

Gut: Probiotics and Prebiotics — Part 2

So, let's start with soluble fiber. It's best tolerated by patients with gut issues in general because they're not FODMAPs and they tend to have a soothing effect on the digestive tract. Most soluble fibers form a gel-like substance, they're mucilaginous, so that gel-like substance coats the digestive tract and that's what can make it helpful in cases of both constipation and diarrhea and with other digestive symptoms like gas and bloating. The soluble fibers I like to use most include glucomannan, which is konjac root, and partially hydrolyzed guar gum. Glucomannan is very well tolerated and has the added benefit of blood sugar regulation. PGX is the brand-name fiber that you might have heard of that contains glucomannan, or konjac root, and it can be taken in capsule or powder form, and there are many different brands but we tend to use the Now brand of glucomannan.

We talked a little bit about partially hydrolyzed guar gum for SIBO treatment. It's also soluble, but unlike other soluble fibers, it's not viscous; it doesn't form that gel in the gut. This makes it easier to mix with water and food and less likely to cause bloating that's associated with some soluble fibers. It's the best-tolerated fiber I've worked with of any of the fibers, especially for patients with FODMAP intolerance and who don't typically do well with fiber.

Other options for soluble fiber include psyllium and acacia. Psyllium is what's found in commercial products like Metamucil. It can work well but I've found that it causes bloating in many patients. You can buy pure organic psyllium online, which I think is better than Metamucil, which has sugar and artificial flavors.

Acacia fiber is from the acacia tree. It's also generally well tolerated and has less of a tendency to cause bloating and gas than other soluble fibers like psyllium, and it can be purchased as pure organic acacia fiber from Now and other companies. All of these fibers are cheap and affordable, which is another benefit.

Another good option is modified citrus pectin. Pectin's a naturally occurring substance found on the cell walls of most plants, and it's especially concentrated in the peel and pulp of citrus fruits. Pectin is then modified to break down its long-branch chain of polysaccharides in the shorter, unbranched lengths of soluble fiber molecules that will dissolve easily in water. It has some distinct properties; it's been used to prevent cancer, metastasis, and bind heavy metals, especially when combined with an alginate complex like in products such as PectaSol. And like other soluble fibers, it's generally well tolerated, but I think you should advise patients to start slowly because of potential detox reactions if they have toxins present.

Soluble fiber options

Fiber	Comments
Partially hydrolyzed guar gum (PHGG)	Very well tolerated; not viscous; easy to mix with water and food
Glucomannan (konjac root)	Well tolerated; shown to reduce blood sugar
Psyllium husk	Tendency to cause bloating; can be purchased as pure, organic powder
Acacia	Well tolerated; can be purchased as pure, organic powder
Modified citrus pectin (MCP)	Well tolerated; chelates heavy metals especially when combined with alginate complexes

So which soluble fibers should you choose? They can all have the desired effect, which is growing beneficial gut flora and relieving both constipation and diarrhea. But which is used depends on the patient response and needs. So we will generally start with partially hydrolyzed guar gum, PHGG for short, or glucomannan if the patient has blood sugar or weight regulation issues.

There's no reason not to try more than one and rotate, which we also advise; it's a really key concept. Resistant starch got really popular for a while in the functional medicine and ancestral health community, and people were taking large amounts of it alone. My concern with that is that studies have shown that taking large amounts of resistant starch alone actually decreases the diversity of the gut flora, which is definitely not the outcome that we're looking for, so rotating the different types of fiber will mimic an ancestral diet. As I said, hunter-gatherers typically ate a lot of plants, they ate a lot of fiber, but they were exposed to a lot of different types of fiber, not just one, so on the rebuilding healthy gut protocol handout we're going to give you in the patient handout, you'll see that we're listing many of these different fibers and we're advising patients to rotate back and forth. They don't necessarily need to take all of them every day, but rotating back and forth is a good idea.

Non-starch polysaccharides

Larch arabinogalactan

Beta-glucan

Inulin & FOS

Galactooligosaccharides

The next category is the non-starch polysaccharides. So this is a large category that includes inulin and FOS, for fructooligosaccharides, which are a subcategory of inulin, larch arabinogalactan, galactooligosaccharides, and beta-glucan. Many of these are FODMAPs, so they're the most likely to cause gas, bloating, and GI distress, especially in patients that are FODMAP-intolerant. Galactooligosaccharides, of all of these, tend to produce the least amount of gas, and they're technically not FODMAPs, so they may be the best tolerated of the non-starch polysaccharides, and they have one of the best profiles in terms of their ability to increase Bifidobacteria and Lactobacillus. I know than Glenn Gibson, who's a researcher in this field, he was actually the person to coin the term "prebiotic," he prefers galactooligosaccharides as a prebiotic.

Larch arabinogalactan is a highly branched polysaccharide consisting of a galactan backbone with side chains of galactose and arabinose sugars. It's been shown to increase the production of short-chain fatty acids, especially butyrate and propionate, and they've been shown to decrease the generation and absorption of ammonia, which is a byproduct of bacterial metabolism and is often elevated in dysbiotic conditions, and also in conditions like autism spectrum disorders and mitochondrial disorders. It has a significant effect on enhancing the beneficial gut microflora. Specifically, it increases anaerobes such as Bifidobacteria and Lactobacillus. It also has an immune-regulating effect; it can stimulate natural killer cell cytotoxicity, enhance other functional aspects of the immune system, and inhibit metastasis of tumor cells in the liver. It's been shown to be useful in decreased immune function, decreased natural killer cell activity, or chronic viral infection.

Beta-glucan, or β -glucan, is a soluble fiber that's readily available in oat and barley grains; also in certain types of mushrooms, like reishi, shiitake and maitake; yeast; seaweed; and algae, and studies have shown that it can play a beneficial role in reducing insulin resistance, dyslipidemia, hypertension, and obesity. Like larch arabinogalactan, beta-glucan has been shown to have an immunoregulatory effect. Some beta-glucans interact with immune cells and stimulate the immune system directly, whereas others regulate the immune system as they pass through the intestinal

tract. Bacteria can ferment beta-glucans in the intestinal tract, and they produce short-chain fatty acids and have an overall prebiotic effect.

Next is inulin and oligofructose, also known as fructooligosaccharide, or FOS. Inulin is a term applied to a variety of fructose polymers found in certain types of plants, like wheat, onions, bananas, garlic, and chicory, among others. Oligofructose is a subgroup of inulin consisting of polymers with a degree of polymerization, or DP, below 10. Inulin and oligofructose are not digested in the upper GI tract, so they become food for beneficial bacteria in the colon, especially Bifidobacteria. Inulin and FOS have been shown to increase stool frequency, increase stool weight, and decrease stool pH. They also decrease triglycerides and total and LDL cholesterol. Inulin and FOS are often added to foods as functional fibers, and as with other FODMAP fibers, they are potent stimulators of Bifidobacteria, but they are also the most likely to cause GI symptoms like gas and bloating.

Galactooligosaccharides, or GOS, is a collective term for a group of carbohydrates composed of oligogalactose, with some lactose and glucose. Oligosaccharides resembling GOS occur naturally in human milk and may be one of the factors that protect human infants from gastrointestinal pathogenic bacteria. They pass undigested into the colon, where bacteria hydrolyze and ferment them, and they're strong promoters of Bifidobacteria and Lactobacilli. They've been shown to protect against enteric infections, increase mineral absorption, regulate the immune system, prevent allergies and gut inflammatory conditions, increase short-chain fatty acids, add bulk to the stool, and protect against toxins that may promote colon cancer. Unlike other non-starch polysaccharides, GOS technically are not FODMAPs, as I mentioned, and may be better tolerated. In my experience, this is true in some patients but not in others. It can still cause significant gas and bloating, so the only thing you can do here is just advise the patient to experiment and see how they respond.

Non-starch polysaccharide options

Fiber	Comments
Larch arabinogalactan	Immune stimulator and regulator
Beta-glucan	Immune stimulator and regulator
Inulin and oligosaccharide (FOS)	Often used in functional foods; most likely to cause GI distress
Galacooligosaccharide (GOS)	Potent promoter of bifidobacteria and lactobacilli

So here's a summary of the non-starch polysaccharide options. I recommend two products, BiotaGen and GalactolImmune from Klaire Labs, and if you take both of these products, it covers the entire spectrum of non-starch polysaccharides, so you can use them together or you can rotate them back and forth, and remember, patients with SIBO and FODMAP intolerance that aren't taking antimicrobials should probably not use these FODMAPs, because they could contribute to a recurring SIBO condition, but you could try starting a low dose and building slowly. This is one of the biggest challenges that we face as clinicians, is that we know that our patients need higher fiber intake to support healthy gut flora, and yet many patients with gut issues are not able to tolerate higher fiber intake, so you really just have to have them experiment with the different fibers and choose the ones that they are able to tolerate most and eat more of those types of fiber, and of course continue to address the underlying conditions as much as possible.