

Quality
is in our nature



Omega-3 Fatty Acids (marine-derived)

Essential to human health



Consumers are searching for tasty, convenient alternatives to eating fish to gain the health benefits of omega-3. Canadian manufacturers of marine-derived omega-3 polyunsaturated fatty acids (PUFAs) have the potential to ensure alternative, healthy foods for consumers.

Omega-3 and omega-6 are essential fatty acids (EFAs) because they are not produced by the body and must be obtained through diet or supplementation. These EFAs are necessary for skin and hair growth, cholesterol metabolism and reproductive performance. Omega-3 fatty acids are important for proper neural, visual and reproductive functions while omega-6 fatty acids are critical for proper tissue development during gestation and infancy.

Omega-3 (n-3) fatty acids are derived from two main dietary sources: marine, and nut and plant oils. The primary marine-derived omega-3 fatty acids with 20 or more carbon atoms are eicosapentaenoic acid (EPA; C20:5n-3) and docosahexaenoic acid (DHA; C22:6n-3) present in high concentrations in deep water oily fish such as tuna, salmon, mackerel and herring as well as seal oil, krill and marine algae.



Agriculture and
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Canada 

EPA and DHA of selected fish ^{1,2}	
Type of fish	EPA + DHA (mg/100g)
Anchovies	1400
Herring	1700-1800
Mackerel	340-1570
Salmon	680-1830
Sardines	980-1700
Trout	600-980
Tuna	240-1280



Health Benefits



Scientific evidence is accumulating to substantiate the role omega-3 fatty acids play in conditions such as cardiovascular disease, joint health, certain cancers and other diseases. The positive effects of essential fatty acids are attributed to their ability to reduce inflammation.³

Numerous large-scale epidemiologic studies suggest people at risk for coronary heart disease (CHD) benefit from consuming omega-3 fatty acids. The beneficial effects of EPA and DHA on the cardiovascular system have led the U.S. Food and Drug Administration (FDA) to allow a qualified health claim linking intake of EPA and DHA with reduced risk of CHD. Approximately 1 g daily of EPA plus DHA is recommended for the cardioprotection of people who have survived a myocardial infarction.

Mechanisms by which omega-3 fatty acids reduce cardiovascular disease (CVD) risk remain under investigation.¹

Research to date suggests they can:

- Decrease risk of arrhythmias (which can lead to sudden cardiac death)
- Decrease risk of thrombosis (which can lead to heart attack and stroke)
- Decrease triglyceride and remnant lipoprotein levels
- Retard growth of atherosclerotic plaques
- Improve endothelial function
- Lower blood pressure (mildly) and,
- Reduce inflammatory responses

Omega-3 fatty acids have also been investigated for efficacy in a myriad of health concerns including Alzheimer's disease⁴, rheumatoid arthritis⁵, hypertension⁶, depression⁷, Crohn's disease⁸, atopic dermatitis⁹, age-related macular degeneration¹⁰, lupus¹¹, and various types of cancer, including colon¹², breast¹³, and prostate.¹⁴ There is insufficient evidence to support the use of omega-3 fatty acids to improve the diabetic state or to treat attention and cognitive disorders in children.¹⁵

EFAs are also promoted for positive influence on the central nervous system, as proper brain development, function and maintenance cannot occur without these vital lipids.¹⁶



Canadian Suppliers

- **Ascenta Health Ltd.**
Dartmouth, NS | www.ascentahealth.com
- **Atlantic Marine Products**
St. John's, NL | www.omegaplus.nf.ca
- **Bioriginal Food and Science Corporation**
Saskatoon, SK | www.bioriginal.com
- **Neptune Technologies & Bioresources Inc.**
Laval, QC | www.neptunebiotech.com
- **Newfoundland Health Foods Corp**
St. John's, NL | www.omega3-drho.com
- **Ocean Nutrition Canada**
Dartmouth, NS | www.ocean-nutrition.com

Applications

The sensitivity of omega-3 fish oils to heat, light and oxygen presents nutritional challenges in formulating functional foods and beverages. These elements eliminate benefits of the oil and reduce its shelf life due to production of off flavours and unpleasant odours. To prevent oxidation of polyunsaturated fatty acids, many fish oils are immersed in protective proteins or starches and spray dried into powders.

Ocean Nutrition Canada has developed a novel technology to protect fish oil. This double-shelled microencapsulation system called Powder-loc protects fish oil from oxidation and interactions with other ingredients and the environment. It allows higher concentrations of fish oil to be incorporated into foods and can be used for more challenging applications where a long shelf life is required.

Microencapsulation has led to the incorporation of omega-3 fish oils into a myriad of food products - infant formulas, baked goods, tortillas, fortified dairy products,

beverages, low-fat meat products, liquid egg products, chews and even chocolate.

The use of omega-3 fatty acids in a wider array of food products has gained novel food approval in Canada and GRAS (Generally Recognized As Safe) approval in the United States. Neptune Technologies & Bioresources recently gained GRAS approval for krill oil.

Condition specific applications for omega-3 fatty acids are also showing up in the market place. Ocean Nutrition Canada has developed a high DHA oil (5:1 ratio of DHA:EPA) for formulation of products aimed at mother and infant nutrition. Bioriginal Food and Science Corporation markets condition-specific combinations of plant and fish omega-3 fatty acids along with other ingredients targeted towards heart health or prostate health. In addition, they sell highly purified pharmaceutical grade fish oils for heart, joint, brain, eye, and inflammatory response health.

Another area under development is the formulation of special animal feed supplements containing DHA for inclusion in dairy herd and poultry diets resulting in enriched omega-3 fatty acid milk and eggs.

Food manufacturers have a number of label options to inform consumers of the benefits of omega-3 fatty acids. In Canada and the United States, the Nutrition Facts label can be used to identify those foods containing this nutrient, and both countries allow a nutrient content claim.^{17,18} In Canada, DHA is on the list of "Acceptable Biological Role Claims for Nutrients" as a nutrient that "supports the normal development of the brain, eyes and nerve".¹⁹ In the United States, a qualified health claim for omega-3 fatty acids, EPA and DHA, and coronary heart disease is permitted.²⁰



Canadian Research Expertise

Centre for Aquaculture and Seafood Development

St. John's, NL

- Applied scientific and technical expertise in seafood processing and aquaculture

Dalhousie University

Canadian Institute of Fisheries Technology
Halifax, NS

- Aquaculture development, biotechnology, fish/food process engineering, marine oils and nutrition, physical properties of foods, process chemical science, seafood biochemistry and toxicology (**S. Budge**)

Memorial University of Newfoundland

St. John's, NL

- Selective metabolism of fatty acids (**G. Herzberg**)

- Lipid oxidation and prevention, bioconversion and technology, omega-3 fatty acids from fish and seal blubber oils, marine lipids (**F. Shahidi**)

University of British Columbia

Vancouver, BC

- Laboratory, preclinical and clinical studies on biological basis of action on dietary components (lipids) ranging from gene expression and protein function to health endpoints in a variety of clinical populations (**S. Innes**)

University of Guelph

Guelph, ON

- Structure/function relationships of PUFAs in cellular systems. Studying potential benefits of omega-3 fatty acids from plant and fish sources with respect to cardiovascular health in humans (**B. Holub**)

- Specialized feed supplements incorporating omega-3 fish oils for poultry and dairy and beef cattle (**B. McBride, S. Leeson, I. Mandell**)

University of Prince Edward Island

Canada Research Chair in

Psychoneuroimmunology

Charlottetown, PE

- Study of omega-3/6 fatty acids to treat symptoms of neurodegenerative diseases such as Alzheimer's, multiple sclerosis and Parkinson's (**C. Song**)

University of Sherbrooke

Canada Research Chair on Use of Dietary Fatty Acids and Cognitive Functions During the Aging Process

Sherbrooke, QC

- Effect of PUFAs on cognitive functions (**S. Cunnane**)

The Canadian Advantage in the Global Marketplace

Quality
is in our **nature**

Natural Resources • Canada's abundant natural resources are proven building blocks for a high tech industry that produces an array of high quality agri-food products.

World-Class Standards • Canada's regulatory and food inspection systems are internationally recognized, resulting in world-class standards and products that are safe, nutritious and high quality.

Innovative Research • Canada has developed a strong network of research facilities across the country where scientific innovators are focused on developing leading-edge products and new technologies.

Collaborative Teamwork • Collaboration among governments, health institutions, universities and industry has helped this vibrant sector prosper by encouraging innovation and manufacturing of diverse agri-food products with proven health benefits.

To learn more about Canada's functional food and natural health products industry, visit: www.agr.gc.ca

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