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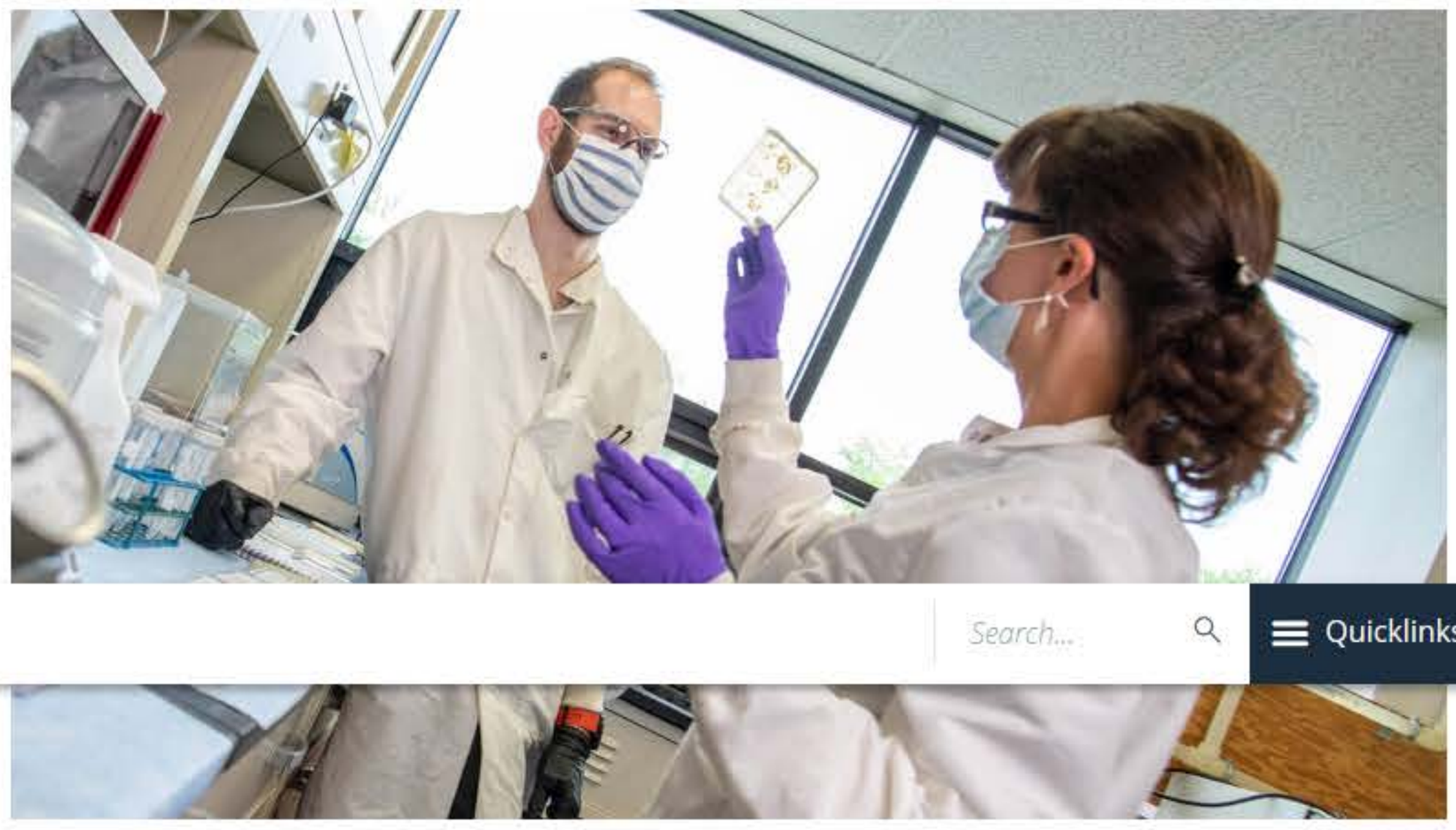

UMaine, UMass Amherst researchers bioengineering novel membrane to capture COVID-19 airborne droplets

July 21, 2020

Detection and analysis of airborne coronavirus droplets using a bioengineered membrane is the focus of exploratory research at the University of Maine and University of Massachusetts Amherst, funded by the National Science Foundation (NSF).

Their inspiration comes from nature — the pitcher plant, with its liquid membrane that traps insects.

The project, led by UMaine biomedical engineer Caitlin Howell and UMass Amherst chemical engineer Jessica Schiffman, received a more than $225,000 NSF EAGER award — early-concept grants for exploratory research. Collaborating on the project is UMaine virologist Melissa Maginnis.

According to NSF, EAGER funding supports "untested, but potentially transformative research ideas or approaches." The research typically involves "radically different approaches, applies new expertise or engages novel disciplinary or interdisciplinary perspectives."

The spread of COVID-19 via aerosolized droplets by talking, coughing and sneezing is a major concern during the coronavirus pandemic. The interdisciplinary research team at UMaine and UMass Amherst hopes to develop novel technology to facilitate the efficient collection of viruses from bioaerosols.

Their model for the membrane technology is the carnivorous Nepenthes pitcher plant, which has a slippery rim and inner walls that cause insects to fall and become trapped within its digestive fluid. The team will engineer a composite material with a liquid layer on the surface of a membrane to capture pathogenic particles for analysis.

The goal is to develop a membrane that can be used as an insert in any air filtration system to capture virus-containing droplets and make them easier to collect from the insert for analysis. The technology would be inexpensive and widely deployable in high-risk locations, such as hospitals, schools, elder-care facilities and travel hubs.

"Disease-causing agents such as the novel coronavirus (SARS-CoV-2) that take form as bioaerosols present unique challenges for disease surveillance, containment, and treatment," noted the researchers in their NSF proposal. "This work will fill a critical gap in current methods of monitoring the spread of disease."

Previous attempts to design aerosol collection systems for viruses have had limited success due to either the difficulty of retrieving intact virus particles from a solid filter surface or inadequate or low air filtration rates.

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