# Healthy humans make nice homes for viruses

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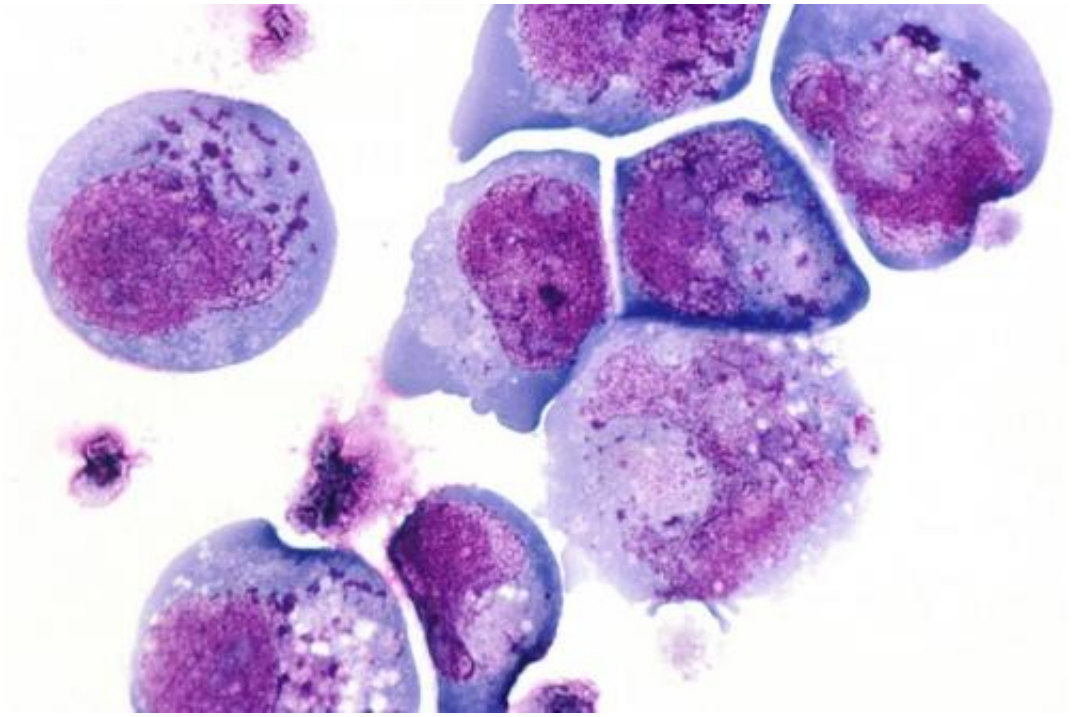

Human herpesvirus 6, pictured above, is just one of numerous viruses found living in and on the bodies of healthy humans. The virus commonly causes illness in young children but is found in the mouths of some healthy young adults, where its presence indicates an active viral infection despite a lack of symptoms. Credit: Wikimedia Commons (Public Domain)

The same viruses that make us sick can take up residence in and on the human body without provoking a sneeze, cough or other troublesome symptom, according to new research at Washington University School of Medicine in St. Louis.

On average, healthy individuals carry about five types of viruses on their bodies, the researchers report online in *BioMed Central Biology*. The study is the first comprehensive analysis to describe the diversity of viruses in healthy people.

The research was conducted as part of the Human Microbiome Project, a major initiative funded by the National Institutes of Health (NIH) that largely has focused on cataloging the body's bacterial ecosystems.

"Most everyone is familiar with the idea that a normal bacterial flora exists in the body," said study co-author Gregory Storch, MD, a virologist and chief of the Division of Pediatric Infectious Diseases. "Lots of people have asked whether there is a viral counterpart, and we haven't had a clear answer. But now we know there is a normal viral flora, and it's rich and complex."

In 102 healthy young adults ages 18 to 40, the researchers sampled up to five body habitats: nose, skin, mouth, stool and vagina. The study's subjects were nearly evenly split by gender.

At least one virus was detected in 92 percent of the people sampled, and some individuals harbored 10 to 15 viruses.

"We were impressed by the number of viruses we found," said lead author Kristine M. Wylie, PhD, an instructor of pediatrics. "We only sampled up to five body sites in each person and would expect to see many more viruses if we had sampled the entire body."

Scientists led by George Weinstock, PhD, at Washington University's Genome Institute, sequenced the DNA of the viruses recovered from the body, finding that each individual had a distinct viral fingerprint. (Weinstock is now at The Jackson Laboratory in Connecticut.) About half of people were sampled at two or three points in time, and the

researchers noted that some of the viruses established stable, low-level infections.

The researchers don't know yet whether the viruses have a positive or negative effect on overall health but speculate that in some cases, they may keep the immune system primed to respond to dangerous pathogens while in others, lingering viruses increase the risk of disease.

Study volunteers were screened carefully to confirm they were healthy and did not have symptoms of acute infection. They also could not have been diagnosed in the past two years with human papillomavirus infection (HPV), which can cause cervical and throat cancer, or have an active genital herpes infection.

Analyzing the samples, the scientists found seven families of viruses, including strains of herpes viruses that are not sexually transmitted. For example, herpesvirus 6 or herpesvirus 7 was found in 98 percent of individuals sampled from the mouth. Certain strains of papillomaviruses were found in about 75 percent of skin samples and 50 percent of samples from the nose. Novel strains of the virus were found in both sites.

Not surprisingly, the vagina was dominated by papillomaviruses, with 38 percent of female subjects carrying such strains. Some of the women harbored certain high-risk strains that increase the risk of cervical cancer. These strains were more common in women with communities of vaginal bacteria that had lower levels of *Lactobacillus* and an increase in bacteria such as *Gardnerella*, which is associated with bacterial vaginosis.

Adenoviruses, the viruses that cause the common cold and pneumonia, also were common at many sites in the body.

It's possible that some of the viruses the researchers uncovered were latent infections acquired years ago. But many viruses were found in body secretions where the presence of a virus is an indicator of an active infection. Dormant or latent viruses hide in cells, not in body fluids such as saliva or nasal secretions, Wylie explained.

A further direction for researchers is to distinguish between active viral infections that aren't causing symptoms and those that are making a person sick.

"It's very important to know what viruses are present in a person without causing a problem and what viruses could be responsible for serious illnesses that need medical attention," said Storch, the Ruth L. Siteman Professor of Pediatrics. "While more research remains, we now have a much clearer picture of the communities of viruses that naturally exist in healthy people."

**More information:** Wylie KM, Mihindukulasuriya KA, Zhou Y, Sodergren E, Storch GA, Weinstock GM. Metagenomic analysis of double-stranded DNA viruses in healthy adults. *BioMed Central Biology*, online Sept. 10, 2014.

Provided by Washington University School of Medicine