

Arabinogalactan Research

Gastrointestinal and Heart Health in Adults

University of Minnesota researchers reported at the Society of Experimental Biology Conference and International Food Technology Symposium their results regarding the potential health benefits derived from the consumption of larch arabinogalactan. Their abstract summary, below, reviews gastrointestinal and serum lipid (cholesterol) benefits in normal and hyperlipidemic subjects:

Arabinogalactan: Unique physiological benefits

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Arabinogalactan (AG) is a dietary fiber composed of beta-linked galactose and arabinose units in a 6:1 ratio. It is found in a variety of foods and herbs, such as Echinacea, and is isolated from the Western Larch and Tamarack trees for commercial use.

Unlike many soluble fibers, AG is not viscous, is easily incorporated into foods and beverages, and is well accepted by consumers.

We have conducted 2 clinical studies of AG (Larex, St. Paul , MN) in healthy human subjects.

In AG1, subjects consumed 15 and 30 grams of AG in a randomized feeding study. AG, consumed as non-caloric drink, increased total fecal anaerobes and decreased fecal ammonia. Both doses of AG increased monocytes.

Our second study (AG2) was a parallel design where subjects consumed lower amounts of AG, 1.4, 4.4 or 8.4 g/day for 6 months. Again, AG was well tolerated and accepted by the subjects. AG at 8.4 g/day decreased serum lipids in hyperlipidemic individuals and appeared to modulate serum glucose. Additionally, AG consumption increased fecal levels of bifidobacteria and lactobacillus. Thus, AG shows promise as a novel fiber because it is a soluble dietary fiber that is easily incorporated into foods, is fermented in the gut with health-promoting physiological properties, and may have a role in immunological function.

Immune System Enhancement

In recent scientific research, investigators at universities and clinics have concluded that immune status and gastrointestinal microflora were beneficially impacted through supplementation of diets with Larch Arabinogalactan. Research results have been published in full or part and abstracts have been reprinted herein:

Oral Administration of Arabinogalactan Affects Immune Status and Fecal Microbial Populations in Dogs

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ABSTRACT: Seven ileally cannulated dogs were randomly assigned to a control or Arabinogalactan (AG) treatments in a 7 x 7 Latin square design to evaluate effects of oral AG administration on nutritional and immunological characteristics. Arabinogalactan treatments included a high (1.65 g/d) and low (0.55 g/d) dose of AG100, AG1000 or AG3000 provided via gelatin capsules. Arabinogalactan forms differed in purification procedures. Each period consisted of a 6-d adaptation followed by a 4-d collection. Blood and fresh fecal samples were collected on d 10 of each period. Fecal score increased ($P < 0.02$) in dogs supplemented with the low dose of AG1000. Ileal and total tract dry matter (DM) and organic matter (OM) digestibilities were not affected by treatment. Dogs supplemented with the high dose of AG1000 tended ($P = 0.15$) to have a higher concentration of total aerobic fecal bacteria than control dogs. Dogs supplemented with the low dose of AG1000 and the high dose of AG3000 had higher concentrations of fecal *Lactobacilli* ($P = 0.04$) and tended to have higher concentrations of fecal bifidobacteria ($P \leq 0.16$) compared with control dogs. Dogs fed the low dose of AG3000 tended ($P = 0.10$) to have a lower concentration of fecal *Clostridium perfringens* compared with control dogs. Arabinogalactan treatments did not affect ($P > 0.05$) serum immunoglobulin G, M or A concentrations. Specific forms and doses of AG increased white blood cell, neutrophil and eosinophil concentrations. Arabinogalactan is a unique dietary fiber that affects the digestive physiology and immunological characteristics of dogs. J. Nutr. 132: 478-482, 2002.

Evaluation of Arabinogalactan's Effect on Human Immunity

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INTRODUCTION

Arabinogalactans are a class of densely branched long chain polysaccharides composed of galactose and arabinose in a 6:1 ratio. The mechanism by which they modulate immunity is not known although several in vitro and in vivo studies have shown a modulation of natural killer cells, monocytes, and acute phase reactants. The purpose of this study was to examine several immune parameters in humans consuming 4 grams of Arabinogalactan per day for 6 weeks.

ABSTRACT

Purpose of Study: The purpose of this University of Florida study was to determine the impact of orange juice (positive control) and fortified orange juice on a number of aspects of the human immune system and its functioning. Healthy adult humans participated in this six-week, double blind, randomized trial by consuming either one, eight-ounce serving of orange juice per day or the same amount of orange juice fortified with five grams of AG. Fasting blood samples were taken at baseline, three and six weeks. Complete blood counts, CBC with differential/platelets and blood samples for functional immune assays were collected and measured. Immune markers measured from peripheral blood included respiratory burst activity, lymphocyte proliferation, IgG, NK cell activity and flow cytometry analysis.

Findings: CBC results indicated a trend towards increased white blood cells and oxidative burst activity with fortification; monocytes and NK cell activity trended higher in both groups. The author concluded that further research was necessary to determine the beneficial impact of orange juice and fortification with AG on human immune system functioning.

Immunity in Children

September 13, 2001 –White Bear Lake, MN Larex, Inc., partnered with a major food manufacturer to conduct a clinical study to determine the potential stimulatory effect of Larch Arabinogalactan on the pediatric immune system. Larch Arabinogalactan, a natural compound found in the Larix genus of trees, has been shown to stimulate the human immune response in adults. A number of immune system boosters have entered the market in recent years, however, most of these products have not been evaluated in clinical trials with pediatric populations.

The 12-week clinical study was conducted at Health East Care System and included a total of 507 children, ages 3 to 12 years. Of the 507 children participating, a total of 337 children consumed three grams of larch Arabinogalactan in a juice drink daily. One hundred sixty-eight of these children also consumed vitamins with Arabinogalactan in their juice drink. Over 90% of children completed the study indicating that larch Arabinogalactan is well tolerated by this sensitive age group.

Children, ages 7 to 9 years, who consumed Larch Arabinogalactan exhibited lower duration and number of illness episodes compared to the other treatment groups. No other significant treatment-related effects were observed among the other endpoints or treatment groups evaluated.

Based on these results and of other studies, Larex plans to conduct additional studies to determine the effect that Larch Arabinogalactan has on the pediatric immune system.

Larex, Inc. (www.larex.com) is the exclusive manufacturer of Arabinogalactan, an FDA approved ingredient used in the food and beverage, health supplement, personal care, and animal care industries. This is the first clinical study conducted by the HealthEast Care System, a network of integrated care services that serve the Twin Cities' East Metro and surrounding communities.

Animal Health & Performance

Equine: Mares & foals (Mares and neonatal foal health)

A paired mare and foal study conducted at the University of Kentucky and published in the Equine Nutrition and Physiology Society (ENPS) Symposium Proceedings concluded that "the use of Larch Arabinogalactan (LaraFeed® AC9) as a supplement for neonatal foals appears to be an effective way to prevent commonly occurring cases of diarrhea and associated medical expenses." A summary of the study follows:

Effects of administration of an oral arabinogalactan supplement on mares and foals.

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Foal heat scours and diarrhea are common problems on horse farms. Severe cases must receive veterinary care and can be costly. Research in other species has suggested that certain types of dietary fibers may promote gut health. This experiment was done to determine whether feeding a soluble Arabinogalactan (AG) fiber to neonatal foals would improve their gastrointestinal (GI) and systemic health. Variables studied included fecal consistency and amount of medication required by foals during the first 30 days, serum immunoglobulin concentration (IgA and IgG), and complete blood cell counts (hemoglobin, hematocrit, red blood cells, white blood cells, % neutrophils, % lymphocytes and plasma total protein).

Mares treated with AG (n=7) were given 75 g/d as a top dressing on their concentrate from approximately 2 wk pre-foaling until 14 d post-foaling. Their foals received 10 g of Arabinogalactan mixed with water in an oral syringe from 1 to 14 d of age. Control mares (n=5) were not given AG, and their foals received an equal volume of water via oral syringe to control for the stress of dosing. Blood samples were taken from mares approximately 2 wk pre-foaling, at foaling, and 2 wk post-foaling and in foals at 12 h, 7 d and 14 d of age. Subjective scores of foal fecal consistency were recorded daily for the first 30 d of life on a scale of 1 to 5 (1 = normal feces and 5 = extremely watery).

Foals treated with AG had fewer subjective fecal scores above 1 (P <

0.01) than control foals; i.e. these foals had less incidence of subjective scores 1 during the first 30 d of life than foals not treated with AG. In addition, foals receiving this supplement had lower incidence of veterinary and/or management treatment for diarrhea ($P < 0.01$) during their first 30 days. There was no significant treatment effect on foal weight, placental weight, incidence of positive foal fecal Salmonella cultures and rotavirus tests, complete blood cell counts, IgA or IgG concentrations in mares or foals.

Livestock

Swine & Early Piglet Weaning:

In a collaborative study, researchers in Finland have determined that Larch Arabinogalactan effectively inhibits the attachment of pathogenic E.coli into piglet intestinal epithelium and intestinal mucus. Further, the studies found that Escherichia coli with K88 fimbriae, a major causative agent of piglet diarrhea that can lead to dehydration and death, are inhibited ten times more effectively from attachment by LaraFeed, the animal feed grade form of Larch Arabinogalactan. That form contains natural flavonoids, also known as polyphenols or antioxidants, that have also demonstrated utility at slowing the growth rate of gastrointestinal pathogens. Pathogens that fail to attach to the piglet gut wall generally pass through the animal without causing illness or symptoms.

The Finish researchers concluded that feed grade Larch Arabinogalactan was a possible natural feed ingredient replacement for routine sub-therapeutic antibiotics in swine feeds.

Feed Efficiency & Weight Gain in Broiler Chickens

In sponsored research at Purdue University , chicks from hatching to market age were fed LaraFeed as a finished feed ingredient and followed for changes in gut microflora, feed efficiency and weight gain. The findings suggest that LaraFeed can be used in an antibiotic-free environment with benefits to gut microflora population and feed efficiency. A study summary follows:

Influence of Arabinogalactan on Intestinal Microbial Populations and Performance of Broilers.

Patterson, J., unpublished research

Purpose of Study: The purpose of this Purdue University study in broiler chickens was to determine the impact that Larch AG and its natural polyphenolics had on the relative gastrointestinal populations of beneficial and pathogenic microflora in both antibiotic and antibiotic-free environments. Beneficial microflora, the lactic acid producers, *Lactobacilli* and bifidobacteria, are believed to have a positive impact on animal health and performance, reduce the need for antibiotics, decrease detrimental bacteria and putrefactive compounds, improve human food safety and reduce environmental impact.

Findings: In a trial of 360 chicks to age six weeks, gut microflora Clostridia-to- *Lactobacilli* bacteria ratio (harmful-to-beneficial as % of total anaerobes) decreased significantly in Monensin-free treatment groups while feed efficiency conversions improved. Inclusion of Larch AG in an antibiotic-free environment can preferentially improve gastrointestinal microflora and improve feed efficiency.

Personal Care

LaraCare, a multi-functional personal care raw material Beautification: Reduction of fine lines and wrinkles

Previous studies have demonstrated that Larch Arabinogalactan (INCI: Galactoarabinan) in personal care formulations enhances emulsion stability, particle dispersion, moisture control and cell exfoliation. Independent research funded by Larex has now shown the anti-aging benefits of LaraCare, with subjects revealing reduction of fine lines and wrinkles and displaying improved measures across a number of healthy skin parameters.

Evaluation of skin treatment product including Galactoarabinan.

Boisits, E., Fong, M., Murray, R., Schwartz, S., International Research Services, Inc., Rockland, Maine, USA report to Larex, Inc., October 2000

Purpose of Study: The objective of this investigation was to evaluate the efficacy of a test product containing Larch AG (INCI Galactoarabinan) in treating the signs of skin aging/photo-aging, with specific attention to the following parameters; fine lines and wrinkles, firmness and elasticity, texture, dryness, skin clarity and uniformity of pigmentation. This clinical was an eight-week, full-face, randomized, double blind, positive control use study with twenty five subjects on test and twenty five subjects on positive control. An oil-in-water emulsion with 5% AG was the test material and an oil-in-water emulsion (same base) containing 8% lactic acid was the positive control. Product performance was assessed visually using trained evaluators and instrumentally using silicon replicas with subsequent image enhancement.

Findings : At the end of eight weeks, the test group had a 19% reduction in fine lines and wrinkles. There was a concomitant improvement in test subject skin erythema compared to the positive control, with all other skin quality parameters improved and essentially equivalent for test and positive control. In conclusion, this study demonstrated an improvement in fine lines and wrinkles for the formulation including **AG** and equivalent or better performance for this formula compared to an 8% AHA formula.