NATURAL TOXINS IN SPROUTED SEEDS: SEPARATING MYTH FROM REALITY
By Dr. William S. Peavy and Warren Peary

Natural toxins in food have become a hot and controversial subject recently. In the last few years, some popular writers have attacked sprouts (particularly alfalfa and legume sprouts) as containing natural toxins. These writers may have heard something about a lathyrogen toxin, saponins, canavanine, and mabbe some other nasty-sounding toxins, and concluded that the sprouts of legumes are toxic in the raw state and so should not be eaten. These statements are taken out of context.

LATHYROGEN TOXIN

One of the natural toxins that has been mentioned comes from the peas of the genus Lathyrus. It is blamed for causing a disease known as lathyrism. Lathyrism causes paralysis in the legs in susceptible individuals and is believed to be caused by a toxic amino acid. This sounds scary, but it's not, because peas of the genus Lathyrus are not edible peas. The toxin is only found in the seeds of certain Lathyrus species (L. sativus, L. cicera, L. clymenun)! Edible peas and beans are of the genera Cicer, Glycine, Phaseolus, Pisum, and Vigna. They do not contain any such toxin.

Non-edible peas of the genus Lathyrus include sweet peas, which are ornamentals grown for their scented flowers. In India, where food is often scarce, some people have resorted to eating a non-edible pea known as Lathyrus sativus. It is often called "chickpea" but is NOT the same chickpea eaten in this country or any other developed country.The edible chickpea is of the genus Cicer and in botany is known as Cicer arietinum.

Outbreaks of lathyrism in India have been blamed on eating large amounts of the non-edible chickpea without proper cooking. Well-cooked, it is safe to eat. But it shouldn't matter to us at all because it is considered an inedible species.

There are at least 1.500 species of legumes within one of three subfamilies of the family Leguminosae (Latin for Legume). Of these 1.500 species, only a few dozen are regularly used as human food. Of course there are toxins in many of the raw legumes usually used for human food; that's why humans have learned not to eat them. This is the first mistake sometimes made in warning about natural toxins- talking about a toxin that's found in some non-edible species people shouldn't eat to begin with!

SAPONINS

The second mistake often made in talking about natural toxins is to call something toxic that, in the body, is not toxic at all but rather, is beneficial. Such is the case with saponins.

Saponins are a compound found in legumes and legume sprouts. They are toxic to red blood cells only in vitro (outside the body in a test tube) but harmless when ingested. In fact, Saponins appear to be beneficial, being responsible for a major part of the cholesteral-lowering effect of legumes. Perhaps it is more than coincidence that the increase in the increase of heart disease in the 20th century in the Western countries coincides with the with a decline in the consumption of saponin-rich legumes. Saponins also seem to be anticarcinogens; in one study they inhibited colon cancer.

Even some of the most beneficial nutrients, such as vitamin C, can be shown to be toxic under certain laboratory conditions. Vitamin C is concidered an important antioxident, and substantial evidence shows that it is involved in cancer prevention. Yet under the right experimental conditions, in the presence of iron (Fe III) or copper (Cu II) ions, ascorbic acid can actually cause the formation of harmful free radicals. Does this mean you should try to avoid vitamin C? Absolutely not! These experimental conditions do not appear to be relevant to what goes on in our bodies.

CANAVANINE

The third mistake made in the warning about some natural toxins is failing to say that the amount encountered in food is so miniscule that it is completely insignificant. Such is the case with a toxin called canavanine, which is found in alfalfa seeds. While some writers may make canavanine sound like a dangerous carcinogen ¾ it isn't. Canavanine is a non-protein amino acid that's toxic in high amounts. In the dry seed it serves as storage protein, a growth inhibitor, and a defense against natural predators. As you might guess, as a sprout grows, canavanine falls rapidly to insignificant levels. The text, *Seed Physiology*, clearly states that "Canavanine…is non-toxic to mammals at low concentration."

Canavanine is so irrelevant that in the 1980 text, *Toxic Constituents of Plant Foodstuffs*, doesn't even mention it. A 150-pound human would have to consume 14,000 milligrams of canavanine all at once for it to be toxic at the same level it is toxic in mice. This is an incredible amount! It is doubtful that with a generous helping of alfalfa sprouts, you would get no more than a few milligrams. There is NO canavanine at all in other legumes that are commonly used as human food.

Even in toxic amounts, canavanine has nothing to do with cancer. In very high, toxic amounts it can cause a lupus-like anemia in susceptible animals due to an alteration in the red blood cells. These studies are not relevant to the human diet. The minute doses found in the diet are completely irrelevant and harmless.

Just remember that most substances can show some kind of toxic effect at a high enough dose. Vitamin A, selenium, copper, zinc, and iron will all kill you at a high enough dose. So don't stop eating alfalfa sprouts any more than you would any other food because of some minute toxin that might be present. They are a good source of vitamin C, folic acid, and othe protective compounds.

ANTI-NUTRIENTS IN SPROUTED LEGUMES

As far as the sprouts of other legumes go, the only other toxins for which any concern has been raised is for a class know as anti-nutrients. These are substances that bind enzymes or nutrients and inhibit the absorption of the nutrients. The commonly alleged anti-nutrients are protease inhibitors, amylase inhibitors, phytic acid, and polyphenolic compounds such as tannins. With proper soaking and germination, none of these are anything to worry about.

Around the world, studies have been and are being conducted on the use of germinated seeds as a low-cost, highly nutritive source of human food. It is well established that when legumes are properly soaked and germinated, their nutritive value increases greatly, usually to levels equal to or exceeding those of the cooked bean. (Nutritive value is the ability of food to provide a usable form of nutrients: protein, carbohydrates, vitamins, and minerals). This has been shown for mung bean, lentil, chickpea (garbanzo bean), cowpea (blackeye pea), pigeon pea, fava bean, fenugreek seeds (a member of the pea family), green & black gram, kidney bean, moth bean, rice bean, soybean, and legumes in general.

The increase in nutritive value in the raw sprouted seed is due to an explosion of enzyme activity, which breaks down the storage-protein and starch in the seed into amino acids, peptides, and simpler carbohydrates needed for the seed to grow. The seed is literally digesting its own protein and starch and creating amino acids in the process. Because of this process, sprouted seeds are essentially a predigested food. At the same time, the anti-nutritional factors such as enzyme inhibitors and other anti-nutrients are greatly decreased to insignificant levels or to nothing.

Soaking alone causes a significant decrease in anti-nutrients, as the anti-nutrients are leached into the soak water. Soaking for 18 hours removed 65% of hemagglutinin activity in peas.Soaking for 24 hours at room temperature removed 66% of the trypsin (protease) inhibitor activity in mung bean, 93% in lentil, 59% in chickpea, and 100% in broad bean. Then as germination proceeds, anti-nutrients are degraded further to lower levels or nothing. Soaking for 12 hours and 3 – 4 days of germination completely removed all hamagglutinin activity in mung beans and lentil. Soaking for 10 hours and germination for 3 days completely removed amylase inhibitor in lentils. Normal cooking removes most or all of the anti-nutrients.

ANTI-NUTRIENTS AS PROTECTORS

Some of the substances commonly referred to as anti-nutrients are actually powerful cancer-protecting phyto-chemicals. These include protease inhibitors and tannins. The problem in most diets is that we don't get enough of these substances.

Substantial research shows that protease inhibitors are one of the most powerful anti-carcinogens we have in our arsenal. They have proven to be particularly protective against cancer of the colon, breast, and prostate.

Tannins have also been shown to give substantial protection against cancer (including cancer of the stomach and lungs) when ingested orally. Tannins and other polyphenols may play a role in fighting tooth decay. Evidence shows that some tannins inhibit the growth of bacteria that cause tooth decay.

Phytates, like tannins, may also interact with digestive processes in a beneficial way. Small amounts in food slow down the absorption of sugars and regulate insulin levels. This is beneficial in the prevention and treatment of diabetes and hyperlipidemia (high blood fats).

Small amounts of protease inhibitors, tannins, and phylates are beneficial and can be considered to be a normal part of nutritional ecology.

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