

Dietary Soluble Fiber

By Marie Spano, M.S., R.D., Contributing Editor

The most famous soluble fiber is the beta-glucan in oatmeal, but other soluble fibers offer health benefits, as well. Research shows soluble fiber aids digestion, increases satiety, helps control blood sugar and benefits cholesterol.

Technically speaking, "dietary fiber is the edible parts of plants or analogous carbohydrates that are resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the large intestine" (AACC Report of the Dietary Fiber Definition Committee, 2001). Though there are important nutritional differences between soluble and insoluble fiber, the difference between the two fractions is somewhat arbitrary and based on the solubility of the soluble-fiber fraction in a pH-controlled enzyme solution (*Cereal Foods World*, 1999; 44:367-369).

Several sources of soluble fiber are used for food and beverage formulation, including oat and barley beta-glucan, konjac plant glucomannan, larch arabinogalactan, soluble corn fiber, inulin and oligosaccharides. And, all come with an array of health benefits. "Soluble dietary fibers have two basic types, high viscosity and low viscosity that provide little 'bulk' per se, but do positively affect intestinal health and provide a colonic environment compatible with the growth of beneficial bacteria," notes Kati Ledbetter, product development scientist, ADM, Decatur, IL. "This may include possibly influencing the absorption of other nutrients that are not absorbed in the small intestine. Secondary influences on blood sugar, insulin, fat deposition and blood lipids (triglyceride and cholesterol) are well documented, but not universal for every fiber."

Digestive health

Each type of soluble fiber plays an important role in digestive health. For instance, "inulin and oligofructose belong to a select group of dietary fibers known for their selective stimulation of the beneficial microflora, which promote good digestive balance," says Joseph O'Neill, executive vice president of sales and marketing, BENEIO, Inc., Morris Plains, NJ. "The prebiotic fibers are fermented in the digestive process and result in the production of a range of short-chain fatty acids known to promote health and well-being."

In addition, "chicory inulin and oligofructose increase stool frequency and have a fecal bulking effect, and may help maintain regularity," says Deborah Schulz, inulin product manager, Cargill Health & Nutrition, Minneapolis.

And, inulin and oligofructose aren't the only ones that have a positive effect on gut flora. One study found that 15 to 30 grams of larch arabinogalactan per day for a three-week period led to a significant increase in beneficial gut microflora, particularly *Bifidobacteria* and *Lactobacillus* (*Alternative Medicine Reviews*, 1999;4:96-103; *Alternative Medicine Reviews*, 2002; 7:138-149; *Journal of the American College of Nutrition*, 2001; 20(4):279-285).

Soluble fibers can also impact bowel functioning. "Resistant maltodextrin is a low-viscosity soluble dietary fiber that helps support or maintain intestinal regularity. Clinical studies show that resistant maltodextrin helps relieve occasional constipation, and select studies show that it improves stool consistency," according to Ledbetter.

Calorie control

Soluble fiber may help people control caloric intake by increasing the release of satiety hormones and slowing digestion. For instance, greater than or equal to 5 grams of beta-glucan decreased subsequent meal intake by more than 95 calories in overweight adults (*Molecular Nutrition and Food Research*, 2009; 53:1343-1351) and beverages containing 2.5 to 5 grams of oat beta-glucan increased perceptions of satiety in healthy adults compared to beverages without fiber (*Food and Nutrition Research*, 2010; 54). Likewise, 2 to 4 grams per day of glucomannan led to significant weight loss in obese and overweight adults (*Alternative Therapies in Health and Medicine*, 2005; 11:30-34). And finally, a meta analysis found a statistically significant but small reduction in weight of 0.79 kg with daily glucomannan consumption in studies lasting an average of 5.2 weeks (*American Journal of Clinical Nutrition*, 2008; 88:1,167-1,175).

In addition to the satiety effects of soluble fibers, resistant maltodextrin, inulin and oligofructose can help reduce the overall caloric content of a food without adversely affecting taste and texture. Plus, all are excellent options for no-sugar-added and sugar-free products, while adding the benefit of soluble dietary fiber.

Controlling blood sugar

The viscous and gel-forming properties of soluble fiber slow gastric emptying and macronutrient absorption from the gut, leading to a reduction in postprandial blood glucose response (*Journal of Nutrition*, 2008; 138:439-442). In fact, studies show that patients with type 2 diabetes who consume foods naturally high in fiber (50 grams per day; 50% soluble fiber) for a 6-week period significantly improved glycemic control compared to patients who consumed moderate amounts of fiber (25 grams per day, 50% soluble) (*Nutrition Reviews*, 2001; 59:52-55). Plus, a meta-analysis of 37 trials found 6 grams of resistant maltodextrin in drinks or foods significantly attenuated the glycemic response of carbohydrate-rich meals by 20% and 10%, respectively (*American Journal of Clinical Nutrition*, 2009; 89:114-125).

Cardiovascular benefits

Several studies show a positive relationship between diets rich in soluble fibers, such as beta-glucan, pectin, guar gum and psyllium, and reduced blood cholesterol (*Food & Function*, 2010; 1:149-155).

In adults with normal or high cholesterol, consumption of at least 3 grams per day of oat or barley beta-glucan can significantly reduce total and LDL cholesterol by 5% to 10% (*Nutrition Reviews*, 2011; 69:299-309; *Nutrition*, 2011;27:1,008-1,016). However, fiber viscosity might matter and higher molecular weight beta-glucan may be more effective than lower weight beta glucan (*Journal of Clinical Nutrition*, 1995; 62:1,245-1,251).

While 3 grams or more seems to be the perfect dose for beta-glucan, glucomannan is effective at 1.2 grams or more per serving. A meta-analysis of 14 randomized controlled trials found doses ranging from 1.2 to 15.1 grams of glucomannan per day administered in various forms led to statistically significant decreases in total cholesterol, LDL cholesterol, triglycerides, body weight, and fasting blood glucose compared to placebo, including potentially clinically significant reductions in LDL (*American Journal of Clinical Nutrition*, 2008; 88:1,167-1,175).

The Daily Reference Value (DRV) for fiber is 25 grams per day for a 2,000-calorie diet, and the Dietary Reference Intake (RDI) is 21 to 38 grams per day for adults, depending on age, life stage and sex. However, many Americans are falling short on their fiber intake (*Advance Data*, 1994; 258:1-28). Because dietary fiber has a positive effect on many aspects of health promotion and disease prevention, functional foods and

beverages fortified with fiber are a viable option for helping people meet their daily fiber needs. The minimum dose necessary for health benefits varies among the different fiber types, though all doses used in the aforementioned studies were well tolerated.

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