

# Safety of Flax

Like many plants in our diets, flax contains some compounds that influence the absorption of nutrients or whose health effects are only now being studied (444,445). This chapter reviews the role of these compounds in human nutrition and also discusses allergic reactions to flax.

## Cyanogenic Glycosides

Cyanogenic glycosides are a group of natural substances found in plants that release cyanide, a poisonous compound, when degraded by enzymes or organic acids. Thousands of plants produce cyanogenic compounds, including most agronomically important crops such as corn, paddy rice, barley, wheat, rye, sugar cane, mango, cassava, lima beans, bamboo shoots, sorghum, flax, apples and stone fruits like peaches, plums, cherries and apricots. Other sources of dietary cyanide include vitamin B<sub>12</sub>, an essential vitamin required for cell growth, and thiocyanates, which are found naturally in milk, beer and green vegetables (446-448). Thiocyanate is a breakdown product of the cyanogenic glycosides and of glucosinolates found in millet and in cruciferous vegetables like cabbage, broccoli, cauliflower, kale, mustard, turnip, radish, and horseradish (449).

Thiocyanate can act as a goitrogen, meaning that it blocks the uptake of iodine by the thyroid gland. When the diet is overly rich in goitrogens, the thyroid gland swells to trap as much iodine as possible,

forming a goiter or lump in the neck (450). There is no evidence that eating flax produces symptoms of goiter. Goiter is not a health problem where iodine intake is adequate (451,452), and it is rare in North America. [Goiter occurs mainly in Asia and Africa, and in 96% of cases, it is due to iodine deficiency, not to the overconsumption of plant goitrogens (450).] Iodine deficiency disorders like goiter have been virtually eliminated in the United States through the iodization of salt (453). In Canada, table salt has been iodized since the 1930s to eliminate endemic goiter in inland regions where dietary iodine was inadequate (452). The addition of iodine to table salt is required in Canada and permitted in the United States.

Furthermore, eating baked goods containing flax appears to have little effect on urinary thiocyanate levels. In a Canadian study, urinary thiocyanate levels were not greater in healthy women who ate muffins containing flax every day for 4 weeks (79). This finding suggests that the risk of goiter was not increased.

Populations most likely to experience health problems from cyanogenic glycosides have poor quality diets rich in cassava and low in energy, iodine and high-quality protein. By comparison, North Americans are well nourished and eat a variety of foods daily. In healthy people who eat varied diets, the body can eliminate the potentially harmful compounds found in plants. Indeed, the body has several methods of metabolizing the cyanogenic glycosides to thiocyanate (447).

Consumption of moderate amounts of flax (1-2 tbsp) daily is not likely to pose a health problem for North Americans who have adequate intakes of protein and iodine. In several clinical studies, volunteers ate muffins containing 50 g (5-6 tbsp) of milled flax daily for up to 6 weeks without ill effects. Muffins made with milled flax showed no trace of the cyanogenic glycosides, suggesting that cooking destroyed the enzyme that metabolizes the glycosides (79). New research suggests that some cyanogenic glycosides have anti-tumour effects (454). In a model of mouse skin cancer, six common cyanogenic glycosides decreased the number of mice with tumours by 13-33% and had a potency comparable to that seen with the anticancer phenolic compound found in green tea.

## **Nutrient Antagonists**

Flax contains two compounds – phytic acid and oxalate – that bind calcium, copper, iron, magnesium and zinc to form insoluble complexes in the intestine (450). Flax contains less than 10 mg of oxalate/kg and about 0.8-1.5% phytic acid by seed weight. The amount of phytic acid in flax is comparable to that found in peanuts and soybeans (7). Phytic acid is widely distributed in plant foods. In cases where there is an imbalance in the intake of phytates, calcium and zinc, rats show diminished growth and decreased bone zinc levels (455). However, there were no effects on bone zinc levels in weanling rats fed various levels of flax, and hence various levels of phytate, for 90 days (456). New research shows that, at least in rats, phytic acid lowers blood glucose and reduces the incidence of colon cancer (7).

## **Food Allergy**

Food allergy to flax appears to be fairly rare, with only a handful of allergic reactions reported in the medical literature (457-461). The prevalence of flax allergy is not known. Likewise, there are no data on cross-reactivity of flax with other allergens. Flax is an oilseed and has a different taxonomic classification than peanuts, which are legumes. Individuals who suspect an allergy to flax should seek the advice of their physician.