatty acids is believed to be related to many diseases including atherosclerosis, inflammatory diseases, joint pain and mental disease. However, the potential benefits of fish oil (omega-3 fatty acids) consumption to reduce CVD risk remains controversial; some investigations have reported a reduced CVD risk while others report no benefit [6-9]. In this regard, these disparities may be due to a greater use of background optimal medical therapy that may have reduced the benefit from omega-3 fatty acids or due to low doses of omega-3 fatty acids or tested omega-3 fatty acid supplementation on top of a relatively high baseline intake of omega-3 fatty acids [10]. This controversy could, in part, be resolved when consideration is given to omega-3 blood levels in relation to CVD risk as well as blood levels achieved in clinical trials of omega-3 supplementation and CVD benefit [6]. With the capability to measure omega-3 fatty acids through blood tests, patients can achieve cardioprotective levels by either taking fish oil supplements or simply eating more oily fish [11]; current guidelines recommend 2 servings of fatty fish per week for the general population. Interestingly, a unique omega-3 fatty acid formulation has been reported to be effective in improving blood lipid profile in ambulatory cardiovascular subjects; the optimal efficacy was found to be dependent upon dose and purity of the formulation [12].

The average daily consumption of seal oil by the Inuit people is approximately 8-9 g [13]. High intake of seal oil has been associated

with a reduced risk of CVD [13,14], which may due to an attenuation of oxidative stress and atherosclerotic lesion formation [15]. It has also been reported that a daily consumption of 5 or 10 capsules of seal oil reduces plasma triglyceride levels as well as decreased lymphocyte production of proinflammatory TNF- $\alpha$  in healthy volunteers [16]. However, there is still very little information on the effect of seal oil consumption on CVD risk factors and thus the potential of seal oil as well as the mechanisms of protection need to be further investigated. Diabetes is an established risk factor for CVD [17,18]. Seal oil and fish oil may exert preventive effects on the risk of diabetes. Several investigators have reported that the Inuit people have lower prevalence of diabetes compared with other populations [19]. From clinical studies and epidemiological surveys, negative correlations between diabetes and intake of seal meal, or salmon fish or active physical activity have been revealed. The oil from a seal meal and salmon fish contains high amounts of omega-3 fatty acids, which can reduce triglycerides, VLDL-cholesterol, platelet activity and blood pressure in type 2 diabetic patients; thus lowering the risk of death in diabetic population due to CVD. However, more clinical studies are required in patients with type 1 diabetes [19].

Comparison studies between fish oil and seal oil have been carried out in the recent years. Fish oil contain high amounts of both Eicosapentanoic Acid (EPA) and Docosahexanoic Acid (DHA) and relatively low amounts of Docosapentanoic Acid (DPA), however, seal oil contains all of these three fatty acids in relatively high amounts. DPA is more potent than EPA in repairing damaged blood vessels and inhibiting inflammatory reactions. Research by Mann et al. [20] have reported that seal oil is more effective than fish oil in suppressing platelet aggregation, lowering triacylglycerol and increasing HDL-cholesterol levels. These observations were supported by the pre-clinical studies of Dubey et al. [21], which reported that seal oil is much more efficient than fish oil in the reduction of plasma triglycerides, total cholesterol and chylomicron total cholesterol as well as reducing oxidative stress as evidenced by the lower level of malondialdehyde (MDA), a well known marker of lipid peroxidation and oxidative stress.

It should be noted that some studies report that fish oil supplements increase oxidative stress and risk of cancer. In this regard, Kimura et al [22] have reported that long term intake of fish increased oxidative DNA damage in Japanese men and women. While there are other reports linking high intakes of omega-3 fatty acids to cancer [23,24], pre-clinical studies by Hardman et al [25] have revealed that 3% dietary fish oil can increase the efficacy of chemotherapy against MDA-MB 232 breast cancer growth mediated by the increase of oxidative stress in tumor cells; this additive cytotoxic effect of omega-3 fatty acids may be related to the induction of apoptosis of cancer cells [26]. From the aforementioned it is evident that further investigation is required to explore the relationship between omega-3 fatty acid intakes and cancer risk. Another major concern for marine source of omega 3

is the mercury contamination [27,28]. Furthermore, concerns about fish taste, smell, allergies and eructation following a fish meal are some of the factors that have limited their dietary use. Flaxseed is an alternative to marine products. It is one of the richest sources of the plant-based omega-3 fatty acid, Alpha-Linolenic Acid (ALA). Based on the results of clinical trials, epidemiological investigations and experimental studies, ingestion of ALA has been suggested to have a positive impact on CVD [29,30]. Indeed, recent clinical studies have shown that flax seed consumption, which would be expected to increase plasma levels of ALA, reduces blood pressure as well as decreases the plasma concentrations of oxylipin, a known regulator of vascular tone, in patients with hypertension [31,32]. It is pointed out that ALA can be converted to long-chain omega-3 fatty acids; however, the rate of conversion is low, which is further decreased by the aging process as well as physical and emotional well being. Nevertheless, it appears that ALA itself may exert beneficial effects in the primary and secondary prevention of CVD.

In conclusion, the large body of data provides strong evidence for fish, seal and flax seed oils as important food supplements for maintenance of human health [33,34] including protection against CVD. From the literature, it seems that seal oil is more potent than fish oil and flax seed oil in reducing hardening of blood vessels. In addition, the combined use of a plant source and marine source omega-3 may result in an additive effect [35-37] and thus warrants further investigation. The typical North American diet provides approximately 0.2 g to 0.4 g of EPA and DHA and 1.4 g of ALA per day [24]. Despite the recent negative data about omega-3 fatty acids, the overall evidence still supports the American Heart Association recommendation of 1 g of EPA/DHA per day for patients with coronary heart disease. In addition, current dietary recommendations for adults suggest a daily intake of 2.22 g of ALA per day [38]. Although there is an increased public awareness of the health benefits of omega-3 fatty acids there is still a need for well designed, randomized, controlled trials of omega-3 fatty acids in different patient populations according to age, sex, and ethnicity as well as with a variety of pathophysiological conditions including CVD and diabetes with higher omega-3 doses.

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