Researchers working on nasal spray to block COVID-19

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A team of researchers, including faculty from the University of Mississippi schools of Pharmacy and Medicine, are developing a treatment that could be effective at preventing COVID-19. The good news is that it's something that you can easily carry in your bag.

The treatment would take the form of a nasal spray that could be prescribed by a doctor and self-administered. A daily dose of this spray could make those taking it more resistant to COVID-19.

The group of researchers is led by Joshua Sharp, a UM associate professor of pharmacology, and Ritesh Tandon, an associate professor of microbiology and immunology at the University of Mississippi Medical Center. They have collaborated with a team from the Rensselaer Polytechnic Institute led by Robert Linhardt, professor of chemistry and chemical biology in the RPI School of Science.

Sharp explained the science behind how viruses infect people, and how their treatment works.

"Some viruses use a family of sugars known as heparan sulfate, which is present on the surface of pretty much every cell in your body, to stick to the surface of the cell," Sharp said. "Once they're stuck on that surface sugar layer, it's easier for the virus to find the specific protein it uses to enter the cell."

SARS-CoV-2, the virus that causes COVID-19, appears to follow that pattern. Fortunately, Sharp and Tandon believe they've found a way to prevent this.

The treatment uses heparin, a complex sugar that has been used as an anticoagulant for nearly 80 years, to block the virus from attaching to and entering cells. Heparin is closely related to heparan sulfate, a sugar that exists on the surface of cells and is used by many viruses to attach to the cells.

Sharp and Tandon have conducted early tests with a pseudotyped virus. This is a virus that has been altered so it attaches to and enters cells in a manner similar to SARS-CoV-2, but is unable to make copies of itself. That means the pseudotyped virus is noninfectious, so it is safe to work with while allowing the researchers to see how the presence of heparin affects it.

"We found very interesting results," Tandon said. "Heparin was really effective against this virus, and it could neutralize the virus."

The use of a nasal spray came from data showing that COVID-19 establishes itself in the nasal cavity, making a spray a potentially effective way to prevent infection.

"Several groups have published data that indicate that most COVID-19 infections probably start with the virus infecting cells lining the nasal cavity," Sharp said.

Linhardt thinks the nasal spray could be very helpful in slowing the spread, especially in those who aren't showing symptoms.

"The reason why we like it is that it's very early intervention," Linhardt said. "It may be useful for asymptomatic people, people who have been exposed and maybe don't have the disease yet, or people who are just beginning to get it."

As for next steps, the team hopes that they can soon move on to clinical trials and confirm that the heparin nasal spray is safe for humans to take before testing its effectiveness against infection. If so, this treatment could be an easy-to-use safeguard against COVID-19 for many.

More information: Ritesh Tandon et al. Effective Inhibition of SARS-CoV-2 Entry by Heparin and Enoxaparin Derivatives, (2020). DOI: 10.1101/2020.06.08.140236

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