Proteins in your runny nose could reveal a viral infection

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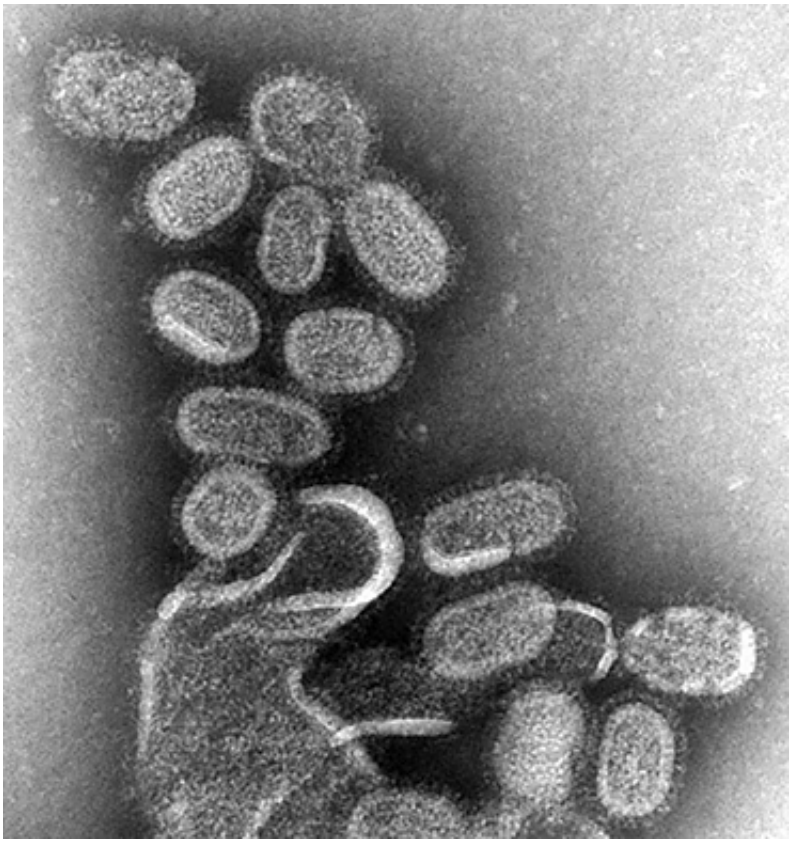

Electron microscopy of influenza virus. Credit: CDC

It may seem obvious, but the key to confirming whether someone is suffering from a cold or flu virus might lie at the misery's source—the inflamed passages of the nose and throat.

Duke Health scientists have identified a group of proteins that, when detected in specific quantities in the mucous, are 86 percent accurate in confirming the infection is from a cold or flu virus, according to a small, proof-of-concept trial published online in the journal *EBioMedicine*.

The researchers hope their initial work identifying the protein signature could aid the development of a quick, noninvasive doctor's office test to determine the cause of upper respiratory illness and appropriate treatment.

"Every day, people are taking time off from work, going to emergency rooms, urgent care or their primary care doctors with symptoms of an upper respiratory infection," said Geoffrey S. Ginsburg, M.D., Ph.D., a senior author of the paper and director of the Duke Center for Applied Genomics & Precision Medicine (DCAGPM), which led the study. "Looking for these proteins could be a relatively easy and inexpensive way of learning if a person has a viral infection, and if not, whether the use of antibiotics is appropriate."

Although upper respiratory infections are among the most common reasons people visit the doctor in the U.S., health care providers lack tools to distinguish between a bacterial infection that might warrant antibiotics and a viral infection that would instead call for symptom relief.

Widespread use of antibiotics for upper respiratory infections don't benefit patients with viral illness and can contribute to antibiotic-resistant superbugs, Ginsburg said. More precise diagnoses of these infections could be another tool to curb the development of superbugs, he said.

For the trial, researchers infected 88 healthy adult volunteers with a common strain of cold or flu virus.

Some participants didn't get sick. Among those who developed infections, researchers found a distinct set of 25 proteins in fluid samples they gathered by flushing about 2 teaspoons of saline through the participant's nasal passages.

Duke researchers in genomics and precision medicine have spent the past decade exploring strategies for differentiating bacterial and viral infections with the goal of developing cost-effective diagnostic tools doctors could use in their offices.

"In the past, science has focused on identifying the pathogen someone is infected with in the blood or other sample," said lead author Thomas Burke, Ph.D., director of technology advancement and diagnostics at the DCAGPM. "Our approach flips the paradigm of how we look for infection. Instead of looking for the pathogen, we study the individual's response to that pathogen and signature patterns in their genes, proteins, metabolites and other biomarkers."

The Duke team has previously explored blood tests to examine a patient's RNA for gene signatures to distinguish bacterial and viral infections in the upper respiratory tract and is working with a private company to develop potential diagnostics.

Analyzing proteins in mucous is a less invasive approach and requires less processing than blood samples. The researchers hope additional studies verify the initial results and lead to the development of a paper-based test that could be used in doctor's offices or even at home to determine whether a doctor's visit is necessary, said Christopher Woods, M.D., a senior author and associate director of applied genomics at the DCAGPM.

"The protein targets offer a faster, more cost-effective model for rapid screening and diagnoses of viral infections," Woods said. "If the data are

verified, the model could be valuable in many circumstances, such as rural settings or developing countries with less convenient access to health care, or even as an airport screening tool during an outbreak of a particularly threatening strain of flu."

More information: Thomas W. Burke et al, Nasopharyngeal Protein Biomarkers of Acute Respiratory Virus Infection, *EBioMedicine* (2017). DOI: 10.1016/j.ebiom.2017.02.015

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