

## **Pandemic Driven Innovation and Post Pandemic Collaborations- The Emergency Medicine and Emerging Pathogens Laboratory Teams**

Despite working within walking distance of each other and sharing the goal of delivering optimal health outcomes, the departments of Emergency Medicine (EM) and the Emerging Pathogens Laboratory (EPL) at the University of Nebraska Medical Center (UNMC) initially followed parallel paths. This changed in early March 2020 when an unexpected collaboration was sparked.

Under the cover of darkness, a team of healthcare professionals from the National Quarantine Unit (NQU) were positioned on the Eppley Airfield tarmac, awaiting the arrival of passengers potentially infected with COVID-19 from the Diamond Princess cruise ship. The NQU team, donned in personal protective equipment (PPE), prepared isolation units to transport the passengers to the NQU homebase at UNMC for SARS-CoV-2 testing and care.

Dr. Jana Broadhurst and her EPL team developed one of the nation's first polymerase chain reaction (PCR) test assays to detect SARS-CoV-2. However, the daunting task remained: collecting diagnostic specimens of a highly virulent pathogen.

### *The Problem*

The nasopharyngeal (NP) swab technique, the preferred method for collecting samples of the SARS-CoV-2 virus, is invasive, potentially painful, and often induces sneezing and coughing. The first NP swab from a Diamond Princess passenger was memorable. An NQU physician, in full PPE including an N-95 mask and face shield, attempted the collection. The passenger's eyes watered, and clear discharge dripped from the nose. Despite attempts to cooperate, the passenger gagged and sneezed, sending a fine ribbon of mucus onto the collector's face shield. This scenario, with variations like coughing and vomiting, repeated over the next forty-plus days of their NQU stay.

### *Pandemic Driven Innovation*

Meanwhile, the Nebraska Medicine Emergency Department, just a five-minute walk away, saw an influx of patients with COVID-19 symptoms. Dr. Thanh Nguyen, working in the emergency department (ED), faced the same challenge: obtaining adequate specimens while ensuring the safety of his healthcare team. Utilizing 3D printing and fabrication resources in the ED's MakER Lab, Dr. Nguyen and colleagues developed the MicroWash—a nasal lavage device designed to gently irrigate the nasal cavity and recollect the resulting nasal effluent solution for testing.

With the MicroWash prototypes ready, Dr. Nguyen collaborated with EPL to validate the device's efficacy. Guided by Dr. Andy Schnaubelt, pilot studies demonstrated that MicroWash specimens consistently had high specimen adequacy, appropriate for diagnostic testing. Furthermore, the MicroWash had a pain rating of 0.3/10 and an

acceptance rating of 100%, compared to the nasal swab's 8/10 pain rating and 25% acceptance.

### *Better Sampling for Community Surveillance*

Since the pandemic began, Dr. Broadhurst and the EPL team have studied immune responses to SARS-CoV-2 by testing blood for antiviral antibodies. The team is now working to characterize antibodies in the upper airway that protect against new strains of SARS-CoV-2 and influenza. Initially, EPL used a traditional nasopharyngeal irrigation method that involved injecting saline into the nose and allowing it to drain into an open basin. Though effective, this method is messy and carries a risk of exposing the healthcare professionals collecting the specimens.

The MicroWash has shown potential to replace this conventional method of upper airway sampling for antibody measurement with a safe and easy self-collection approach that may prove ideal for community-based surveillance of antiviral antibodies. Building on this experience, Dr. Broadhurst, in collaboration with Dr. David Brett-Major and the Emerging Threats Epidemiology Group, has incorporated MicroWash collections into extramural funding proposals for clinical and public health research. This collaboration between EM and EPL not only addressed immediate challenges but also forged a partnership that continues to enhance community health through innovative research and improved diagnostic methods.



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