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Study of unexplained respiratory infections leads researchers to new virus

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An ongoing effort to identify the microorganisms that make us sick has discovered a new virus potentially linked to unexplained respiratory infections.

Clinicians can typically use a patient's symptoms to determine that a virus is the likely culprit in a respiratory infection. However, even with advanced testing they still can't pin the blame on a particular virus in roughly one-third of all such infections.

Scientists can't yet prove that the new virus, known as the WU virus, is making patients sick. But senior author David Wang, Ph.D., of Washington University School of Medicine in St. Louis, is suspicious enough that he's started follow-up studies.

"We've completed the first step required to link the WU virus to disease," explains Wang, who is an assistant professor of molecular microbiology. "First, you have to detect the potential pathogen in someone who's sick. Then you have to develop a way to grow the new microorganism in the laboratory. Finally, you have to show that you can make an animal model sick by exposing it to the microorganism."

These steps, known to microbiologists as Koch's postulates, were established in the 19th century. Wang says they represent the scientific "gold standard" for linking a microorganism to disease, but as technology has made it possible for scientists to identify viruses before culturing them, the postulates haven't always been followed. For

example, scientists have long accepted the hepatitis C virus as a cause of disease, but they only successfully grew it in the lab in the past year.

The research appeared in Public Library of Science Pathogens on May 4. It was supported in part by a grant from the Midwest Regional Center of Excellence for Biodefense and Emerging Infectious Disease Research, a multi-institutional research center anchored at Washington University.

For the study, collaborators at The Royal Children's Hospital in Melbourne, Australia, provided samples from patients with respiratory infections. Despite an exhaustive battery of tests, Australian researchers had not been able to link the infections to any known pathogen.

Wang's lab used a technique called high throughput DNA sequencing to study patients' nasal secretions. The approach involves chopping up all genetic material from the secretions and rapidly and randomly reading the coding of that material.

They found signs in one patient of a virus with limited similarity to polyoma viruses. The genetic material of the new virus is arranged in a similar fashion, encoded in circular, double-stranded DNA, and the virus's five proteins have similarities to the proteins of other polyoma viruses.

Other previously identified polyoma viruses are widespread in the general population, where they typically produce no symptoms. Scientists have shown in animal models that they can produce multiple tumors, but they are still not certain if the viruses can have the same effects in humans.

In patients with immune deficiencies, polyoma viruses can pose serious health threats. For example, one of the most infamous polyoma viruses, the JC virus, is a leading secondary infection in HIV patients. It causes a

life-threatening neurological disorder called progressive multifocal leukoencephalopathy.

After identifying the WU virus in the lungs of the Australian patient, researchers found it in the respiratory tract secretions of another 43 patients in Australia and St. Louis, suggesting that the virus may be geographically widespread. There are early suggestions that the virus may be a secondary infection more likely to invade when hosts already are dealing with another infectious agent.

Polyoma viruses previously have been named after the initials of the patient in whom they were first discovered. Given enhanced patient privacy measures such as the United States' Health Insurance Portability and Accountability Act, that's no longer possible. So the virus was named after Washington University.

In addition to the follow-up needed to link the WU virus to respiratory disease, Wang will try to determine if the virus has more serious effects in patients with suppressed immune systems.

Source: Washington University School of Medicine