THE SCIENCE COALITION

A Year of Innovation:
Catalyzing Research to Combat COVID-19

Since day one, member institutions of The Science Coalition have been working to combat the COVID-19 crisis from every angle. Using fundamental research as their foundation, university scientists and researchers jumped into action. With the aid of federal research agency partners and key federal investments, these researchers are forging new treatments, finding creative solutions to ever-changing problems, and working alongside public health officials to understand the long-term effects of the virus.

Boosting Testing Capacity

A team at **Indiana University** is developing a breathalyzer-like test to quickly detect COVID-19 by identifying the scent in breath altered by the virus. Using breath samples from people who have tested positive and negative for COVID-19, the researchers, who received funding through the National Science Foundation, are developing technology to test many individuals in a short amount of time, significantly curbing the spread of the virus.

A **UC Santa Cruz** researcher spearheaded the development of a new COVID-19 test that can provide results in less than 20 minutes. Using an optical biosensor to measure antibody levels in the blood, the test is quicker than other methods but maintains the "gold standard" of accuracy associated with slower tests. While the test cannot diagnose active infections, understanding antibodies in the immune system may help to establish a minimum baseline of antibody levels in order for an individual to be considered protected and assess the prevalence of infections across communities.

Supplying Medical Equipment

In response to the high demand for nasal swabs, a team of researchers at the **University of South Florida** designed, tested, and produced a 3D-printed nasal swab to be used for COVID-19 tests. The swabs have been shown to work just as well as regular nasal swabs in diagnosing the virus and were designed using FDA-approved surgical grade material. They could serve as a standard model for 3D printed swabs tests as health care systems across the country work to increase their testing capacities.

Mitigating the Spread

Princeton University scientists helped to conduct the largest COVID-19 contact tracing study, monitoring more than 500,000 people in India to understand the factors most affecting the virus's spread. The research found superspreaders, who represent only a small portion of total infections, posed the greatest risk, and children and young adults may be driving transmission. Additionally, the research found shutdown orders help to curb mounting cases, providing public health insights to inform future policy decisions. The work was supported by the National Science Foundation.

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Innovating Treatments

Stanford University researchers are developing a single-dose vaccine for COVID-19 that could be more easily stored and transported than current options. Pivoting their research from vaccines for HIV, Ebola, and influenza, the lab added the coronavirus spike protein to nanoparticles to form the basis for their vaccine. Some nanoparticle formulations can be kept at room temperature, so the potential vaccine could eliminate a significant barrier in delivering doses to low and middle income countries, curbing the pandemic worldwide.

With a funding grant from the National Institutes of Health (NIH), a team of researchers at **West Virginia University** will lead an eight-state consortium to broaden the National COVID Cohort Collaborative. The member states will provide patient registry data to create a large, granular dataset from which patient outcomes from various treatments can be assessed. The eight states selected to participate represent a cross section of patients varying in age, weight, socioeconomic status, and health care access. The resource will provide critical insights to curate personalized, lifesaving care protocols as NIH works to develop treatment regimens for COVID-19 across patient populations.

Designing Preventative Technology

Scientists at **Massachusetts Institute of Technology** transitioned their work on diagnostic algorithms to create an artificial intelligence model to distinguish asymptomatic individuals infected by COVID-19 from their healthy peers based on the sound of their cough. The model accurately identified 100 percent of people known to have COVID-19. The team is working to scale the technology into an app that people could use at home as a first step in identifying a potential infection.

Addressing Social Outcomes

Researchers at **Columbia University** conducted a study that analyzed New Yorkers' mobility during exponential growth periods of the COVID-19 pandemic, finding that low income populations and communities of color used the subway most often, increasing their risk of infection. The research, funded by the National Science Foundation, demonstrates how early mitigation efforts, including social distancing, compounded pre-existing health disparities among essential workers. Their findings will be an important consideration in future health policy as decision makers work to balance transmission risk with socioeconomic burdens.

Urban vegetation could slow the spread of COVID-19 by improving air quality and keeping people socially distanced, according to **Auburn University** researchers. Their study found areas with higher amounts of green space were associated with lower cumulative cases of COVID-19, suggesting smart planning for urban vegetation could be an important factor in mitigating future public health crises. The researchers also found urban vegetation had a positive impact on mental health.