PRECAUTIONS

Glandulars should be avoided by pregnant women, nursing mothers and children.

Glandulars marketed as nutritional supplements should never be used for estrogen replacement, androgen replacement, thyroid replacement or cortisol replacement.

DOSAGE AND ADMINISTRATION

No recommended doses.

LITERATURE

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Also, see Liver Hydrolysate/Desiccated Liver.

Glucomannan

DESCRIPTION

Glucomannan is a hydrocolloidal polysaccharide comprised of D-glucose and D-mannose residues (hence, the name) bonded together in beta-1,4 linkages. Approximately 60% of the polysaccharide is made up of D-mannose and approximately 40%, of D-glucose. Some of the sugar residues in glucomannan are acetylated. The molecular weight of this slightly branched polysaccharide ranges from 200 kilodaltons to 2,000 kilodaltons.

Glucomannan, which is also classified as a soluble dietary fiber, is derived from konjac flour. Konjac flour itself is derived from the *Amorphophallus* species, plants which are related to the common philodendron house plant and which grow in only certain parts of the world, including some regions in China and Japan. One member of the *Amorphophallus* genus called *Amorphophallus konjac*, is also known as voodoo lilly, devil's tongue and konjac. Konjac flour, however is derived from the tubers of various species of *Amorphophallus*, and the term konjac is used generically for the various species, as well as for the flour from their tubers. In addition to being known as konjac, the plant is called ju ruo (pronounced in Chinese) by the Chinese people, and called konjaku or konnyaku by the Japanese.

Konjac flour has a long history of use in both China and Japan as a food substance and as a folk remedy. Glucomannan products are widely used in Japan and China as general health aids, topically, for skin care and as a thickening agent for foods, among other things. Glucomannan, sometimes called konjac mannan, is marketed in the United States as a dietary supplement. Polysaccharides containing D-mannose and D-glucose in similar proportions to that found in konjac flour are found in other organisms, such as certain yeasts. Yeast glucomannan is not marketed as a dietary supplement.

ACTIONS AND PHARMACOLOGY

ACTIONS

Glucomannan may have laxative activity. It may also have activity in the control of serum glucose and lipid levels. Glucomannan has putative bariatric activity.

MECHANISM OF ACTION

The laxative effect of glucomannan is thought to be due to the swelling of glucomannan with consequent increase in stool bulk.

Some studies indicate that glucomannan may improve glycemic control in Type 2 diabetics. The mechanism of this effect is unclear. Glucomannan may delay the absorption of carbohydrates by increasing gastric-emptying time and/or decreasing small intestinal transit time.

The mechanism of glucomannan's possible hypocholesterolemic activity is likewise, unclear. The polysaccharide may stimulate the conversion of cholesterol to bile acids, as well as the fecal excretion of bile acids. Glucomannan may also decrease the intestinal absorption of cholesterol.

The putative bariatric (weight reduction) effect of glucomannan is not well understood. The swelling of glucomannan that occurs when it absorbs water in the gastrointestinal tract may confer a feeling of satiety in some.

PHARMACOKINETICS

Following ingestion of glucomannan, very little of it is digested in the small intestine. Glucomannan is resistant to hydrolysis by the digestive enzymes. Significant degradation occurs in the large intestine via the action of colonic bacteria. Products of degradation in the large intestine, include formic acid, acetic acid, butyric acid, propionic acid, beta-1,4-D-mannobiose (4-O-beta-D-mannopyranosyl-D-mannopyranose), cellobiose (4-O-beta-D-glucopyranosyl-D-glucopyranose), 4-O-beta-D-glucopyr-anosyl-D-mannopyranose, glucose and mannose. There may be some absorption of these degradation products from the large intestine. Most of them are excreted in the feces, along with unchanged glucomannan. Butyrate is used as a respiratory fuel by the colonocytes.

INDICATIONS

Glucomannan has demonstrated some usefulness in the management of obesity, diabetes and constipation. It has some favorable effects on lipids.

RESEARCH SUMMARY

Some studies have demonstrated that glucomannan has some efficacy in the management of obesity. In an eight-week, double-blind study, 20 obese subjects received 1 gram of glucomannan or placebo daily. Subjects were instructed not to change eating or exercise habits. Glucomannan-supplemented subjects had a significant mean weight loss of 5.5 pounds. Serum cholesterol and LDL cholesterol were significantly reduced, as well, in the treated group.

In a double-blind trial, this one involving 60 children under age 15 with childhood obesity, there was a significant reduction in weight in both treated and placebo groups. Further, there was a concomitant significant reduction in alpha-lipoprotein and an increase in triglycerides in the treated group but not in the placebo group. However, in another controlled study of childhood obesity, excess weight and triglycerides were significantly decreased in treated subjects but not in controls.

In a 3-month study of severely obese patients, a hypocaloric diet therapy by itself was tested against the same hypocaloric diet in combination with 4 grams of glucomannan (in three doses) daily. The combination therapy resulted in more significant weight loss in relation to fatty mass alone, in an overall improvement in lipid status and carbohydrate tolerance and a greater adherence to the diet. The researchers concluded: "Due to the marked ability to satiate patients and the positive metabolic effects, glucomannan diet supplements have been found to be particularly efficacious and well tolerated even in the long-term treatment of severe obesity."

Glucomannan, given in a long-term feeding program to baboons, showed beneficial effects on glucose homeostasis. Subsequently, it was shown that 2.6-grams and 5.2-grams daily doses of glucomannan, added to a carbohydrate rich breakfast in eight patients with previous gastric surgery, improved their reactive hypoglycemia and decreased the postprandial rise in plasma insulin. Benefits were achieved without unpalatability and carbohydrate malabsorption.

In a recent randomized, placebo-controlled metabolic trial, glucomannan was found to improve metabolic control in high-risk Type 2 diabetic patients, as measured by glucose and lipid levels and blood pressure. More research is warranted.

Several studies have demonstrated that glucomannan is an effective treatment for many with chronic constipation. This has been demonstrated in double-blind, placebo-controlled and multicenter studies. One to 4 grams daily, in divided doses, are typically used in these studies of constipation.

CONTRAINDICATIONS, PRECAUTIONS, ADVERSE REACTIONS

CONTRAINDICATIONS

Glucomannan is contraindicated in those hypersensitive to any component of a glucomannan-containing product. It is also contraindicated in those with intestinal obstruction, difficulty in swallowing and esophageal narrowing.

PRECAUTIONS

Pregnant women and nursing mothers should avoid glucomannan supplements.

Glucomannan must be taken with adequate amounts of fluids. Inadequate fluid intake may cause glucomannan to swell and block the throat, esophagus or intestines.

Tablet forms of glucomannan should be avoided.

Glucomannan should not be taken before going to bed.

Type 2 diabetics who use glucomannan, may require adjustment of their antidiabetic medications.

ADVERSE REACTIONS

A few cases of esophageal obstruction have been reported with the use of glucomannan tablets. The most common adverse reactions are flatulence and abdominal distension. Diarrhea is occasionally reported.

INTERACTIONS

NUTRITIONAL SUPPLEMENTS

Fat-soluble vitamins (A, D, E, K): Concomitant intake of fat soluble vitamins and glucomannan may decrease the absorption of the fat-soluble vitamins.

FOODS

Glucomannan may decrease the absorption of fat-soluble vitamins found in foods.

OVERDOSAGE

Glucomannan overdosage has not been reported.

DOSAGE AND ADMINISTRATION

Glucomannan supplements are mainly available in capsules. Glucomannan powder is also available and there are glucomannan combination products.

Doses used range from one to four grams daily, taken in divided doses and with plenty of liquids.

LITERATURE

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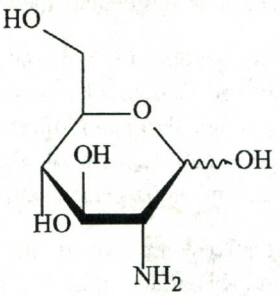
Glucosamine

DESCRIPTION

Glucosamine is an amino monosaccharide found in chitin, glycoproteins and glycosaminoglycans (formerly known as mucopolysaccharides) such as hyaluronic acid and heparan sulfate. Glucosamine is also known as 2-amino-2-deoxyglucose, 2-amino-2-deoxy-beta-D-glucopyranose and chitosamine. Glucosamine has the following chemical structure:



Glucosamine

Glucosamine is available commercially as a nutritional supplement in three forms: glucosamine hydrochloride or glucosamine HCl, glucosamine sulfate and N-acetyl-glucosamine.

At neutral as well as physiologic pH, the amino group in glucosamine is protonated, resulting in its having a positive charge. Salt forms of glucosamine contain negative anions to neutralize the charge. In the case of glucosamine hydrochloride, the anion is chloride, and in glucosamine sulfate the anion is sulfate. N-acetylglucosamine is a delivery form of glucosamine in which the amino group is acetylated, thus neutralizing its charge. To date, most of the clinical studies examining the effect of glucosamine on osteoarthritis have been performed with either the sulfate or the chloride salts of glucosamine. All three forms are water soluble.

The glucosamine used in supplements is typically derived from marine exoskeletons. Synthetic glucosamine is also available.

ACTIONS AND PHARMACOLOGY

ACTIONS

The actions of supplemental glucosamine have yet to be clarified. It may play a role in the promotion and maintenance of the structure and function of cartilage in the joints of the body. Glucosamine may also have anti-inflammatory properties.