Why IBD is so hard to treat—and how scientists are making progress

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Inflammatory bowel disease (IBD) is a life altering chronic illness that is rising dramatically globally. It is stubbornly difficult to treat, and many people find the treatments we have just don't work for them.

Over the last 30 years, there has been almost a 50% increase in cases—now affecting around 5 million people. Not to be confused with irritable bowel syndrome (IBS), which is a condition that affects the digestive system, IBD is more serious. It is the term for two severe illnesses called Crohn's disease and ulcerative colitis. More women are diagnosed with Crohn's disease while more men are affected by ulcerative colitis.

People with IBD can experience a variety of symptoms, ranging from diarrhea and blood in the stool to weight loss and belly aches. On paper, this may sound no worse than mild food poisoning; however, this is no normal stomach upset.

Experiences are often extreme; people with IBD can suffer excruciating pain and in some cases, require surgery to remove parts of the bowel. This is done by redirecting the bowel to a hole in the abdomen, where feces are collected in a colostomy bag.

However, we still don't fully understand the cause of IBD.

The impact of inflammation

The main symptom of IBD is excessive and uncontrolled inflammation —normally a sign of the body fighting off an infection. Although

inflammation is an important aspect of our immune system, in IBD it is happening when the body is not under attack. Since we don't know what causes this over-the-top reaction, treatments are limited to managing the derailed immune system.

Inflammation is controlled by cell signaling. Our cells detect bacteria using receptors that attach to parts of bacteria. This activates the receptor, causing it to send a signal to proteins, and each protein sends on more signals, creating a signal cascade. This is what tells the body it's under attack.

Many treatments follow the strategy of intercepting signals and preventing the signal cascade from starting. However, they are not effective for many people.

Scientists are trying to target a different protein network, called NOD2, that often goes haywire in people with IBD but is not targeted by current treatments. A protein, called RIPK2, seems like a promising target since it is only found in this network. Researchers from the European Molecular Biology Laboratory are investigating its structure to help scientists design a new medication that will block the signals from this protein.

Importance of the microbiome

Another inspiration for new treatments comes from the bacteria residing in our guts. This community of bacteria, called the gut microbiome, has been associated with all sorts of health conditions ranging from asthma to obesity.

Gut bacteria work closely with our bodies and play a vital role in digesting food and managing our immune system. In a healthy person, there is a fine balance between gut bacteria and the immune system.

Disruption of this balance can lead to disease, starting from minor discomfort to more severe, long-term conditions.

Scientists are trying to understand how our bodies interact with gut bacteria, and what changes when people develop IBD.

The gut microbiome is an ecosystem. Just like a forest has animals eating different things, microbes can form a food web. Some bacteria will use up one type of food, while others feed off other foods. Some rely on the waste of other bacteria after they've eaten. It is now believed that disruption to the gut microbiome is a characteristic of IBD and contributes to its development and progression.

It's a chicken and egg situation. Is there a change in the bacteria and food web that alters our bodies? Or does something else in the body, like our immune system, change the food web, subsequently limiting which bacteria can grow? Scientists aren't sure of the answer.

Instead of trying to figure out what happens first, a team at the Hudson Institute of Medical Research in Australia have focused on investigating which interactions in the food web are the most affected in IBD. This could help scientists to prioritize certain gut bacteria, or their food source, to restore the balance in the microbiome and improve patients' symptoms.

Hopefully, this specialized targeting of the microbiome will lead to more effective and longer lasting treatments.

Although we have a long way to go before these ideas for treatments can become a reality, it is a step in the right direction. Targeting a new signaling pathway will hopefully control the inflammation in more patients. And studying the microbiome may reveal how we can reverse changes associated with IBD.

Since they are key features of IBD, these developments could allow doctors to stop the disease in the early stages and reduce complications.

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