

Gut microbes battle a common set of viruses shared by global populations

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The human gut is home to a teeming ecosystem of microbes that is intimately involved in both human health and disease. But while the gut microbiota is interacting with our body, they are also under constant attack from viruses. In a study published online in *Genome Research*, researchers have analyzed a bacterial immune system, revealing a common set of viruses associated with gut microbiota in global populations.

Viruses that prey on bacteria, called phages, pose a constant threat to the health of [bacterial communities](#). In many ecological systems, viruses outnumber [bacterial cells](#) ten to one. Given the richness of bacteria in the [human gut](#), it was not surprising that scientists have found that phages are also highly prevalent. But how can viruses targeting [gut microbiota](#) be identified? How do viral communities differ between people and global populations, and what could this tell us about human health and disease?

In this report, a team of scientists from Israel has taken advantage of information coded in a bacterial immune system to shed new light on these questions. Bacteria can "steal" small pieces of DNA from phages that attack them, and use these stolen pieces to recognize and respond to the attacker, in a manner similar to usage of [antibodies](#) by the [human immune system](#). The stolen DNA pieces are stored in specific places in the [bacterial genome](#) called CRISPR loci (clustered regularly interspaced short palindromic repeats).

"In our study we searched for such stolen phage DNA pieces carried by bacteria living in the human gut," said Rotem Sorek of the Weizmann Institute of Science and senior author of the study. "We then used these pieces to identify DNA of phages that co-exist with the bacteria in the gut."

Sorek's team used this strategy to identify and analyze phages present in the gut microbiota of a cohort of European individuals. They found that nearly 80% of the phages are shared between two or more individuals. The team compared their data to samples previously derived from American and Japanese individuals, finding phages from their European data set also present in these geographically distant populations, a surprising result given the diversity of phages seen in other ecological niches.

Sorek explained that their findings mean that there are hundreds of types of viruses that repeatedly infect our gut [microbiota](#). "These viruses can kill some of our gut bacteria," said Sorek. "It is therefore likely that these viruses can influence human health."

The authors note that as evidence for the beneficial roles played by bacteria in the healthy human gut continues to mount, it is critical that we understand the pressures placed upon the "good" bacteria that are vital to human health. "Our discovery of a large set of phages attacking these good bacteria in our gut opens a window for understanding how they affect human health," Sorek added. Researchers can now begin to ask how phage dynamics in the gut changes over time, and what it might tell us about diseases, such as inflammatory bowel disease, and how to more effectively treat them.

Scientists from the Weizmann Institute of Science (Rehovot, Israel) and Tel Aviv University (Tel Aviv, Israel) contributed to this study.

More information: *Genome Res* [doi: 10.1101/gr.138297.112](https://doi.org/10.1101/gr.138297.112)

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