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Watch Out for Foods Containing Anti-nutrients

This article is not about gluten sensitivity, wheat allergy, excessive fiber content, food sensitivities caused by common proteins in the diet, or similar problems that tend to cause digestive system inflammation. The purpose of this article is to consider some of the other more uncommon, but possibly important reasons why certain foods, especially grains, may cause inflammation and leaky gut, which can lead to food sensitivities.

Two somewhat separate issues exist:

1. **Highly refined carbs**
2. **Anti-nutrients**



Highly refined carbs

Highly refined carbs include foods such as flour refined for baking, and various products made from that flour, many of which are referred to as “junk foods”. Sugar, breakfast cereals, and various other products are also made from highly processed carbs. Although highly refined carbs are rather easy to digest, low in fiber, and

tend to provide a relatively quick boost in energy potential, attributes which appear to make them advantageous for a microscopic colitis (MC) recovery diet, their effect in the diet is typically counterproductive. Although they might provide a brief energy burst, this fades rather quickly, as blood sugar levels plummet, because foods in this category actually contain fewer nutrients than carbs that are less highly refined. Research shows them to be inflammatory. And most of us are well aware that chronic inflammation leads to leaky gut, which is the cause of food sensitivities.

Although technically, sugar is not an anti-nutrient, it contains only empty calories with no actual nutrients. Consequently, some refer to it as an anti-nutrient, simply because it contains no nutrition. A *Candida* overgrowth is a somewhat common problem among MC patients who have been reacting for an extended length of time. The consumption of sugar and other highly refined carbs raises the risk of developing a *Candida albicans* overgrowth, which can cause leaky gut. And published research shows that excessive consumption of sugar, on its own, can lead to the development of leaky gut. A *Candida* overgrowth typically induces the brain to crave sugar, because *Candida* requires sugar in order to thrive. If you find that avoiding sugar (and/or highly refined carbs) is very difficult to accomplish, look at your tongue in the mirror. If at least the middle of it is covered with thrush (in other words, if it has a whitish

appearance), you almost surely have a Candida overgrowth.

Note that despite the fact that highly-refined carbs are generally unhealthy, they contain far fewer anti-nutrients than unrefined, or lightly refined carbs. This is because a high percentage of the anti-nutrients are contained in the husks, and outer shells, which are milled away when grains are highly processed. But because of this distinction, these are clearly two separate issues, as far as digestive problems are concerned.

Anti-nutrients: Plants don't appreciate being eaten.

While the issues caused by highly refined processing are man-made, anti-nutrient problems exist because plants have evolved as objects of predation by grazing animals and insects throughout history. Because they can't jump up and run, like most other species, plants have been forced to develop other defensive



mechanisms to prevent, or at least discourage, predation. These protective adaptations vary between species, but most of them involve the ability to create chemical compounds that can range from irritating to toxic, when eaten. Most of these compounds cause digestive difficulty, not only for the predatory species at which they are targeted, but humans as well. These compounds can be found in the leaves, stems, fruit, and seeds of plants. Virtually all plants contain at least a few of these compounds, which are sometimes referred to as anti-nutrients.

Whole plant foods contain anti-nutrients.

Examples of whole plant foods include whole-grain flours, brown rice, peas, beans, lentils, peanuts, seeds, and other similar whole foods. Although many anti-nutrients exist, only a limited number of them have been researched. For example, published research can be found regarding lectins, chitins, and amylase trypsin inhibitors. And although there are many others, we'll focus on these because they appear to be more likely to be specific threats for MC patients. Some of these substances may cause immediate symptoms, while others may cause delayed, or not-easily-recognized symptoms.

Fruits are an exception.

Before we get into the details of anti-nutrients, consider that fruits, in general, appear to be exceptions, because they contain very few anti-nutrients. The primary caveats regarding the inclusion of fruit in a recovery diet, is due to the relatively large amount of sugar and fiber in fruits. The sugar in fruits consists mostly of fructose and sugar alcohols. Fructose is more difficult to digest than most sugars, because it has to be digested by the liver, rather than by a normal digestive process. And sugar alcohols, such as sorbitol, mannitol, xylitol, and others, are indigestible. Ingesting a significant amount of sugar alcohols can result in their fermentation by gut bacteria in the colon, resulting in gas, cramps, and sometimes diarrhea. Many grapes, for example, contain relatively large amounts of sorbitol. Most of the fiber in fruit is in the outer shell, or peel, which is why peeling fruits and vegetables before cooking and eating is recommended for MC patients. But even the pulp content of most

fruits is rather high in fiber, which can be a problem for many MC patients still in recovery, if too much fiber is consumed.

Interestingly, some fruits that we may mistakenly consider to be vegetables contain significant levels of amylase trypsin inhibitors, which are anti-nutrients. This may be at least part of the reason why most MC patients absolutely cannot tolerate watermelons. Many of us can't even tolerate them after we've been in remission for a while.

Tomatoes, on the other hand, although also a fruit, don't contain significant amounts of amylase trypsin inhibitors. But because they're part of the nightshade family, they may contain anti-nutrients such as alkaloids, solanine, and chaconine, which can be toxic if consumed in large amounts. This applies to potatoes as well, but these anti-nutrients are normally in the peel, so if you peel your potatoes before cooking them, this problem will be minimized. Solanine in potatoes is typically caused by sun exposure of the tuber while growing, and it can normally be detected by the presence of a greenish coloration of the peel.

Although this possibility has never been specifically investigated by medical researchers, it's at least theoretically possible that some of these anti-nutrients, if consumed in sufficient quantities, may possibly be capable of triggering the development of digestive system syndromes, such as MC, for some individuals. And although anti-nutrients may affect anyone in the general population who ingests them, they can be especially troublesome for MC patients who are on a recovery diet, attempting to get their MC symptoms under control.

Lectins have been the target of extensive research for decades.

Lectins are not broken down as they pass through the human digestive system. They tend to stick to cell membranes, and they're capable of causing sugar molecules to stick together. This is known as agglutination, and it's the mechanism that allows the molecules in bread dough made from wheat flour to stick together so well, and allows it to be kneaded. In other words, wheat germ agglutinin is an example of a lectin. But because lectins are not broken down by our digestive system, they tend to retain their antagonistic properties, and they can bind to cell membranes in our intestinal walls, arteries, and other organs, causing inflammation and possible cellular damage.



Grains, legumes, dairy products, and nightshades are common sources of lectins in foods. Note that some of the highest lectin content can be found in the foods officially designated as the eight most common allergens — specifically eggs, fish, milk, peanuts, tree nuts, shellfish, soy, and wheat. Lectins are surely one of the main reasons why a low-carb diet is so effective for

preventing heartburn, gastroesophageal reflux disease (GERD), and other digestive issues. And lectins are why a low-carb diet can be so beneficial for MC patients trying to control the symptoms of their disease.

According to Sullivan (2016, October 5), certain carbohydrates can bind specific lectins. This prevents them from attaching to cell membranes.¹ The body normally produces N-acetyl-glucosamine (aka N-acetyl-D-glucosamine, GlcNAc, or NAG), which is an amide derivative of the monosaccharide glucose, and it's the primary target to which wheat lectin binds. Glucosamine supplements can bind to wheat lectin, which leaves less wheat lectin available to bind to NAG. It appears that this may be the reason why glucosamine supplements seem to have a protective effect against gluten-induced arthritis damage to cartilage in joints. And this protective effect may extend to the intestines, although to date, none of this has been proven by random, double-blind medical trials.

The exoskeleton (outer shell) of crustaceans and insects is made of chitin.

Chitin is found only in very small amounts in plants, which means that it shouldn't be a problem with plant-based foods. However, it can be found in significant amounts in insects and fungi. This may raise a warning flag regarding a currently popular trend in the development of new foods, namely, entomophagy, the practice of eating insects.

Will we soon be eating insects?

Due to the possibility of a global food crisis as a direct result of the pandemic, the European Food Safety Authority of the European Union (EU) recently approved dried yellow mealworms as a novel food, effective June 1, 2021.²



Conservationists, in general, are strongly in favor of this practice. So far, the Food and Drug Administration (FDA) in the United States (US) has ignored this issue, and they continue to focus their efforts on treating insects in food as filth. But presumably, the FDA will eventually be forced to address the issue at some point. If insects are approved as food, please be aware that the chitin they contain may be an issue that affects long-term gut health. This possibility hasn't yet been verified — it needs more research.

But we're already eating insects.

Carmine is one of the most widely used red food colorings, and this additive is made from crushed bugs. Hopefully, we're ingesting such a small amount of it, that it isn't having a significant effect on our digestive system. The bottom-line is that so far, at least, the chitin in the plant-based foods, and insect-based additives in the foods we currently eat, is unlikely to be causing any problems. That may change, if insects become popular as human food. And it's certainly not the case with yeasts, because yeasts can be a problem for many of us, especially while we're still in recovery.

Foods can legally contain a surprising amount of foreign matter.

The regulations allow up to a certain specific amount of various forms of foreign matter in most foods. For example, official FDA regulations allow a 50-gram sample of cornmeal (slightly over 1/3 of a cup), to contain up to the following amounts of foreign material: an average of one or more whole insects, an average of 50 or more insect fragments, an average of two or more rodent hairs, or an

average of one or more rodent droppings (referred to as rodent excreta, in the regulations).³ For foreign matter tolerance levels in other foods, please refer to the reference.



Certain types of food have a relatively high yeast content.

And that yeast content presumably places them in the risk category of chitins. In fact, there's a possibility that the chitins in yeast may be the primary reason why many MC patients show a yeast intolerance in their results, if they order a

yeast test from EnteroLab. To support this conjecture, note that most of us who do show a positive yeast sensitivity result, appear to do so only while we're reacting — not after we're in remission. That suggests that this sensitivity may only occur when leaky gut is present. If yeast was actually a valid food sensitivity, it wouldn't disappear once remission is attained. A few of us remain sensitive to yeast after we're in remission. Perhaps that's because those of us in this particular situation have an elevated sensitivity level to chitin, causing us to continue to react — not to the yeast, but to the chitin.

True food sensitivities are typically permanent.

Note that all other food sensitivities (where food sensitivities are defined as foods that are marked by the production of antibodies by our immune system) do not disappear just because remission is reached. Instead, they're permanent, in the vast majority of cases. The theory that this particular so-called sensitivity (to yeast) may be caused by a reaction to chitin, rather than the yeast itself, would explain why yeast causes only a temporary sensitivity. In other words, a yeast reaction may be caused by a reaction to an anti-nutrient, rather than a reaction to antibody production. Remember that when we're reacting, our sensitivity level to virtually everything is elevated, causing us to react to some foods that cause no problems after we're in remission, and our digestive system has had time to heal sufficiently.

Consider fermented foods and baked goods.

All fermented foods and beverages tend to contain a high yeast content as a byproduct of the fermentation process. Most baked goods go through a dough rising step that's initiated by yeast, prior to baking. Even gluten-free breads, and similar baked products contain yeast, despite the fact that they don't rise nearly as well as products that contain gluten. Perhaps an elevated sensitivity to chitin or some other anti-nutrient is the primary reason why some of us cannot tolerate gluten-free breads, even after we're in remission. And although beer almost surely causes us to react because of the barley malt used to start the fermentation process, as has been traditionally claimed, remember that beer also contains yeast. This theory (of shifting the sensitivity blame from yeast to chitin) would imply that although most of us wouldn't be able to tolerate gluten free beer when we are not in remission, many of us should be able to tolerate it whenever we're in remission, except for those of us who have an elevated sensitivity level to chitin. But again, remember that this is speculation, not proven fact.

Chitin may be capable of altering the gut biome.

Another issue associated with chitin is that it may have a significant

effect on the gut biome, and this may be a primary cause of some of our sensitivities.⁴ While very limited research data are currently available regarding this possibility, it could have far-reaching effects, due to the complexity of the interactions of the gut biome with many aspects of not only our digestion, but our overall health.

Candida roots contain chitin.

Consider the fact that all pathogenic fungi contain chitin in their cell walls (Lenardon, Munro, & Gow, 2010).⁵ A *Candida albicans* overgrowth appears to be a somewhat common problem for many MC patients before they're able to reach remission, and the



outer walls of the roots of Candida are made of chitin. It's well known that when a patient has a Candida overgrowth, the roots of the yeast usually penetrate the epithelial layer of the intestines, and this typically leads to leaky gut. But the question remains, "Does the penetration by the Candida roots through the tight junctions in the intestines cause the leaky gut issue, or is the problem due to the chitin content of those roots?"

Amylase trypsin inhibitors interfere with digestion.

The small intestine produces amylase enzyme, and this is used to digest carbohydrates. It also produces trypsin enzyme to be used to help digest proteins. Research documentation showing that soy, and other legumes, contain not only lectins, but also compounds that inhibit the ability of amylase and trypsin to function properly, has been available for decades. And more recently, it's been shown that amylase trypsin inhibitors (ATIs) can activate toll-like receptor 4 (TLR4). TLR4 is a protein that's part of our immune system known to promote inflammation, when activated.



It's well known that chronic alcohol exposure causes leaky gut.

It accomplishes this by activating TLR4 (Li, 2013).⁶ And it's been known for many years that TLR4 activation is associated with IBDs

(Oostenbrug, 2005).⁷ But note that the most important implication here seems to have been overlooked by the medical literature — namely that TLR4 activation by ATIs may help explain how and why celiac disease develops at different ages, for different people. It certainly explains how ATIs can trigger a leaky gut, and food sensitivities, as a result.

This validates non-celiac gluten sensitivity.

Even if the activation of TLR4 by ATIs has nothing to do with the process by which celiac disease develops, it almost surely defines a primary pathway by which non-celiac gluten sensitivity develops. Furthermore, note that TLR4 is part of our innate immune system. That means that we don't have to develop any food sensitivities in order to trigger a TLR4 response, because we are born with that capability. That implies that not only ATIs, but any anti-nutrients that trigger a TLR4 response can trigger leaky gut, and the resulting food sensitivities, including non-celiac gluten sensitivity.

In conclusion

These specific issues probably are not a significant factor for most of us. If we select a recovery diet according to safe guidelines, most of us can ignore these issues. However, if the recovery diet you've selected isn't as basic, bland, and simple as the Microscopic Colitis Foundation recommends, and you're eating significant amounts of these foods, the reason you're unable to reach remission might be at least partially associated with one or more of the issues discussed in this article.

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“How’s your food allergy?”