

N-3 Polyunsaturated Fatty Acids and Inflammation: From Molecular Biology to the Clinic

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Affiliations

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Abstract

The immune system is involved in host defense against infectious agents, tumor cells, and environmental insults. Inflammation is an important component of the early immunologic response. Inappropriate or dysfunctional immune responses underlie acute and chronic inflammatory diseases. The n-6 PUFA arachidonic acid (AA) is the precursor of prostaglandins, leukotrienes, and related compounds that have important roles in inflammation and in the regulation of immunity. Feeding fish oil results in partial replacement of AA in cell membranes by EPA. This leads to decreased production of AA-derived mediators, through several mechanisms, including decreased availability of AA, competition for cyclooxygenase (COX) and lipoxygenase (LOX) enzymes, and decreased expression of COX-2 and 5-LOX. This alone is a potentially beneficial anti-inflammatory effect of n-3 FA. However, n-3 FA have a number of other effects that might occur downstream of altered eicosanoid production or might be independent of this effect. For example, dietary fish oil results in suppressed production of proinflammatory cytokines and can modulate adhesion molecule expression. These effects occur at the level of altered gene expression. Fish oil feeding has been shown to ameliorate the symptoms of some animal models of autoimmune disease and to protect against the effects of endotoxin. Clinical studies have reported that oral fish oil supplementation has beneficial effects in rheumatoid arthritis and among some asthmatics, supporting the idea that the n-3 FA in fish oil are anti-inflammatory. There are indications that the inclusion of fish oil in enteral and parenteral formulae is beneficial to patients.

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