VACCINES AND DIAGNOSTICS

COVID-19 INITIATIVES

DR. SIDI BENCHERIF has developed a biomaterial-based vaccine platform that could be leveraged for COVID-19 vaccine development. His strategy is based on an injectable biomaterial that could slowly release in the body as an adjuvant (one used in common U.S. vaccines), as well as SARS-CoV-2 antigens. The vaccine will therefore be engineered to recruit and activate immune cells against SARS-CoV-2 antigens, ultimately mounting a strong and long-lasting immune response against SARS-CoV-2.

DR. JIAHE LI is engineering an immune adaptor to enhance vaccines against influenza by targeting its receptor, STING, in humans. Coronaviruses can inhibit the STING protein to evade the immune system. Dr. Li proposes to engineer the STING protein with resistance to deactivation by coronavirus so that the STING proteins can become a more potent tool to augment our immune response against coronavirus replication.

DR. LI is also proposing research in quickly identifying areas and surfaces contaminated by COVID-19 to mitigate future need for diagnosis. Although disinfection on large suspected areas is effective, it is not practical or economical to apply this type of approach to disinfect all high-risk public areas, e.g., public transportation. Dr. Li proposes to develop a functional swab that can capture COVID-19 at low densities from a large surface area via COVID-19-specific binding peptides, perform an immune assay on the swab, and rapidly acquire results using smart phones with commercially available microscope lens **(figure 1).**

DR. MING WANG is proposing research on a rapid home test kit for COVID-19 detection. Current numbers show that a significant percentage of the population may carry the virus without symptoms, creating a need for a kit that may be used at home in addition to being available at all local clinics.

DR. NIAN SUN is developing new sensing techniques for diagnosing COVID-19 in air and solutions in a matter of seconds, rather than hours or days. Dr. Sun's preliminary data shows that the virus can be detected in the air from the breath of a patient in approximately 1–2 seconds with nearly 100 percent specificity, which is a dramatic improvement from the current technology.

DR. ED GOLUCH has developed a diagnostic platform that can adapt to detect the surface spike protein of COVID-19 from a nasal swab from patients with symptoms in five minutes. The platform is simple enough for home testing, and once adapted, Dr. Goluch has already identified a company that can manufacture the test.
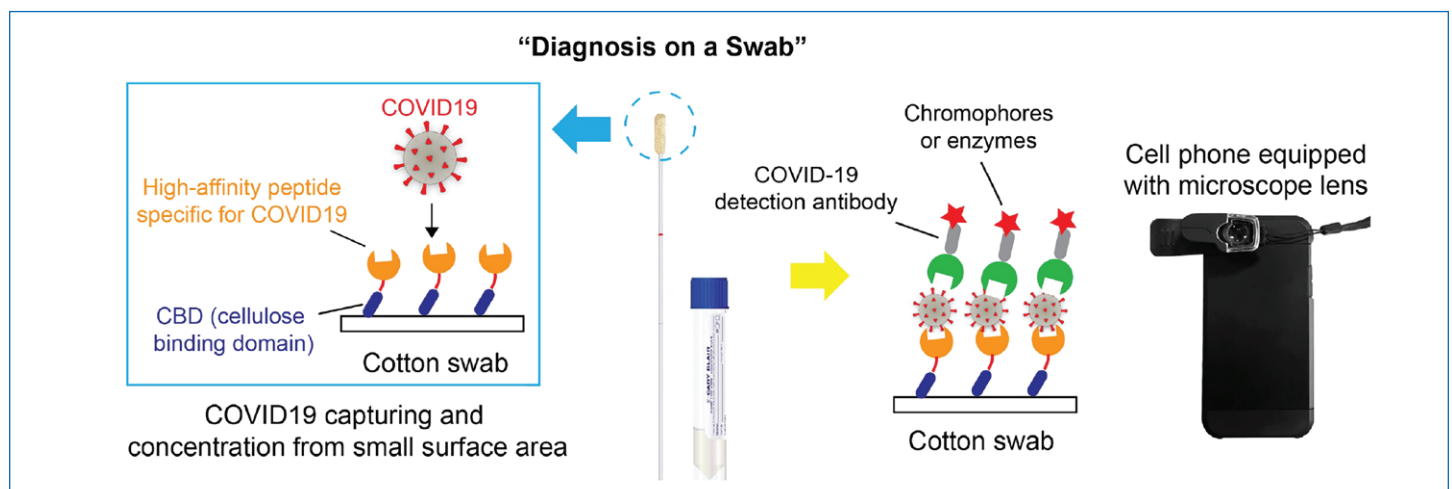

"Diagnosis on a Swab"

COVID19

High-affinity peptide specific for COVID19

CBD (cellulose binding domain)

Cotton swab

COVID19 capturing and concentration from small surface area

Chromophores or enzymes

COVID-19 detection antibody

Cotton swab

Cell phone equipped with microscope lens

FIGURE 1