

Lactulose may enhance the colonic absorption of calcium and magnesium supplements if used concomitantly.

FOODS

Lactulose may enhance the colonic absorption of calcium and magnesium in foods.

OVERDOSAGE

There have been no reports of overdosage.

DOSAGE AND ADMINISTRATION

Lactulose is available in some functional foods and nutritional supplements in Japan. Its use in the U.S. for supplemental purposes is still experimental. Supplemental doses used in Japan are about 2 to 5 grams daily. Doses higher than 10 grams daily are likely to cause gastrointestinal side effects (flatus, abdominal cramping, diarrhea). Doses of 10 to 20 grams daily and up to 40 grams daily are used to treat constipation. Doses from 60 to 120 grams daily are used to treat hepatic encephalopathy. Pharmaceutical lactulose is available in solutions and in the form of a crystalline powder. Lactulose is a prescription drug in the U.S. for pharmaceutical uses.

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Larch Arabinogalactan

DESCRIPTION

Larch arabinogalactan refers to a polysaccharide derived from wood of the Western larch or *Larix occidentalis*. Arabinogalactans occur in other types of larch, but that which is marketed for supplemental usage comes from the Western larch. Larch arabinogalactan is not one substance but a mixture of several different arabinogalactans with molecular weights as low as 3,000 daltons and as high as 100,000 daltons.

Arabinogalactans are water-soluble polysaccharides widely found in plants, fungi and bacteria. They are comprised of D-galactose and L-arabinose residues in the form of a beta-D-(1-3)-galactan main chain with side chains made up of galactose and arabinose units of various lengths. Galactan itself is a polymer of galactose.

In plants, arabinogalactans occur as arabinogalactan proteins. These proteins are proteoglycans involved in plant growth and development; they may also be involved in signal transduction in plants.

Dietary intake of arabinogalactans comes from carrots, radishes, tomatoes, pears and wheat, among other plant foods. Gum arabic, a commonly used food additive, is composed of highly branched arabinogalactan. Arabinogalactans are also found in such herbs as *Echinacea* spp. and such edible mushrooms as *Ganoderma lucidum*. Arabinogalactans are thought to contribute to the possible immune-enhancing activities of echinacea and ganoderma.

Larch arabinogalactan is considered a nondigestible soluble dietary fiber. It is also thought to stimulate the colonic growth of such bacteria as bifidobacteria and lactobacilli. These bacteria may confer certain health benefits. Substances that stimulate the growth of bifidobacteria are called bifidogenic factors. Substances that promote the colonic growth of beneficial bacteria are called prebiotics.

ACTIONS AND PHARMACOLOGY**ACTIONS**

Larch arabinogalactan may have immune-enhancing activity.

MECHANISM OF ACTION

Larch arabinogalactan has shown some immune-enhancing activity in the laboratory, particularly with regard to the stimulation of human natural killer cell cytotoxicity.

The mechanism of the possible immune-enhancing activity is not known.

PHARMACOKINETICS

Little is reported on the pharmacokinetics of larch arabinogalactan in humans. It appears that there is little digestion of the polysaccharide in the stomach and small intestine. Like similar substances, it is most likely fermented in the colon to produce the short-chain fatty acids acetate, propionate and butyrate; the gases hydrogen, hydrogen sulfide, carbon dioxide and methane; and lactate, pyruvate and succinate. This requires corroboration by human studies.

INDICATIONS AND USAGE

Larch arabinogalactan exhibits immune-enhancing properties in animal and *in vitro* studies.

RESEARCH SUMMARY

Larch arabinogalactan has enhanced natural killer (NK) cell cytotoxicity and has also enhanced the function of some other immune-system components in experimental studies. It has inhibited the metastasis of tumor cells to the liver in the laboratory. Human trials are needed.

CONTRAINDICATIONS, PRECAUTIONS, ADVERSE REACTIONS**CONTRAINDICATIONS**

Larch arabinogalactan is contraindicated in those hypersensitive to any component of a larch arabinogalactan-containing preparation.

PRECAUTIONS

Since larch arabinogalactan contains galactose and since the pharmacokinetics of the polysaccharide in humans has not been clarified, those who require a low galactose diet should avoid the substance.

Pregnant women and nursing mothers should avoid larch arabinogalactan supplements, pending long-term safety studies.

Those with lactose intolerance should exercise caution in the use of supplemental larch arabinogalactan.

ADVERSE REACTIONS

Doses of up to 10 grams daily appear to be well tolerated. There are no reports of adverse reactions. However, as with similar products, it would be expected that at higher doses (e.g., greater than 30 grams daily) gastrointestinal side

effects, such as flatus, abdominal cramps and diarrhea, would be likely to occur in some.

INTERACTIONS

No known interactions with drugs, nutritional supplements, foods or herbs.

OVERDOSAGE

There are no reports of overdosage.

DOSAGE AND ADMINISTRATION

Larch arabinogalactan is available in capsules, powder and combination products marketed as nutritional supplements. Dosage is variable and ranges from 1 to 3 grams daily and sometimes higher.

LITERATURE

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Lithium

DESCRIPTION

Lithium is the lightest element of the alkali-metal group and the lightest metal. Its atomic number is 3 and its symbol Li. Lithium is a very reactive metal and is found naturally as lithium salts. Lithium is best known for its pharmaceutical use in the treatment of bipolar disorder or manic-depressive illness. Lithium is not currently considered an essential nutrient for humans. However, certain lithium deficiency states have been reported in some animals. Rats fed diets low in lithium were found to have depressed fertility, birth weight, litter size and weaning weight. Goats fed diets deficient in lithium were reported to have depressed fertility, birth weight and life span, as well as altered activity of several liver and blood enzymes. At least for rats and goats, lithium may serve an essential nutrient role.