COVID-19 Research Highlights

Across the State University System of Florida, faculty, researchers, and students have been actively engaged in research to address a variety of issues associated with the COVID-19 pandemic. The System has utilized its strengths across disciplines to help the state, country, and world respond to the pandemic. This document highlights activities and initiatives from each of the 12 State University System Institutions as of November 2020. These examples are only a small snapshot intended to demonstrate the breadth of research occurring across the System in a wide array of disciplines ranging from the Fine Arts to Medicine and Engineering.

System Collaboration

- **FAMU**, **FSU**, and Leon County collaborated to assess COVID-19's impact on hurricane evacuation plans and the potential impact of mitigation measures.
- **FIU** and **UCF** are collaboratively looking at health outcomes experienced by communities of color, with a focus on access of healthcare services.
- **FSU** and **UF** conducted a virtual interdisciplinary symposium on October 19th as part of the joint UF-FSU Clinical and Translational Science Award program. This event provided a space for discussions on current and planned COVID-19 research and provided participants with an overview of available resources to support their research.
- **UF, FSU,** and **USF** are collaborating on a study to prevent blood clotting induced by COVID-19 infections.

Lifecycle of the Infection

- **FAU**, **FIU**, **UF**, **UNF**, and **USF** are conducting various research projects to understand the onset of COVID-19.
- **FGCU** is developing point of care antibody tests.
- **UF** is conducting a trial on outpatient blood clot prevention in adults age 40-79.
- **USF** developed a sensor array that can detect a scent in a person's breath unique to the virus that causes COVID-19. USF is also partnering with leading detection dog training firm Valhall K9 International to determine if technology can be joined with the dog's natural ability to produce a low-cost and simpler virus detection system for large crowds.

Manufacturing & Product Development

- **USF** designed a 3D-printed nasal cotton swab through a partnership with Formlabs. The patent-pending files were made available free for a year so that health entities around the world can produce the swabs at a low cost.
- **UCF** is developing a cough drop to reduce the spread of COVID-19.
- **FAU** is developing a web-based knowledge base and risk evaluation tool.
- **UCF** is working to develop rapid disinfectants.
- **POLY** is exploring artificial intelligence (AI)-based biosensing for selective testing of the virus within minutes.

Vulnerable & Underserved Populations

- **FAMU** and **FIU** are both conducting studies that seek to uncover barriers to testing and vaccination.
- **FAMU** is conducting research on improving health equity and minimizing secondary impacts of the pandemic.
- **NCF** is working with the Multicultural Action Team in the community to promote prevention, education, advocacy, and solutions to mitigate the spread among minority communities.
- **FSU** is conducting research on the long-term mental health impacts on elderly populations.

Across Disciplines

- **FSU** is conducting research on economic impacts on small businesses and entrepreneurs.
- **UCF** is using virtual reality technology to deliver mental health treatments to first responders working through the pandemic.
- **UNF** developed an interdisciplinary team that is researching COVID-19's mental health impact on healthcare workers.
- **UNF** published research on COVID-19's impact on the criminal justice system.
- **UWF** was awarded an NSF grant to analyze new strategies for reducing the spread of viral infection through air travel.

Seed Funding

- **FSU** created a virtual COVID-19 Collaborative Collision interdisciplinary networking program to connect faculty with complementary expertise, facilities, and resources, and provided seed funding to 26 projects.
- **USF** formed the Pandemic Response Research Network (USF-PRRN) to coordinate research across a wide range of subject matter "hubs," allowing faculty and students from a variety of disciplines to collaborate on the various issues and problems emerging from the pandemic and work toward creating solutions to the immediate challenges facing the nation and the world. USF provided 42 rapid response seed grants, designed to begin research with an eye toward securing external funding (i.e., National Science Foundation Rapid Response Grants) and private sector partnerships to advance the projects.
- **UF** developed a Rapid Response Pilot Program through its Clinical Translational Science Institute. This initiative has funded 19 research projects across multiple disciplines, such as Medicine, Public Health, Engineering, Journalism, and Veterinary Medicine.

For additional information regarding these research initiatives and some additional research projects currently underway across the System, please refer to the following pages.

Florida Agricultural & Mechanical University

- **College of Pharmacy, Pharmaceutical Sciences Institute of Public Health**
  - o Dr. Karam Soliman, Associate Dean for Research and Innovation, Pharmaceutical Sciences, Florida Agricultural & Mechanical University (FAMU), is working on a project focused on the use of flavonoid supplements to prevent SARS-CoV-2 infection. This project is under consideration for initial clinical investigation in collaboration with research partners at the Mayo Clinic in Jacksonville, FL and Meharry Medical College.
  - o Dr. Soliman is working on a project to expose social, behavioral, and ethical factors that may influence COVID-19 testing, treatment, and vaccination among racial, ethnic, and vulnerable correctional, nursing, and mental hospital populations in Gadsden County.

- **Google, LLC COVID-19 Artificial Intelligence and Data Science for Social Good Fund Award**
  - o Dr. Richard A. Aló, Dean of the College of Science and Technology at FAMU, has been selected as part of a team to work collaboratively in Google LLC's COVID-19 Artificial Intelligence and Data Analytics for Social Good project. The project is focused on improving health equity, minimizing secondary effects of the pandemic, and monitoring and forecasting of disease spread.

- **COVID-19 PCR Testing and Analysis**
  - o FAMU has been operating a COVID-19 PCR (nasal swab) testing site since April 2020 and has administered approximately 55,000 tests. In partnership with Thermo Fisher, FAMU announced a major expansion of its capabilities to process samples from students, faculty, and staff and to offer its services to Florida's other Historically Black Colleges and Universities at no-cost. Testing clinics operated by HBCUs in Florida may send their samples to FAMU for analysis, and results will be reported back to the ordering physician.

Florida Atlantic University

- **Capturing Ephemeral and Time-bound Data on the Subjective Perceptions of Resilience of Individuals and Households**
  - o A research group led by Dr. Alka Sapat and funded by NSF seeks to capture ephemeral and time-bound data on the subjective perceptions of the resilience of individuals and households, including their coping and adaptive capacities. These individuals and households face multiple challenges, including health risks, precarious housing conditions, and exposure to weather and climate hazards, within the context of rapidly evolving policy mandates and short-term measures (e.g., moratoriums on evictions) to address the uncertainties stemming from the growing and increasingly wide-spread COVID-19 pandemic.

- **Social Networks and Machine Learning, Facilitated by Molecular Genetics and Viral Infection, for COVID-19 Modeling and Risk Evaluation**
    o Researchers from the FAU College of Engineering and Computer Science, in collaboration with FAU's Schmidt College of Medicine, received a one-year, $90,000 NSF RAPID project grant to conduct research using social networks and machine learning, facilitated by molecular genetics and viral infection, for COVID-19 modeling and risk evaluation. The project will create a web-based COVID-19 knowledge database and a risk evaluation tool for individuals to assess their infection risk in a dynamic environment.

- **Developing a Data-driven Algorithm to Identify Patterns of Onset, Detection, Progression, and Recovery from COVID-19**
    o A BCBS/Florida Blue Foundation funded study of 100 test subjects aims to develop a data-driven algorithm to identify patterns of onset, detection, progression, and recovery from COVID-19 in a targeted population of FAU College of Medicine healthcare providers and trainees by observing body temperature, heart rate, breathing rate, and related measures as well as illness symptoms such as fever, cough, and fatigue. Biological samples will also be used to identify COVID-19 infection (molecular detection by PCR) and recovery (serological immunity by IgG and IgM). The physiological measures will be collected with the OURA ring. Ultimately, researchers may be better able to identify patterns that could predict the emergence and recovery from novel infections and thereby prevent and contain future pandemics.

Florida Gulf Coast University

- **Lee County COVID-19 Antibody Study**
    o This three-phase project aims to 1) collect, analyze and interpret point of care COVID-19 antibody assay tests on a cross-section of Lee County Residents and validate a random sample using gold-standard neutralization assay techniques, 2) evaluate potential acute multi-system effects among first responders, and 3) conduct sewage testing to quantify nucleic material of COVID for population-based COVID epidemiology.

Florida International University

- **Community-Engaged Research on COVID-19 Testing Among Underserved and/or Vulnerable Populations**
  - This project will examine the impact of COVID-19 on vulnerable populations and barriers to testing and uptake of future vaccines, the effectiveness of community engagement to increase the uptake of COVID-19 testing in the underserved communities, acceptability, sensitivity, and specificity of using less invasive testing methods compared to nasopharyngeal swabs. Over 1,000 participants will receive free? COVID-19 testing as part of the project.

- **Examining the Impact of Micro and Ecological Disparities on COVID-19 Health-Related Outcomes in the United States**
  - This project consists of an examination of the health outcomes experienced by communities of color and accessing and providing healthcare services. The endeavor is a collaboration between the FIU Community-Based Research Institute in the College of Public Health and UCF Population Health in the College of Medicine.

- **COVID-19 Supplement: Novel Long Noncoding RNAs in the Airway Mucous Response**
  - The overarching goal is to identify and characterize the early host immunomodulatory factors that might predispose to severe hyperinflammatory state to novel severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), the causative agent of the COVID-19 disease.

Florida Polytechnic University

- **Artificial Intelligent Assisted Nano-enabled Biosensing for Intelligent COVID-19 Pandemic Management**
  - POLY is exploring artificial intelligence (AI)-based biosensing for selective testing of the virus within minutes in response to demand for an efficient sensing system for the rapid testing of the COVID-19 infection. This collective approach will be useful to manage COVID-19 intelligently and successfully.

- **Manipulate Nanomedicine Against COVID-19, a Future Therapy**
  - POLY is exploring nano-biotechnology and the design of nanomedicine for targeted delivery to recognize and eradicate the virus without causing side-effects. Such approaches are novel and may be the basis of future COVID-19 therapy.

- **Tiny Drones to target COVID-19 with flavonoids**
  - Recent scientific work has demonstrated the potential of flavonoids in serving as prophylactics or therapeutics for COVID-19. A new AI-designed nanoparticle drone has been developed, which can also deliver the flavonoids more effectively.

Florida State University

- **Collaborative Collision Interdisciplinary Networking Program**
    - o On April 10th, FSU's Office of Research Development hosted a virtual COVID-19 edition of the Collaborative Collision interdisciplinary networking program to connect faculty with complementary expertise, facilities, and resources and catalyze projects focused on addressing the impacts of COVID-19. After the event, 26 projects were funded a combined total of $400,000. Those projects were in late August and have since resulted in 20 publications or external proposals submitted, with an additional 56 publications planned for submission soon.

- **Social, Psychological, and Economic Impact of COVID-19 on Older Adults**
    - o Several projects focus on the social, psychological, and economic impact of COVID-19 on older adults. For example, a team from FSU's Department of Psychology explored how social distancing policies and ethical debates on treatment priorities may disproportionately exacerbate experiences of social isolation, perceived expendability, and exposure to suffering. These factors can increase the risk of suicide in older adults. However, innovative efforts to expand access to telecommunications, including telemedicine, can decrease this risk by lessening feelings of isolation.

- **COVID-19's Impact on the Economy, Businesses, and Workers**
    - o The FSU College of Business has over 25 ongoing projects related to COVID-19's impact on the economy, businesses, and workers. Highlights include an examination of the impact of expanding paid leave policies, remote worker mental health and productivity, financial impacts of life insurance providers, and the effect of the pandemic on small businesses and entrepreneurs.

New College of Florida

- **Collaboration between Multicultural Action Team and Multicultural Health Institute**
    - o New College has joined a regional initiative led by the Multicultural Health Institute (MHI) and Tidewell Hospice and supported by a grant through the Manatee County CARES Act Community Health and Wellbeing Program. The partnership, known as the Multicultural Action Team, brings together community non-profit organizations to protect the health and well-being of at-risk Manatee County residents. Several New College students, faculty, and staff are collaborating to promote prevention, education, advocacy, research, linkage to care, and sustainable solutions to mitigate the spread of COVID-19.

- **Understanding Covid-19: An Interdisciplinary Approach to the Pandemic**
    - o New College has created a course that explores the current pandemic through an interdisciplinary lens, including biology, epidemiology, data science, history, politics, economics, sociology, literature, ethics, religion, and arts. The course was collaboratively designed by more than 20 different faculty. The course will also include an internship that will allow students to work with Dr. Lisa Merritt at MHI and help in the institute's efforts to address the impact that the pandemic has had on the local community.

University of Central Florida

- **Cough drops to control COVID-19 Spread**
  - o Researchers at UCF, led by Engineering Assistant Professor Michael Kinzel, are developing a cough drop that could reduce the spread of COVID-19 by making saliva heavier and stickier, which would make particles ejected through sneezing and coughing fall rather than float. This would reduce the transmission distance of the virus, which is important as people return to work and school, where maintaining six feet of social distance may be difficult.

- **Rapid Acting Disinfectant**
  - o Researchers from engineering and the medical school are working with an alum who runs her own research and development technology company to develop a new, rapid-acting, long-lasting disinfectant spray that instantly kills viruses without using harsh chemicals. Current disinfectant products for killing viruses like the coronavirus take minutes to fully sanitize surfaces, which is not practical on high-contact areas such as door handles, elevators, and banisters.

- **Mental and Behavioral Health Support**
  - o The RESTORES program at UCF conducts research on methods for treating PTSD and anxiety and has developed a virtual reality infused method of delivery therapy that is highly effective and is currently used by the military. Through two CARES grants, RESTORES is providing one-on-one sessions and follow-up care to first responders. A separate grant is giving the faculty at RESTORES the opportunity to provide advice to residents of the Azalea Park community on managing stress using virtual platforms. The neighborhood is a hotspot for COVID and also experiencing high levels of unemployment. RESTORES, led by Professor Deborah Beidel, will be studying how effective the use of apps and other virtual platforms is in helping residents manage their stress.

University of Florida

- **RNA nanoparticle vaccines targeting SARS-Cov-2,** Elias Sayour MD, Ph.D. (Associate Professor of Neurosurgery and Pediatrics)
  - o This research involves the development of a novel prophylactic vaccine for prevention of COVID-19 disease. Dr. Sayour's lab has developed specialized nanoparticle vaccines that deliver messenger RNA encoding for tumor antigens or viral antigens and stimulate a potent immunologic response against the targeted antigens. They have demonstrated in preclinical studies that these vaccines elicit a broad spectrum of immune responses, including cellular immune responses and antibodies. Dr. Sayour's group has received FDA-approval to begin studies of RNA nanoparticle vaccines against cancer and the lab has adapted this potent vaccine technology to target components of the novel coronavirus, SARS-Cov-2. Dr. Sayour has generated data sufficient for a recent application to FDA for an Investigational New Drug (IND) application to evaluate preventative COVID-19 vaccines.

- **CLEARED: Culture of Living Biopsies for Emerging Airway-pathogens and Respiratory Disease (3D printing of lungs and SARS-Cov-2),** Greg Sawyer, Ph.D. (Professor of Mechanical & Aerospace Engineering)
    - o Dr. Sawyer and colleagues have used an innovative 3D printing system that allows the embedding of living tissues and cells into a viable matrix where they can be studied using high-power microscopy and video imaging. Using living lung tissues embedded in a clear 3D matrix, Dr. Sawyer's team is studying the early events of viral infection in the lungs by the SARS-Cov-2 virus. This engineered living 3D system allows an understanding of how the virus gains entry into the lungs and spreads through human tissues and evaluation of the effectiveness of drugs and drug combinations in blocking the spread of the virus.

- **ACT-IV Phase III COVID-19 Outpatient Thrombosis Prevention in Adults 40-79,** Eileen Handberg, Ph.D., ARNP (Department of Medicine), Betsy Shenkman, Ph.D. (Professor and Chair, Department of Health Outcomes and Bioinformatics), and Carl Pepine, MD (Professor of Medicine & Cardiology)
    - o One of the major approaches to treating COVID-19 infection is trying to prevent blood clotting induced by the virus that can lead to significant complications for infected patients. The ACT-IV Phase 3 outpatient study intervenes early in the course of disease in patients that do not need hospitalization using thrombosis prevention strategies to determine the severity of disease progression in adult patients can be reduced. The UF Health OneFlorida Clinical Research Consortium has been chosen as the vanguard U.S. site for coordination of enrollment in the trial with the goal of enrolling the majority of the 7,000 subjects in the state of Florida. UF, FSU, and USF are collaborating SUS institutions in this study.

University of North Florida

- **SARS-CoV-2 Rapid Detection**
    - o A group of UNF physicists and engineers are developing technology based on surface-enhanced Raman spectroscopy to detect the presence of the SARS-CoV-2 virus. Their projects are particularly focused on addressing the stability and shelf-life of the sensor substrate to ensure the efficacy of portable and rapid detection.

- **Impact of COVID-19 on Healthcare Workers**
    - o UNF researchers in health administration, nutrition, public health, and mental health counseling are teaming together to investigate the impact of the pandemic on healthcare professionals. This includes research on employment, telehealth utilization, and interprofessional collaboration across Florida.

- **COVID-19 Pandemic and the Criminal Justice System**
    - o Faculty in UNF's Department of Criminology & Criminal Justice published a special journal volume on the impact of the pandemic on the criminal justice system, including topics such as targeted releases of prisoners, immigrant detention, and judicial actions. The work led to over 200 radio and television interviews.

University of South Florida

- **USF Forms Pandemic Response Research Network**
  - Formed in the early days of the crisis, the USF Pandemic Response Research Network (USF-PRRN) coordinates research across a wide range of subject matter "hubs," allowing faculty and students from a variety of disciplines to collaborate on the various issues and problems emerging from the pandemic and work toward creating solutions to the immediate challenges facing the nation and the world. Through the hubs, researchers came together in transdisciplinary teams that then received institutional support in 42 USF Rapid Response Seed Grant projects, designed to begin research with an eye toward securing external funding (i.e., National Science Foundation Rapid Response Grants) and private sector partnerships to advance the projects.

- **Bull Nose: A Multi-prong XPRIZE Contender that Exemplifies the PRRN and Corporate Partner Strategy**
  - The first round of grants under USF's COVID-19 Rapid Response Research Grant effort was a project led by USF College of Engineering Professor Sal Morgera, whose expertise is building biologically-inspired software that can address the impact of disease in human neural networks. The Bull Nose team also developed a sensor array that can detect VOCs in a person's breath and identify a VOC "signature" unique to the virus that causes COVID-19. The team is now partnering with a leading detection dog training firm, Valhall K9 International, to determine if technology can be joined with the dog's natural ability to produce a low-cost, easy to use virus detection system for large crowds. The project is a semi-finalist for a share of the $5 million XPRIZE for rapid COVID-19 detection.

- **3D Printed Testing Swabs Address a Global Shortage**
  - The USF-designed 3D-printed nasal swab is now being used by hospitals, academic medical centers, state governments, and international agencies and health care facilities across the nation and around the world. The USF Health Department of Radiology team of Dr. Summer Decker, Dr. Todd Hazelton, and Dr. Jonathan Ford worked round-the-clock for a week with Northwell Health, New York's leading healthcare provider, to create the initial design and develop a prototype. The team then collaborated with Formlabs to optimize the design and maximize the number of swabs that could be printed–a process that normally takes years was reduced to just two weeks. The USF Technology Transfer Office made the patent-pending design files available to hospitals and universities free for the first year, allowing health care entities to produce a swab for less than 30 cents each.

University of West Florida

- **Spread of Viral Infections Through Air Travel**
    - Dr. Ashok Srinivasan, the William Nystul Eminent Scholar Chair and professor in the UWF Computer Science Department, is researching the spread of viral infections through air travel. He cites advances in air travel for why the COVID-19 virus has spread quickly and reached pandemic status. Dr. Srinivasan also heads an interdisciplinary, multi-university project in which researchers analyze new strategies for reducing the risk of spreading viral infections through air travel. The National Science Foundation awarded a grant to UWF for the Viral Infection Propagation Through Air-Travel, or VIPRA, project that includes seven faculty, along with 13 additional experts, who agreed to collaborate.