

Gut Bacteria and Irritable Bowel Syndrome

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By: Eamonn, M. M. Quigley M.D., M.B., B.Ch., B.A.O., Professor, Weill Cornell Medical College; Medical Director, Lynda and David Underwood Center for Digestive Disorders; and Chief, Gastroenterology and Hepatology, Houston Methodist Hospital, Houston, TX



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At a Glance

Bacteria are very small organisms (microbes) that are normally in the gut (intestines). There are over 500 different kinds known to live in the gut. Most bacteria are in the large intestine (colon).

Some bacteria can cause infection. These are called pathogens.

Antibiotics are medicines that destroy bacteria. They can change the balance of the number and kind of gut bacteria. Changing the normal balance may put some people at risk for IBS.

On the other hand, if there are too many or the wrong kinds of bacteria in the small intestine, antibiotics may make IBS symptoms better.

Some kinds of bacteria, in the right amount, can be helpful. These are called probiotics. In some people, changing the kind of gut bacteria with probiotics may make symptoms of IBS better.

We still do not know the exact role bacteria may have in IBS. More medical research is needed.

Bacteria are present in the normal gut (intestines) and in large numbers the lower parts of the intestine. They achieve concentrations of several billion in the colon. These “normal” bacteria have important functions in life:

- They protect against infection by “bad”, or pathogenic, bacteria
- They help the immune system of the gut to develop
- They produce a variety of substances, including some essential vitamins, that have an important nutritional value

Together, the normal bacteria are often referred to as the gut flora. A variety of factors may disturb the mutually beneficial relationship between the flora and its host, and disease may result. For example, temporarily suppressing the normal flora in the colon can be a side effect experienced by a susceptible person after taking a course of antibiotics to treat an infection. This then provides the opportunity for bacteria that can cause disease to take hold.

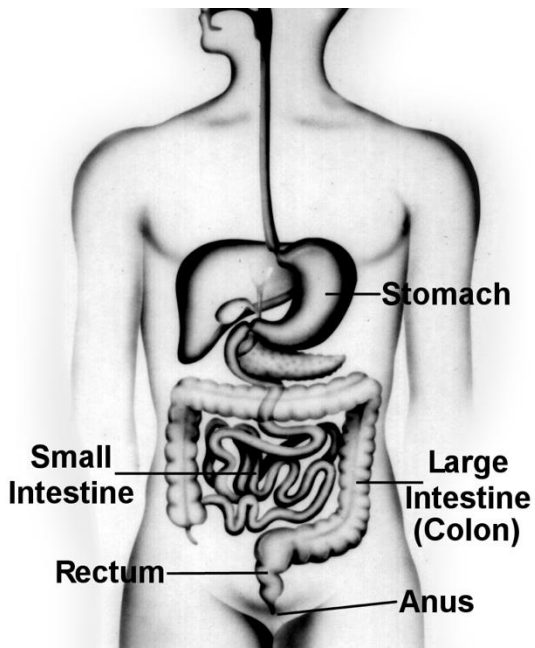
Many consider a different disturbance in the interaction between the flora and the host to be the fundamental cause of ulcerative colitis and Crohn’s disease. In these instances, the type or quantity of bacteria in the gut may not be abnormal. Instead of peaceful and mutually beneficial coexistence, the host responds to the normal bacteria as if they were disease causing. The result is intense inflammation.

Do Bacteria Play a Role in IBS?

The possibility that gut bacteria could have a role in irritable bowel syndrome (IBS) may surprise some; there is indeed, now quite substantial evidence to support the idea that disturbances in the bacteria that populate the intestine may have a role in at least some patients with IBS. What is this evidence? It can be summarized as follows:

1. Surveys which found that antibiotic use, well known to disturb the flora, may predispose individuals to IBS,
2. The observation that some individuals may develop IBS suddenly, and for the first time, following an episode of stomach or intestinal infection (gastroenteritis) caused by bacterial infection,
3. Recent evidence that a very low level of inflammation may be present in the bowel wall of some IBS patients, a degree of inflammation that could well have resulted from an abnormal interaction with bacteria in the gut,
4. The suggestion that IBS may be associated with the abnormal presence, in the small intestine, of types and numbers of bacteria that are normally found only in the large intestine; a condition termed small intestinal bacterial overgrowth (SIBO),
5. Accumulating evidence to indicate that altering the bacteria in the gut, by antibiotics or probiotics, may improve symptoms in IBS.

There is now considerable evidence directly supporting the concept of post-infectious IBS. In this situation, an individual who was previously well develops IBS-type symptoms following an episode of gastroenteritis while all others affected recover quickly and suffer no long-term effects. Some people seem to be especially at risk: those who have an especially severe infection, females, and those who have psychological issues prior to the infection. Post-infectious IBS may explain only a minority of cases of IBS but does represent a clear link in those more at risk between exposure to an environmental factor (such as contaminated food or water), the inflammation it produces, and IBS.



Is there a Role for Antibiotics in Treating IBS?

More recently, the role of the gut bacteria in IBS has taken a step further with the suggestion that some IBS patients may harbor in the small intestine increased numbers of bacteria as well as types of bacteria normally found only in the colon. This condition is called small intestinal bacterial overgrowth (SIBO). The observation that a course of antibiotic(s) may improve symptoms supports a role for SIBO in IBS.

Normally, bacteria are virtually absent in the acid environment of the stomach and are few in the upper gut. They increase considerably in the lower parts of the small intestine, and then dramatically on crossing into the colon. A number of factors can lead to SIBO. These include an absence of stomach acid, suppressed gut motility, areas of narrowing (strictures) that restrict movement of gut contents, or abnormal connections (fistula) present between the colon and the upper small intestine. Of these, in IBS, only abnormal gut motility has been found and then not consistently. Why SIBO should be as common as some report in IBS is not clear.

This novel theory of IBS has been the target of much criticism on several grounds. Firstly, IBS symptoms are non-specific and SIBO may mimic them, regardless of cause. Secondly, the hydrogen breath test, a test that has been the one most widely used in the diagnosis of SIBO in this context, is subject to considerable error. Thirdly, studies of the impact of antibiotics have been relatively short-lived. Finally, other researchers have failed to confirm a high rate of SIBO in IBS. Still, one has to explain why at least some IBS patients respond to a course of antibiotics. This has most recently been reported by Pimentel and his colleagues in a study where they treated IBS patients with the antibiotic rifaximin (an antibiotic that is not absorbed into the blood but stays in the gut).

There may be other explanations for a role for antibiotics in IBS. A suppression of certain species of bacteria in the colon, and especially those bacteria that are prone to produce gas and other substances through fermentation, could also explain these responses. A recent report from Sharara and colleagues supports this suggestion. They described an improvement of gas-related symptoms, with antibiotic therapy, among a group of patients with bloating and flatulence, who did *not* have evidence of SIBO. Antibiotics clearly, therefore, help some IBS patients though how this happens may be more complex than originally thought.

One must remain cautious, pending long-term studies, in recommending a prolonged course of antibiotic therapy to any group of individuals regardless of the safety profile of a given antibiotic. This is an important issue, as IBS tends to be a chronic and relapsing condition. While some patients obtain a relatively long-lasting improvement following a single course

A variety of recent research studies have provided direct and rather compelling evidence for a role for inflammation in the bowel's inner lining (mucosa) in IBS. This is low-grade inflammation and far less than that seen in the true inflammatory bowel diseases, ulcerative colitis and Crohn's disease. Interestingly, it has been found among patients in whom there were nothing to suggest that their IBS began with an infection. What suddenly causes this inflammation, in the absence of an obvious earlier infection, is not clear. We may speculate that subtle changes in the bacterial population in the intestines might be driving it.

There is, indeed, some evidence that some IBS patients may be genetically predisposed to an exaggerated inflammatory response to the normal bacteria. While the inflammatory theory of IBS is in its infancy, there is already some evidence for the extension of the inflammatory process beyond the confines of the gut wall. This could explain some of the symptoms such as tiredness and fibromyalgia that may occur in IBS sufferers.

For some time, various studies have suggested the presence of changes in the kind of colonic flora in IBS patients. The most consistent finding is a relative decrease in the population of one species of "good" bacteria, *bifidobacteria*. However, the methods employed in these studies have been subject to question, and other studies have not always reproduced the findings. Nevertheless, these changes in the flora, be they primary or secondary, could lead to the increase of bacterial species that produce more gas and other products of their metabolism. These could contribute to symptoms such as gas, bloating, and diarrhea.

of antibiotic, others do not. As emphasized in a journal editorial by Drossman, responses to antibiotic therapy in IBS are far from spectacular; further studies are needed before clear recommendations can be made.

Is there a Role for Probiotics in Treating IBS?

Given their safety profile, probiotics, if effective would, at first sight, appear to be more attractive as a means to influence the gut flora in IBS. Are probiotics effective in IBS? There have been several studies of a variety of probiotics in IBS. It is only recently that these have been of the quality needed to come to firm conclusions. There was some evidence, even in the earlier studies, of symptom improvement especially in “gas-related” symptoms. Still, the evidence was by no means consistent. More recently, there has been some evidence of benefit from some probiotic combinations. However, the best evidence relates to a particular organism, *Bifidobacterium infantis* 35624. Studies have shown this strain to be superior to placebo in relieving the main symptoms of the irritable bowel syndrome (abdominal pain/discomfort, distension/bloating and difficult defecation).

Summary

Many recent findings add to a growing body of evidence to suggest that IBS, like inflammatory bowel disease, may result, at least in part, from a dysfunctional interaction between the gut flora and the host. This leads to a low-grade inflammation in the gut wall that may spill over into the circulation and affect other areas. Some researchers propose a role for bacterial overgrowth in the small intestine as a common factor in causing the symptoms of IBS. Other evidence points to more subtle changes in the colonic flora. Both hypotheses remain unconfirmed. Nevertheless, short-term therapy with either antibiotics or probiotics does seem to reduce symptoms among some IBS patients. Whether or not these effects come about through subtle and perhaps localized changes in the number or type of bacteria in the colon and/or small intestine, it is evident that manipulation of the flora, whether through the administration of antibiotics or probiotics, deserves further attention in IBS.

Further reading

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537 Long Point Road, Suite 101
Mt Pleasant, SC 29464

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