

Resistant Maltodextrin (such as Soluble Corn Fiber)

Fiber Name

- Resistant Maltodextrin (such as Soluble Corn Fiber)

Source

Produced from food starch. Food starch is exposed to a combination of heat, acid and enzymes before purification.

Background

Soluble Corn Fiber has been available on the US market since 2007 and it is used in foods and beverages across the Americas, Europe and Southeast Asia. Soluble Corn Fiber is produced from corn starch through enzymatic hydrolysis. It has a low viscosity, is water soluble and very stable to heat, pH, and processing stresses. Soluble Corn Fiber helps to meet demand for a lower sugar, higher fiber ingredient that can be used to create consumer packaged food products that have lower sugar content while providing a good source of dietary fiber.

Nutritional Properties

Animal, *in vitro* and human studies have shown that Soluble Corn Fiber resists digestion in the small intestine and passes into the large intestine where it is fermented. Soluble Corn Fiber contains a mixture of α 1-6, α 1-4, α 1-2, and α 1-3 glucosidic linkages that contribute to its low digestibility. Changes in fecal short chain fatty acids (SCFA), decreased gut pH, and increased breath hydrogen indicate that it is fermented in the gut.

It is well known that a sudden increase in dietary fiber may cause mild gastrointestinal disturbances, but these are generally transient and improve with adaptation to the dietary fiber source. Soluble Corn Fiber is well tolerated at various doses. Clinical trials assessing the gastrointestinal tolerance of Soluble Corn Fiber at doses of 12-27g/day found it to be well tolerated over a period of 10 days to 3 weeks^{1 2 3 4}. In a trial of 20 healthy volunteers, Soluble Corn Fiber was well tolerated at both a single dose of 40g and multiple doses totaling 65g over the day⁵.

Physiological Benefit

1. **Increases calcium absorption** and may support bone mineralization
2. **Promotes digestive health** through its effect on laxation
3. Additional physiological effects that have been demonstrated by animal, *in vitro* and/or clinical studies, include:

- Promotes the growth of various bacteria while limiting the growth of less desirable bacteria.
- Elicits a low glycemic response and supports a postprandial blood glucose and insulin lowering effect when used to replace sugars.
- Long term weight management: By replacing higher calorie ingredients, soluble corn fiber may help reduce calorie intake.

Scientific substantiation of benefits

- **Increased calcium absorption:** In a three week, randomized, double-blind, placebo-controlled crossover study of 24 adolescents, calcium absorption was increased by 12% when 12g/day of Soluble Corn Fiber was consumed, compared to a control, in conjunction with a background diet that contained 600 mg/d of calcium⁶. In addition, researchers found that the change in calcium absorption was positively correlated with significant increases in gut bacteria, namely the phylum *Bacteroides*⁶. If the adolescents in this study had continued to consume Soluble Corn Fiber, allowing for increased calcium absorption, the researchers estimated that this would lead to additional 41 mg/day retained calcium and if persistent over a year would account for an additional 15 g of calcium, or about 1.8% of total body calcium. Similar increases in calcium absorption were reported in a four-week, randomized, double-blind, placebo-controlled, crossover study in 26 free-living adolescent females who consumed 10 and 20 g/day of fiber from Soluble Corn Fiber with their habitual diet containing ≤ 800 mg/day of calcium⁶. While the results of this human study only assessed calcium metabolism, a 12-week study conducted in rats investigated the impact of Soluble Corn Fiber on bone indices as well as calcium metabolism⁷. Compared to a cellulose control, Soluble Corn Fiber improved total bone mineral content (BMC), total bone mineral density (BMD), trabecular BMC and BMD, cortical BMC, and cortical area and thickness in the distal femur. Bone strength of the distal femur was also significantly improved by the ingestion of Soluble Corn Fiber¹³. In addition, a recent study by Jakeman et al. measured the dose-response of chronic soluble corn fiber intake over a 50-day period on bone turnover in healthy post-menopausal women using ⁴¹Ca methodology. Results indicated significant increases in bone calcium retention in relation to soluble corn fiber consumption in a dose-dependent manner. Serum bone-specific alkaline phosphatase concentrations were significantly increased at the 20 g dose versus the control (p=0.03). (Jakeman et al, unpublished)
- **Laxation:** Thirty-six healthy adults who consumed 20g/day of Soluble Corn Fiber in breakfast cereal and muffins for 10 days in a randomized placebo controlled, double-blind crossover study experienced an increase in fecal weight³. Increased fecal weight was also observed in another randomized, placebo controlled, double-blind crossover study of 21 healthy overweight men who ingested 21g/day of Soluble Corn Fiber for 21 days⁴.

- **Effect on gut microbiota:** In one out of 9 published studies, there was after the consumption of 21g/day of Soluble Corn Fiber for 21 days a 1 log increase in *Bifidobacterium* in 21 healthy men compared to a no fiber control⁴. Another study in 24 adolescents noted an increase in gut bacteria – *Bacteroides*, *Butyricoccus*, *Oscillibacter* and *Dialister* – which was correlated with an increase in calcium absorption when 12g/day of Soluble Corn Fiber was consumed for three weeks⁸. The significant increase in gut bacteria observed in human studies has been supported by *in vitro* studies that have used human fecal inoculum under conditions that simulate the human gastrointestinal tract^{9 10}.
- **Favorable blood glucose and insulin response:** The postprandial glycemic response to Soluble Corn Fiber was compared to the glycemic response to glucose in 12 healthy adults in a randomized controlled crossover study⁹. Soluble Corn Fiber had a significantly lower incremental glucose and insulin response than the glucose control. Another acute study¹⁰ observed a significant lowering effect on postprandial blood glucose and insulin at a dose of 55g of Soluble Corn Fiber in randomized, single-blind, crossover study in 18 overweight adults compared to a full calorie control. Finally, a series of Soluble Corn Fiber formulations investigated in an animal study were found to yield significantly lower postprandial blood glucose and insulin responses than a maltodextrin control¹¹.

What types of food is this fiber typically found in?

Soluble Corn Fiber is used in a wide variety of prepared foods, beverages, and condiments, including cereals, baked goods, candy, dairy products, frozen foods, soups, salad dressings, fruit drinks, carbonated beverages, meal replacement drinks, and flavored water.

Recommended Daily Intake

*Of the under-consumed nutrients, calcium, potassium, **dietary fiber**, and vitamin D are considered nutrients of public health concern because low intakes are associated with health concerns.” – Dietary Guidelines for American 2025-2030 (10th edition).*

In the United States, the recommended dietary fiber intake is 14g/1,000kcal. For an average adult, this means a daily intake of 25g (female) or 38g (male). Most Americans only consume about half of the recommended intake (13.5 and 18g, respectively). This shortage in our diet is called the fiber gap.

Given Americans' current eating habits, closing the fiber gap without consuming fiber-enriched foods would also mean significantly increasing calorie intake. To reach the recommended fiber intake without fiber-enriched foods, most Americans would need to increase their calorie intake by more than 500 calories per day. But meeting fiber requirements doesn't have to mean adding calories if fiber enriched foods are consumed. Studies have shown, for example, that enriching grain foods with fiber (2.5g–5g) resulted in a fiber intake of 24.7g–39.1g/day with no caloric increase. (Nicklas et al, 2011; Jones, 2014)

Fiber-enriched foods help bridge the fiber gap while delivering excellent taste and additional metabolic benefits. The overall diet should have a mix of various fiber types.

Consuming a Variety of Fibers

Although most fibers will have more than one health-related effect, no one fiber can produce every potential health benefit. Some effects are well recognized for a large number of different fiber types, while others can be very fiber specific. To maximize the health benefits of fiber, it is important to consume a variety of fibers.

Fibers can be found in many different foods. The amount of fiber per serving can easily be found by looking at the Nutrition Facts Panel for the Dietary Fiber line.

Additionally, the fiber content in foods like raw fruits and vegetables that do not have a nutrition label can be found [here](#).

Gastrointestinal Tolerance

Increasing fiber intake suddenly, particularly in individuals consuming a low fiber diet, may result in gastrointestinal effects, such as an increased number of stools per week, having softer stools (but not diarrhea) or having increased flatulence. These effects are due to either bulking effects or due to the fermentation of fiber in the gastrointestinal tract. These potential effects can be minimized by increasing fiber intake more gradually to allow the gastrointestinal tract to adapt. Thus, it may be helpful to decrease fiber intake until these feelings subside and then gradually increase fiber intake until the recommended intake of 14g/1,000kcal is achieved.

Nutrition Facts			
Serving Size (100g)			
Amount Per Serving			
Calories 160			
		% Daily Values*	
Total Fat	14.66g		23%
Saturated Fat	2.13g		11%
Trans Fat	0g		
Polyunsaturated Fat	1.82g		
Monounsaturated Fat	9.8g		
Cholesterol	0mg		0%
Potassium	485mg		14%
Sodium	7mg		0%
Total Carbohydrate	8.53g		3%
Dietary Fiber	6.7g		27%
Sugars	0.66g		
Protein	2g		4%
Vitamin A 0.1%	●	Vitamin C 16.7%	
Calcium 1.2%	●	Iron 3.1%	
Vitamin E 6.9%	●	Vitamin K 26.3%	
Thiamin 4.5%	●	Riboflavin 7.6%	
Niacin 8.7%	●	Vitamin B6 12.9%	
Folate 20.3%	●	Pantothenic Acid 13.9%	
Phosphorus 5.2%	●	Magnesium 7.3%	
Zinc 4.3%	●	Manganese 7.1%	
*Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.			
	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2400mg	2400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Resources

- 1 Sanders L, Kendall C, Maki K, et al. A novel maize-based dietary fiber is well tolerated in humans. FASEB J. 2008; 22:lb761.
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- 4 Vester Boler BM, Seroo MC, Bauer LL, et al. Digestive physiological outcomes related to polydextrose and soluble maize fiber consumption by healthy adult men. Br J Nutr. 2011; 106:1864-71.
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- 6 Macdonald-Clarke C, Martin B, Whisner C, et al. 2013. Soluble Corn Fiber Increases Calcium Absorption in Free Living Adolescent Girls. J Bone Miner Res 28 (Suppl 1).
- 7 Weaver CM, Martin BR, Story JA, et al. Novel fibers increase bone calcium content and strength beyond efficiency of large intestine fermentation. J Agri Food Chem. 2010; 58:8952-8957.
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- 9 Maathuis A, Hoffman A, Evans A, et al. The effect of undigested fraction of maize products on the activity and composition of the microbiota determined in a dynamic in vitro model of the human proximal large intestine. J Am Coll Nutr. 2009; 28:657-66.
- 10 Titoria P, Gibson P, Komitopoulou E, et al. Understanding Prebiotics. Confidential Collaborative Project In House Final Report No. 120368. Leatherhead Food International. March 2007.
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