

New FLAX FACTS

FLAX FAVOURABLY AFFECTS THE IMMUNE SYSTEM

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SUMMARY

Flax is rich in ALA, which has been shown to decrease inflammatory reactions in humans. Lignans have anti-inflammatory effects in rats.

- ALA-rich diets increase the omega-3 fat content of cell membranes and decrease the production of agents that promote inflammation.
- ALA-rich diets decrease blood levels of CRP, a biomarker of inflammation and tissue damage. In a clinical study, CRP blood levels decreased 75% in volunteers who ate an ALA-rich diet containing a combination of walnuts, walnut oil, and flax oil. In a cohort of women participating in the Nurses' Health Study, CRP levels in blood decreased as their ALA intake increased.
- Lignans decrease levels of pro-inflammatory cytokines like TNF α in rats.

Flax is rich in alpha-linolenic acid (ALA), the essential omega-3 fatty acid, and lignans, which are phytoestrogens. ALA and lignans modulate immune reactions and may play a beneficial role in the prevention and management of atherosclerosis, obesity, the metabolic syndrome, and other chronic diseases in which chronic inflammation is a key feature.

Features of Chronic Inflammation

In healthy tissue there is a balance between agents that promote inflammation and those that block it. When there is an infection or injury, the pro-inflammatory agents rally to eliminate the infection or repair the injury and return the tissue to health. When health is restored after a few days or weeks, the number of pro-inflammatory agents returns to normal. In some cases, however, the immune system switches from an acute mode to a chronic, low-grade inflammation that can persist for months or years.¹

In both acute and chronic inflammation, immune cells release a variety of pro-inflammatory agents, including cytokines such as tumor necrosis factor α (TNF α), interleukin-1 β (IL-1 β), and interleukin-6 (IL-6). These cytokines are part of a large network of cell signaling agents. One of their key actions is to stimulate the release of C-reactive protein (CRP).

CRP is an acute phase pro-inflammatory protein formed mainly in the liver in response to acute injury, infection, hypersensitivity reactions, inflammatory diseases, malignancy, and trauma. CRP is a sensitive biomarker of systemic inflammation and tissue damage. It is strongly associated with atherosclerosis, insulin resistance, and the metabolic syndrome.^{2,3}

When immune cells switch to a chronic inflammatory mode, they produce more cytokines and CRP than are needed. The result is that healthy tissue becomes inflamed. Indeed, chronic inflammation has been said to result from the failure of normal wound healing.¹

Chronic Inflammation and Chronic Disease

Low-grade chronic inflammation is a feature of many chronic diseases. In atherosclerosis, for example, TNF α , IL-1 β , and IL-6 are released by macrophages (a type of immune cell) and foam cells found within vascular cell walls.⁴ In rheumatoid arthritis, IL-1 β and TNF α are major pro-inflammatory cytokines found in affected joints.¹ In one study of 74 patients with rheumatoid arthritis, blood concentrations of IL-1 β and TNF α were 5- and 15-fold greater, respectively, in arthritis patients than in healthy adults.⁵

Obesity can also be viewed as a state of chronic inflammation.² The presence of excess adipose tissue, particularly in the abdominal area, is marked by increased blood levels of CRP and also of TNF α , IL-6 and other pro-inflammatory cytokines.^{2,6,7} The abundance of these cytokines in adipose tissue and CRP in the bloodstream is believed to contribute to insulin resistance – a major risk factor for type 2 diabetes, hypertension, and blood lipid disorders, and possibly a risk factor for coronary heart disease.⁸⁻¹⁰ Indeed, even in a group of healthy Japanese men and women, there was an association between CRP and increased fasting insulin levels, fasting glucose levels, and insulin resistance.¹¹

Flax Effects on the Immune System

Flax contains ALA and lignans, both of which decrease inflammatory reactions. New research provides insights on their anti-inflammatory effects.

ALA. One way in which ALA influences immune reactions is by changing the fatty acid composition of membrane phospholipids. For example, in a clinical study, the ALA content of red blood cell membranes increased 225%, and their content of eicosapentaenoic acid (EPA) increased 150%, in healthy men who ate a diet enriched with flax oil (about 2 tbsp daily or 15 g ALA/day) for 12 weeks.¹²

This increased omega-3 fatty acid content of cell membranes decreases the production of the cytokines TNF α and IL-1 β . In a study of 28 healthy men, for example, consuming flax oil (about 1 2/3 tbsp daily



providing 13.7 g ALA/day) for 4 weeks resulted in a decrease in TNF α and IL-1 β production of nearly 30% in mononuclear cells (a type of immune cell).¹³

Diets rich in ALA have also been shown to decrease the blood concentration of CRP. A clinical study conducted in 23 men and women with high blood cholesterol found that serum CRP concentration decreased 75% when the volunteers consumed an ALA-enriched diet compared with when they consumed an average American diet.¹⁴ Dietary ALA was obtained by eating a combination of walnuts, walnut oil, and flax oil in this study. [The ALA-rich diet provided about 17 g ALA/day, based on a 2,400 kcal diet, and can be achieved by consuming roughly 2 tbsp flax oil daily.] The average American diet in this study provided about 2 g of ALA per 2,400 kcal. In the Nurses' Health Study, ALA intake was inversely related to plasma CRP concentrations.¹⁵

Lignans. Lignans have been shown to decrease the production of TNF α and IL-6 in microglial cells of rats.¹⁶ (Microglial cells are found in the brain.) The anti-inflammatory effects of lignans have not been studied in humans.

Flax Has Favourable Effects on the Immune System

Flax favourably influences immune reactions. ALA and lignans block the release of pro-inflammatory cytokines. ALA-rich diets decrease blood CRP levels. Through these effects, flax consumption may help prevent and treat disorders characterized in part by an over-stimulated immune system. Such disorders include atherosclerosis, obesity, the metabolic syndrome, diabetes mellitus, rheumatoid arthritis, multiple sclerosis and systemic lupus erythematosus.¹⁷

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