Innovative project solves testing swab shortage with 3-D-printed swabs

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An innovative effort launched in April and led by a fellow in the UCLA Biodesign program has yielded positive results, solving the health system's shortage of nasopharyngeal swabs—a key element in

COVID-19 testing—at a time when Southern California is seeing a rise in new cases and new deaths per day.

On April 24, UCLA Health announced the project and institutional review board (IRB) approval of a protocol for a validation study of new swabs. In just over a month, and after conducting rigorous clinical testing of several 3-D-printed swab prototypes on patients with COVID-19, UCLA Health was granted permission from the Food and Drug Administration to use the most promising design, which is from Resolution Medical LLC.

"With the rapid spread of the new coronavirus, testing supplies—especially nasopharyngeal swabs—were suddenly in high demand and short supply on a local, national, and even global scale. After working with a variety of manufacturers to test various designs, we now have a secure source to supply all of UCLA Health's swabs as the need for COVID-19 testing continues to grow," said Gabriel Oland, MD, a general surgery resident at UCLA David Geffen School of Medicine and a fellow in the UCLA Biodesign program, who helped lead the effort to test swabs that could be manufactured swiftly and in large quantities.

Unlike swabs with woven fiber at the tip—similar in appearance to cotton swabs found in stores for consumer use, but made with longer shafts and sterile, spongy materials—UCLA Health's new swabs, like many others, consist of a single plastic material from tip to tip, with a lattice design to collect a sample at one end.

"Given that it's only using one material, 3-D printing is perfect for rapid output," Oland said.

"COVID-19 is spreading rapidly in California, and more than half of new cases in the last two weeks have been in Los Angeles County," said

Omai Garner, Ph.D., director of clinical microbiology testing for UCLA Health. "Before the pandemic, we used about 200 nasopharyngeal swabs a day, but now we need 500-600 for COVID-19 testing alone, and we anticipate needing over 1000 each day in the coming months."

Garner and Oland conducted the study with principal investigator Annabelle de St. Maurice, MD, assistant professor of Pediatrics and co-chief infection prevention officer at UCLA Health.

"Although we hoped the Los Angeles area would be spared the brunt of the COVID-19 pandemic, we had to move with urgency to address the testing swab shortage," de St. Maurice said. "Results of our collaboration mean that UCLA Health is now well-positioned to meet the needs of our community as testing becomes increasingly important."

Desert Horse-Grant, senior director of UCLA Health Research and Innovation and co-executive director of UCLA Biodesign, worked with UCLA Health leadership to coordinate the 3-D-printed swab task force with the study's framework and objectives. She tapped Oland to co-lead the task force because his combination of skills gave him "the expertise to think through COVID-19 obstacles and outsmart them with the right experts."

Oland has medical and surgical experience—including treating COVID-19-positive patients—an undergraduate degree in biomedical engineering and a familiarity with production methods like 3-D printing. He had been working to develop a noninvasive intracranial pressure monitoring device before pivoting to the swab task force in lieu of an externship that would normally come at the end of the UCLA Biodesign fellowship year.

Although the FDA normally requires lengthy and thorough testing and validation of new medical products, swabs fall into a category for which

the onus of validation instead rests with hospitals and clinical labs. "It's not an easy task, but it was imperative that we executed the study right so we could offer the best results for our patients," Oland said, adding that he has been impressed with the way industry, healthcare systems and regulatory agencies have adapted and worked together to solve this problem under unusually tight time constraints.

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