

FIBER, PREBIOTICS & RESISTANT STARCH

Fiber is a non-starchy carbohydrate found predominantly in plant foods, though it can also be found in some shellfish exoskeletons or synthetically derived. Humans lack the enzymes to digest fiber. Instead, fiber passes through the entirety of the digestive tract fully intact, serving other purposes in our body.

BENEFITS OF FIBER

A main role of fiber is to feed the microbiome, which will shift depending on fiber adequacy: When adequate, the microbiome will proliferate with beneficial strains, while when insufficient, the microbes will begin feasting on the mucosal layer instead, causing wear-and-tear on the gut lining and subsequent downstream dysfunction. Increased fiber intake has been associated with decreased inflammation, lower risk of various cancers, regulated bowel motility and slowed movement through the small intestine (meaning increased nutrient absorption, although more food for any microbes that shouldn't be there), increased satiety and lower caloric intake, slower glucose release via delayed gastric emptying, decreased serum cholesterol, balanced microbiome flora, improved immune response by decreasing mucosal membrane inflammation, and improved clearance of exogenous toxins from the gastrointestinal tract

CONSUMING FIBER

The USDA recommends at least 28 g total fiber per day for women, 38 g for men, and 25 g for a child aged 4-8 years. However, at least 35 to 50 g per day for adults would be considered more optimal. A typical Western dietary pattern contributes about 5 to 15 g of fiber per day (and children commonly consume less than 5 g per day), while in some cultures where traditional foods are consumed, people may eat over 40 g per day.

Fiber should always be added low-and-slow to the diet to prevent constipation, gas, cramping, and bloating (since microbes will be more happily munching and proliferating!). While increasing fiber, water must also be increased to at least 64 fluid ounces per day, and more as needed. For individuals with small intestinal overgrowths, the addition of dietary fiber may be contraindicated. Aside from encouraging an increase in dietary fiber from whole fruits, vegetables, whole grains, and legumes, sometimes functional (supplemental) fiber can be added. Dietary fiber is preferred where possible, as some supplemental functional fibers have been found to create gastrointestinal symptoms in some individuals.

Naturally occurring types of fiber include gums, beta-glucans, inulin and oligofructose, lignans, cellulose and hemicellulose, and pectins. Functional fibers are those that have been extracted from foods or are synthetically produced, including psyllium husks, chitin and chitosan, fructooligosaccharides, galactooligosaccharides, polydextrose and polyols, resistant dextrins/maltodextrin, and Polyglycoplex (PGX). (Note the overlap with FODMAPs categories.)

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TYPES OF FIBER

All plant-based foods contain a mixture of soluble and insoluble fiber. Soluble fiber dissolves in water; insoluble does not.

1 SOLUBLE FIBER

Soluble fiber can be further categorized as viscous (gel forming in water) or non-viscous, and fermentable or non-fermentable.

- **Soluble, viscous, fermentable fibers** feed gut microbes that produce short chain fatty acids (SCFAs) and peptides for neurotransmitters and gut-derived hormones while promoting a thicker mucosal layer. This fiber category is what is responsible for decreasing postprandial blood sugar spikes and serum cholesterol.
- **Soluble, viscous, unfermentable fibers** are not digested by gut bacteria, but still help regulate blood sugar and serum cholesterol levels.
- **Soluble, nonviscous, fermentable fibers** are what most feed the gut microbiome.

Foods containing significant amounts of viscous and nonviscous soluble fiber include beans and legumes, fruits, vegetables, nuts and seeds, and oats and other cereal grains. Of these soluble fiber foods, some of the highest sources are lentils and beans, winter squash, artichoke hearts, prunes, mushrooms, and konjac root (Miracle Noodles).

2 INSOLUBLE, UNFERMENTABLE FIBERS

Insoluble fiber, in a larger, less processed form (think large pieces of bran) act as laxatives, irritating the gut lining to increase water and mucus release, which bulk up the stool and help it to pass. When finely ground, insoluble fiber can cause further constipation by being less irritating and drawing in less water, and in some cases can even be too drying. Foods containing high amounts of insoluble fiber include whole grains, brown rice, wheat and rice bran, barley, cabbage, and celery.

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PREBIOTICS AND RESISTANT STARCHES

PREBIOTICS

Prebiotics are soluble and insoluble fibers that specifically aid with microbial colonization, and which can be fermented by commensal gut microbes in the lower digestive tract. Prebiotics are like the fertilizer that enriches the garden soil for the commensals to thrive.

Via the microbiome, prebiotics can decrease inflammation and adipocyte size, help regulate glucose regulation, decrease allergies and eczema, nourish enterocytes via SCFA production, and support detoxification by keeping the bowels moving while sequestering and escorting carcinogenic substances and metals out of the gut. Prebiotic foods include leeks, onions, and garlic; jerusalem artichokes; asparagus; greener bananas and plantains; lentils, beans, potatoes, and raw potato starch; dandelion greens; apples with peel; jicama; and chicory

RESISTANT STARCHES

Resistant starches are prebiotic foods that contain a combination of carbohydrates as fiber plus starches. They are called resistant because they resist digestion in the small intestines and make their way to the colon, where they are acted on by the commensal bacteria. Foods containing high amounts of resistant starch include greener bananas and plantains and their flours; beans, peas, lentils, rice, and potatoes that have been cooked and then cooled before eating (ok to reheat); raw potato starch; and whole grains including gluten.

References:

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<https://www.scientificamerican.com/article/fiber-famished-gut-microbes-linked-to-poor-health1>

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SOME EXAMPLES OF FOODS TO FEED YOUR MICROBIOME

SOLUBLE FIBER	PREBIOTICS
<ul style="list-style-type: none"> • lentils and beans (black, garbanzo, lima, navy, kidney, etc.) • oatmeal* • winter squash • artichoke hearts • Brussels sprouts and broccoli • turnips • prunes • oranges • mushrooms • sweet potatoes • avocado • dried figs • apricots with skin • onions • konjac root (Miracle Noodles) • chia* and flaxseeds* (freshly ground) 	<ul style="list-style-type: none"> • leeks, onions, and garlic • jerusalem artichokes • asparagus • greener bananas* and plantains • lentils, beans, potatoes, and raw potato starch • dandelion greens* • apples with peel • jicama • chicory
INSOLUBLE FIBER	RESISTANT STARCH
<ul style="list-style-type: none"> • bamboo shoots* • whole grains (brown rice*, wheat and rice bran*, barley) • nuts (almonds*, pistachios, peanuts*) • amaranth* • cauliflower • cabbage* • green peas • leafy greens* • apples with peel • celery • blackberries, raspberries* • root vegetables (carrots*, parsnips, potatoes with peel) 	<ul style="list-style-type: none"> • greener bananas* and plantains*, their flours • beans • whole grains (oats*, pearl barley, rye) • peas, lentils, beans, rice, and potatoes that have been cooked and then cooled before eating (ok to reheat) • raw potato starch

*low FODMAPs option when eaten in small quantities