

# Viruses may play unexpected role in inflammatory bowel diseases

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Inflammatory bowel diseases are associated with a decrease in the diversity of bacteria in the gut, but a new study led by researchers at Washington University School of Medicine in St. Louis has linked the same illnesses to an increase in the diversity of viruses.

The scientists found that patients with inflammatory bowel diseases had a greater variety of [viruses](#) in their digestive systems than healthy volunteers, suggesting viruses likely play a role in the diseases.

The research appears online Jan. 22 in *Cell* and in the journal's print edition on Jan. 29.

Scientists only recently started recognizing the role of the microbiome—the bacteria in and on the body, and the bacteria's genes—in illness. For example, changes in the [gut microbiome](#) have been linked to obesity, diabetes, metabolic syndrome and inflammatory bowel diseases.

The new research is the first to associate disease with changes in the virome, or the viruses in the human body and their genes. According to the researchers, the results raise the possibility that viruses may have unrecognized roles in obesity and diabetes and the two most common inflammatory bowel diseases, Crohn's disease and [ulcerative colitis](#).

The findings suggest that scientists should be studying the virome as closely as the microbiome, said senior author Herbert W. Virgin IV,

MD, PhD.

"This is the tip of the iceberg," he said. "A significant portion of the viral DNA we identified in these patients is unfamiliar to us—it comes from newly identified viruses we don't know much about. We have a great deal of groundwork to do, including sequencing the genetic material of these viruses and learning how they interact with the gut and [gut bacteria](#), before we can determine if changes in the virome cause these conditions or result from them."

The Centers for Disease Control and Prevention estimates that inflammatory bowel diseases affect about 1 million people in the United States. Crohn's disease and ulcerative colitis are thought to involve misdirected immune attacks on [gut tissue](#) and can lead to weight loss, bleeding in the gut and rectum, and loss of appetite. Surgery to remove part of the bowel is often necessary to treat Crohn's disease.

Virgin and his colleagues studied three groups of patients with Crohn's disease or ulcerative colitis living in Chicago, Boston and the United Kingdom. In each group, they compared viral DNA purified from the feces of participants with viral DNA from the feces of healthy people living in the same areas and, in some cases, the same homes.

"Much of the increased viral diversity in participants with inflammatory bowel diseases was in the form of bacteriophages, which are viruses that infect bacteria and can incorporate themselves into the bacteria's [genetic material](#)," said Virgin, the Edward Mallinckrodt Professor of Pathology and head of the Department of Pathology and Immunology.

Changes in the gut that eliminate bacteria in inflammatory bowel diseases may unleash bacteriophages in the dying bacteria, Virgin speculated. Or the introduction of a new bacteriophage to the gut, perhaps through the foods in a person's diet, may trigger a reaction in the

digestive system or the microbiome that causes the disorders, he said. It's also possible that a combination of these mechanisms may contribute.

To develop better treatments for inflammatory bowel diseases, scientists need to learn more about how the gut microbiome and the gut virome interact with a patient's genes.

"We know that mutations in human genes affect the risk of inflammatory bowel diseases, and scientists also are exploring how bacterial genes may influence risk," Virgin said. "Our results show that the virome's potential effects on the [gut](#) also need to be a part of these investigations."

The researchers are developing an animal model of inflammatory bowel diseases to make it possible to determine whether human, bacterial or viral genes, or some mixture of all three, are driving these illnesses.

Provided by Washington University School of Medicine

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