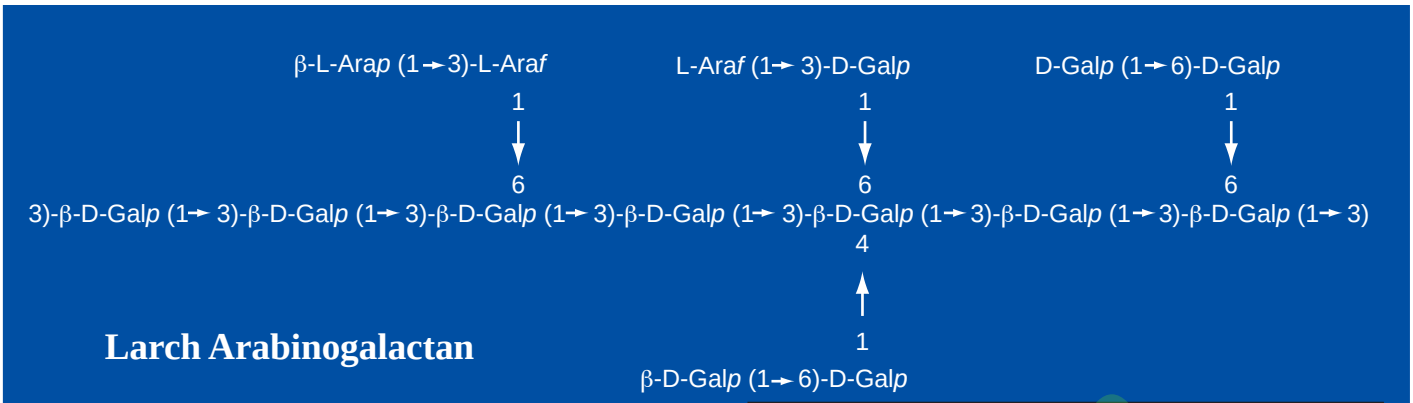

Monograph

Larch Arabinogalactan

Introduction

Larch arabinogalactan is a polysaccharide powder derived from the wood of the larch tree (Larix species) and comprised of approximately 98 percent arabinogalactan. Arabinogalactans are found in a variety of plants but are more abundant in the Larix genus, primarily *Larix occidentalis* (Western Larch). The Western Larch is unique among pines in that it loses its needles in the fall. Western Larch is also known as Mountain Larch or Western Tamarack and is native to the Pacific and Inland Northwest United States as well as parts of British Columbia, Canada.[1] Larch arabinogalactan is approved by the U.S. Food and Drug Administration (FDA) as a source of dietary fiber, but also has potential therapeutic benefits as an immune stimulating agent and cancer protocol adjunct.

Description and Biochemistry

Pharmaceutical-grade larch arabinogalactan is a fine, dry, off-white powder with a slightly sweet taste and mild pine-like odor. It dissolves completely in water or juice, is low in viscosity and therefore easy to administer, even to children. It is composed of galactose and arabinose molecules in a 6:1 ratio, with a small amount of glucuronic acid. Arabinogalactans are long, densely branched polysaccharides of varying molecular weights (10,000-120,000). Lower molecular weight polysaccharides typically exhibit an anti-inflammatory, anti-complement, antiallergy effect, while those of higher weights stimulate natural killer (NK) cell cytotoxicity and reticuloendothelial cells. In the case of larch arabinogalactan, molecular weights of the two major fractions are 16,000 and 100,000, perhaps accounting for its wide range of therapeutic properties.[2]

Pharmacokinetics

Human studies on the pharmacokinetics of larch arabinogalactan are few and the amount absorbed following an oral dose remains unclear. Animal studies indicate that intravenous injection of purified larch arabinogalactan results in 52.5 percent of the dose being present in the liver and 30 percent in the urine 90 minutes after dosing. Hepatic clearance occurred with a half-life of 3.42 days.[3] Non-absorbed larch arabinogalactan is actively fermented by intestinal microflora and is particularly effective at increasing beneficial anaerobes such as Bifidobacteria and Lactobacillus.[4]

Clinical Indications

Dietary Fiber

Larch arabinogalactan is an excellent source of dietary fiber that is able to increase short-chain fatty acid production (primarily butyrate) via its vigorous fermentation by intestinal microflora.[2] It is well documented that butyrate is essential for proper colon health as it is the preferred substrate for energy generation by colonic epithelial cells.[5] Butyrate also acts as a protectant for the intestinal mucosa against disease and cancer-promoting agents.[6] Arabinogalactan added to human fecal homogenates has also been shown to decrease ammonia generation, and therefore may be of clinical value in the treatment of portal-systemic encephalopathy, a disease characterized by ammonia build-up in the liver.[4] Larch arabinogalactan given to human subjects increased levels of beneficial intestinal anaerobes, particularly *Bifidobacterium longum*, via their fermentation specificity for arabinogalactan compared to other complex carbohydrates.[7,8]

Cancer Protocols

Larch arabinogalactan may be an effective adjunct to cancer therapies due to its ability to stimulate NK cell cytotoxicity, stimulate the immune system, and block metastasis of tumor cells to the liver.[2] Tumor metastasis to the liver is more common than to other organ sites, probably due to tumor cell specificity for lectin-like receptor sites found in liver parenchyma. Animal studies have demonstrated arabinogalactan's ability to inhibit or block lectin receptor sites, thereby reducing tumor cell colonization of the liver and also increasing survival time of the subjects.[9-11] Pretreatment with larch arabinogalactan was found to stimulate NK cell cytotoxicity via potentiation of the cytokine network, primarily via an increase in the release of gamma interferon.[12]

Pediatric Otitis Media

Recurrent otitis media is common in pediatric populations and it appears that improving immune system function might lead to a decrease in both frequency and severity of this condition. Research has demonstrated larch and other arabinogalactans to be capable of enhancing the immune response to bacterial infection via stimulation of phagocytosis, competitive binding of bacterial fimbriae, or bacterial opsonization. This was found to be particularly true for infection by gram negative organisms such as *Escherichia coli* and Klebsiella species.[2,13] In addition, D'Adamo reports a decrease in occurrence and severity of otitis media in pediatric patients supplemented prophylactically with larch arabinogalactan.[2] Larch arabinogalactan's mild taste and excellent solubility in water and juice make it a relatively easy therapeutic tool to employ in pediatric populations.

Chronic Disease

A number of chronic diseases are characterized by decreased NK cell activity, including chronic fatigue syndrome,[14] viral hepatitis,[15,16] HIV/AIDS,[2] and autoimmune diseases such as multiple sclerosis.[17] Stimulation of NK cell activity by larch arabinogalactan has been associated with recovery in certain cases of chronic fatigue syndrome.[18] Viral hepatitis (hepatitis B and C) is also characterized by a decrease in NK cell cytotoxicity[15,16] and therefore these patients may benefit from its stimulation by larch arabinogalactan. In the case of multiple sclerosis, a small 2-year study of patients with the relapsing/remitting type concluded that disease severity was correlated with NK cell functional activity, supporting the hypothesis that NK cells play a role in the immunopathogenesis of this disease.[17] Consequently, stimulation of NK cell cytotoxicity might be of clinical benefit to these patients. Patients with HIV/AIDS develop low CD4 cell counts and often are plagued by opportunistic infections. By virtue of

its immune-stimulating properties, larch arabinogalactan has been shown to effect a slight increase in CD4 cell counts, in addition to decreasing susceptibility to opportunistic pathogens.[2]

Hepatic Drug Delivery

Hepatic uptake of an injected dose of larch arabinogalactan resulted in 52.5 percent of the dose arriving in the liver. Due to its high hepatic concentration and its ability to increase vascular permeability,[19] larch arabinogalactan has been suggested as a vehicle for administering diagnostic or therapeutic agents to the liver.[3]

Platelet Washing Medium

Larch arabinogalactan solution has been studied as a medium for use in platelet washing; a technique employed to separate platelets from platelet-rich plasma. The washed platelets can then be used in transfusions, bioassays, and research. Platelets washed with larch arabinogalactan solution were free of plasma proteins and retained both normal morphology and function.[20]

Side-Effects and Toxicity

Larch arabinogalactan is a safe and effective immune-stimulating phytochemical. It is FDA-approved for use as a dietary fiber and in food applications. Both acute and long-term toxicity studies in rats and mice reveal no evidence of toxicity.[21] Human consumption is usually without side-effects; however, a small percentage of people (<3%) experienced bloating and flatulence, possibly due to the vigorous fermentation of the arabinogalactan by intestinal microflora.[2] Because of its excellent safety profile and solubility in water and juice, larch arabinogalactan is considered a safe, effective immune-stimulating agent for pediatric use.

Dosage

Larch arabinogalactan in powder form is typically dosed in teaspoons or tablespoons at a concentration of approximately 4-5 grams per tablespoon. The typical adult dosage is one to three tablespoons per day in divided doses; the pediatric dose is one to three teaspoons per day. The powder is usually mixed with water or juice but can be added to food if desired.

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