



## Dreamfields Pasta—The Healthy Product for Healthy Digestive Systems and Proper Immune Function

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Next to headaches, stomach problems are one of the most self-treated ailments in the U.S., with more than 70 million Americans suffering from a digestive disease or disorders, 15 percent on a daily basis. Recent estimates indicate that more than 7 million Americans have irritable bowel syndrome, gastritis, colitis and another 4-plus million with chronic constipation. Many use over-the-counter medications, such as anti-acids and laxatives, but these do not address the underlying cause. The elderly—a group growing at unprecedented rates—are particularly prone to intestinal inflammation and constipation.

The health of the large intestine is key to overall body health. It is the body's primary site for water absorption and rehydration and supports the majority of the body's immune system by acting as a barrier between invading materials and the internal body cavity. Scientific studies show that the integrity of the intestinal barrier can change due to stress, starvation (even short term), lack of proper nutrition, or as the result of serious health situations such as Crohn's disease, ulcerative colitis, celiac sprue, extensive burn injury, antibiotic therapy, parasites, rheumatoid arthritis and indomethacin-associated enteritis, and intestinal obstruction<sup>17,19</sup>. Many of these diseases are caused by faulty intestinal barrier function and microbe's subsequent ability to invade the body<sup>13,14,27</sup>.

Research indicates that highly fermentable dietary fibers, know as prebiotics, like the inulin found in Dreamfields pasta, might be a promising way to address the cause of some gastrointestinal health disorders.

### **What the research says about prebiotic fibers, like inulin for proper digestive health and immunity**

The prebiotic fibers, like inulin, differ from other fibers because they selectively promote growth of "good" microorganisms in the intestine, while eliminating "bad" microorganisms that can potentially cause disease or disorders. The most common "good" microorganisms these prebiotics nourish are the lactobacilli and bifidobacteria, found naturally in yogurt and kefir products. Research has shown that prebiotic fiber, like the inulin in Dreamfields pasta, are used or fermented selectively by these good bacteria to foster their growth while simultaneously creating a gut environment that is inhospitable to the "bad" microorganisms reproduction. A smaller number of "bad" microorganisms means fewer intestinal proteins are used in the intestine, and fewer harmful products are made from their use. These by-products (ammonia, phenolic products, amines, and N-nitroso compounds) have been linked to various cancers and ulcerative colitis<sup>2,7</sup>. Animal studies have further suggested that the prebiotic fibers play a significant role on intestinal immune function<sup>4,5,12,15,16,21,23</sup>. In a human infant study conducted at Johns Hopkins, 123 infants aged 4-24 months fed an infant cereal fortified with the prebiotic fiber inulin for 6 months showed reduced incidence of fever, less antibiotic use, fewer doctor visits, less vomiting and fewer daycare absences than a group without the inulin fortification<sup>25</sup>.

The health of the intestinal barrier is vital to maintain a healthy digestive process and resistance to outside invasion to the body from foreign material. When the intestinal barrier is compromised, it becomes more permeable and can "leak" undigested food, fecal material and other disease-causing organisms into the body cavity and is viewed as an indicator for several diseases or disorders. A typical result of this increased permeability is chronic diarrhea, but potentially a more harmful effect of gut barrier function loss is the formation of chronic bowel inflammation--loss of water recycling and proper immune function--due to

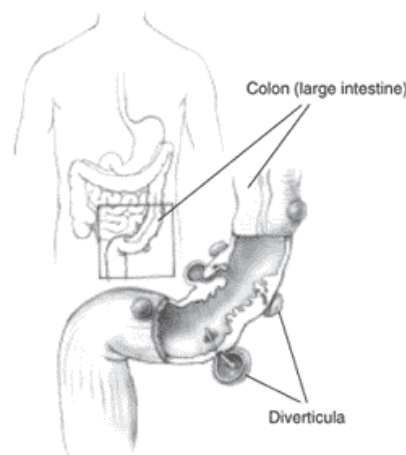
exposure of the mucosa to foreign material<sup>29</sup>. This can further lead to onset of autoimmune disorders—disorders characterized by the body attacking itself—in some individuals.

In healthy-functioning intestinal barriers immune antibodies typically predominate. However, in individuals having ill-functioning barriers, the body typically creates a different type of antibody responsible for hyper-immune responses related to the body being contaminated with foreign material. The antibodies trigger inflammation and pain, and further can lead to autoimmune conditions where the body destroys ones own body tissue. Examples of such disorders are Crohn's disease, ulcerative colitis, Grave's disease, rheumatoid arthritis, celiac disease, Lupus, and others<sup>1</sup>. While not being directly caused by intestinal barrier loss, diseases and disorders such as those listed have been associated with higher levels of circulating inflammatory antibodies and could have their onset or reoccurrence triggered by exposure of the intestinal lining to intestinal foreign material<sup>6,20,31</sup>.

To keep the colon cells healthy and the intestinal barrier functioning properly, it is important to maintain a positive balance between cell growth and cell loss by cell sloughing<sup>18,30</sup>. While different fiber types have different effects on colon lining cell growth it is generally accepted that prebiotic fibers, like the inulin in Dreamfields, have greater influence on cell growth, via SCFA production, than other fibers like cellulose typically found in cereal brans. The short chain fatty acids (SCFA), particularly butyrate, are the primary products derived from gut bacteria fermentation to provide energy for the colon cells to keep them healthy. Unlike the small intestine, which can derive energy from various bodily sources, the colon lining cells get their energy solely from SCFA. As a preferred nutrient, butyrate indirectly stimulates colonic barrier health and prevents its reduction, which can develop within only days of oral starvation, low fiber intake or stress<sup>24</sup>.

#### **What research says about the prebiotic fiber, inulin, in diverticular disease and constipation**

In addition to gut barrier loss, a rapidly growing disease trend is also related to low fiber intake, and is one of modern civilization<sup>21</sup>. Named for its pouch-like protrusions or divergences of the colon, namely the diverticula (plural), diverticulosis is the condition of having many of these sac-like pouches.



When these pouches become infected or inflame the condition is know as diverticulitis. This happens in 10 to 25 percent of people with diverticulosis. Diverticulosis and diverticulitis are also called diverticular disease. Diverticulosis is a disease of modern times, unknown before 1900 and only about 5-10% of the US population had the disease at the beginning of the 20<sup>th</sup> century. In England, the increase in disease incidence around World War I, was attributed to changes in flour production made about 30 years prior, when the flour mills increased refining, removing about two-thirds of the wheat fiber. The prevalence today is 5% at the age of 40 years, 30% by 60 years and almost everyone has it after the age of 85 years. It is mostly a disease of progress, affecting predominately affluent western societies, particularly the United

States, England, and Australia, where low-fiber diets are common. By contrast, the prevalence in Asia and Africa is less than one percent, where demographically the population eat high-fiber vegetable diets. Further epidemiological evidence support a link to a lack of dietary fiber stemming from observations of rural African cultures made in the early 1970s<sup>8,9,22,28</sup>. Diverticulosis was nonexistent in the rural African cultures who ate a fiber-rich diet, but was common in urban populations, such as Johannesburg. In addition, studies involving rats have shown that those fed a low-fiber diet have more than five fold the incidence of diverticulosis as those fed a fiber-rich diet.

The primary function of the colon is to recycle water from the stool before excretion. In relation to diverticulosis, dietary fiber, particularly like the fiber types in Dreamfields pasta, have been attributed to helping increase fecal bulk<sup>30</sup>. Research has identified that the number of bacteria in human feces is approximately  $4 \times 10^{11} - 8 \times 10^{11}$ / gram of dry feces, and makes up to about 50% of fecal solids in subjects on a Western diet<sup>9</sup>. Increases in microbial biomass from fermentable fiber use contributes directly to stool bulk, making up a large part of the weight. As bacteria are about 80% water and have the ability to resist dehydration, increasing their relative fecal content contributes significantly to the water-holding effects in fecal material. Trapping of gas, another by-product of fiber fermentation by bacteria, also contributes to increased volume and a decrease in fecal transit time. Thus, fermentable fiber, like the unique fiber blend found in Dreamfields pasta are important as they are utilized by bacteria to grow in number and help maintain healthy populations to enhance stool bulk and reduce constipation. Less fermentable fiber sources, like cellulose from cereal grains and brans, also provide some bulking effects, but the mechanism of their action is quite different. Stool bulking from dietary fiber, particularly fermentable soluble fibers, is important as it is suggested that a high-fiber (bulking) diet expands the colon, whereas a low-fiber (bulking) diet narrows it. A narrowed colon must generate higher pressure to move its fecal content along, eventually the pressure could force the colon to bulge at weak points along its length, where nourishing blood vessels penetrate the colon wall. Repeated occurrences over time, these bulges enlarge into protrusions—diverticula. These sacs occur most frequently where colon pressure is the greatest, namely in the descending (left) colon.

While being benign by themselves, the diverticula create weakened intestinal conditions for the blood vessels alongside them to rupture and bleed or even cause permeations, as previously described, allowing fecal material carrying harmful bacteria to move into the body cavity.

Diverticulosis is common and mostly characterized as being a disease of the elderly. In fact, about half of all Americans age 60 to 80, and almost everyone over age 80, have the disease, but has been shown in young individuals also. Diverticulitis, infection of the diverticula, is a deceptive and insidious disease. Only about 20% of individuals with diverticulosis will have symptoms of infection, such as change in bowel habit, abdominal pain, nausea, bloating, and/or diarrhea. The most common symptom is tenderness around the left side of the lower abdomen. However, while severe infection is infrequent it can lead to complications such as systemic infection, perforations, blockages, or bleeding. Bleeding may occur in about 5% of patients and diverticulosis accounts for 30 to 50 percent of cases with mass bleeding from the colon. Some cases involving diverticular hemorrhage require surgery and in patients with reoccurring diverticulitis.

Diverticular disease is typically treated with high-fiber diets, particularly the fermentable type, like that in Dreamfields pasta, to relieve symptoms and reduce constipation that could increase the likelihood of further diverticula development or infection to occur. Fiber keeps stools soft, reduces constipation and lowers pressure inside the colon so that bowel contents can move through more easy. Recommended daily fiber intake levels made by various world health agencies typically range between 20-35 grams<sup>11,29</sup>, coming from foods such as fruits, vegetables, grains and nuts or from manufactured food products containing mixed fiber types to contain at least 30% of fermentable fiber sources. Dreamfields pasta is a rich source of fiber, containing 4 grams of fermentable fiber per serving and 5 grams of fiber overall.

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