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## **ABSTRACT**

### **Potential health benefits of marine food with a special emphasis on fatty fish and omega-3 fatty acids**

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The nutrient profile of fish and other marine food is often rather different to that of terrestrial food. This difference in nutritional properties results in distinct effects on the consumer so influencing physiology, health status and well-being. The relation between marine food and human health and well-being is probably best understood for marine fish, especially so-called fatty (or oily) fish. Numerous prospective cohort studies reveal an inverse association between intake of fish and risk of several chronic diseases or disease outcomes including coronary heart disease, cerebrovascular disease, and some cancers. The protective effect of eating fish could be due to any of the individual nutrients provided in higher amounts in fish or to a specific combination of nutrients. Where the type of fish has been studied, fatty fish has often been seen to be protective; this has led to the suggestion that it is the long chain omega-3 fatty acids (O3FA: EPA and DHA) found in uniquely high amounts in fatty fish that are the protective nutrients. Indeed, prospective cohort studies reveal inverse associations between O3FA and risk of several chronic diseases. However, it is important to note that the “epidemiology of O3FA” is not as strong as that of fish. Intervention studies allow for a more robust evaluation of cause and effect. There are relatively few intervention studies with fish, but those that have been performed show an improved cardiovascular risk factor profile. The “Salmon in Pregnancy Study” demonstrates that increased salmon intake by pregnant women may benefit their offspring in childhood. There are many controlled trials of O3FA supplements in healthy subjects, in at risk groups and in different patient populations. Increased intakes of O3FA are reflected in greater incorporation into blood lipid, cell and tissue pools. Increased content of EPA and DHA can modify the structure and function of cell membranes. EPA and DHA also modify the production of lipid mediators and, through effects on cell signaling, can alter patterns of gene expression. Through these actions EPA and DHA act to alter cellular responsiveness in a manner that seems to result in more optimal conditions for



growth, development and maintenance of health. EPA and DHA have a wide range of physiological roles which are linked to certain health or clinical benefits. A number of risk factors for cardiovascular disease are modified in a beneficial way by increased intake of EPA and DHA: these include blood pressure, platelet reactivity and thrombosis, plasma triglyceride concentrations, vascular function, cardiac arrhythmias, heart rate variability, and inflammation. As a result of these effects, increased EPA and DHA intake is associated with a reduced risk of cardiovascular morbidity and mortality. Thus, there is a key role for these fatty acids in prevention and slowing progression of cardiovascular disease. Furthermore, some (but not all) studies with EPA and DHA have demonstrated reduced mortality in at risk patients, such as post-myocardial infarction, indicating a therapeutic role. A number of other, non-cardiovascular, actions of EPA and DHA have also been documented, suggesting that increased intake of these fatty acids could be of benefit in reducing the risk of (i.e. protecting from) or treating many conditions. For example, they have been used successfully in rheumatoid arthritis and, in some studies, in inflammatory bowel diseases, and may be useful in other inflammatory conditions like asthma, chronic obstructive pulmonary disease, and psoriasis. EPA and DHA may also have a role as part of cancer therapy; some recent studies show that they improve the effectiveness of some chemotherapeutic agents. DHA has an important structural role in the eye and brain, and its supply early in life when these tissues are developing is known to be of vital importance in terms of optimizing visual and neurological development. Recent studies have highlighted the potential for EPA and DHA to contribute to enhanced mental development and improved childhood learning and behaviour and to reduce the burden of psychiatric illnesses in adults, although these areas of possible action require more robust scientific support. There may also be a role for EPA and DHA in preventing neurodegenerative disease of ageing. The effects of EPA and DHA on health outcomes are likely to be dose-dependent, but clear dose response data have not been identified in most cases. Also in many cases it is not clear whether both EPA and DHA have the same effect or potency and therefore which one will be the most important for a particular indication.

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