EMORY UNIVERSITY | Office of the Senior Vice President for Research

2022 Research Highlights

Dear Colleagues,

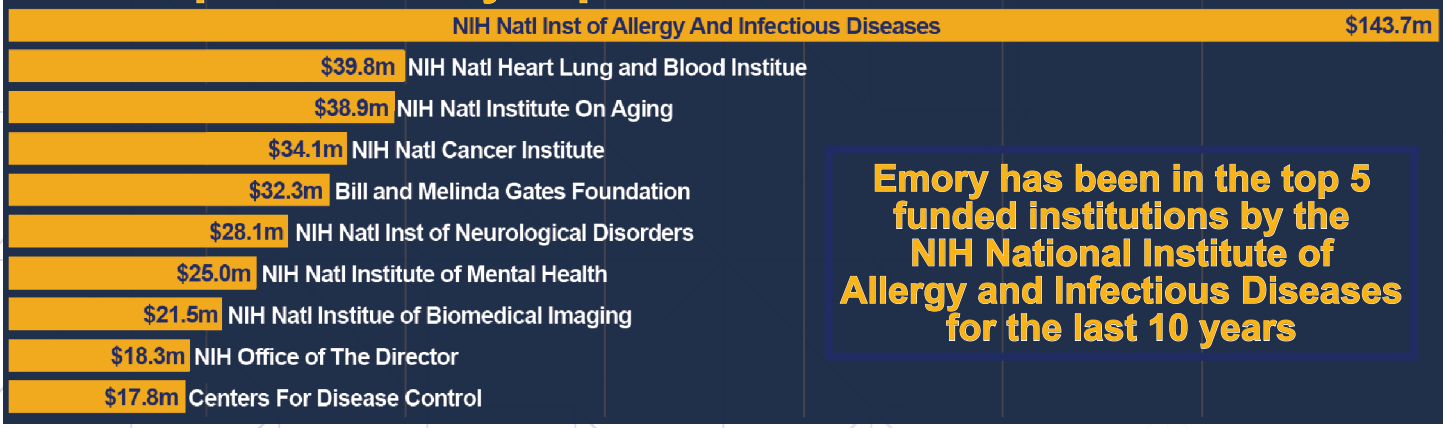
As we begin a new year and a new semester, I wanted to take a moment to congratulate you on the myriad of research that you have achieved over the last year. We highlight just a few of the outstanding achievements of our faculty in 2022 and encourage you to follow our SVPR Newsletter for monthly recognition of faculty grants, awards, and research activities. I sincerely appreciate your dedication, collegiality, and fortitude as we have managed unprecedented growth in many areas of our research enterprise. From enhancing our current strengths in fields such as immunology, brain health, and cancer to rapidly growing our stature with the Provost's initiatives in artificial intelligence, social & racial justice, and climate change, we are actively making a difference every day in the lives of our neighbors in Atlanta, our communities in Georgia, and our human family across the globe. All these successes could not be accomplished without the dedication and collective spirit of our research community, including the nearly 500 staff who support research administration. On behalf of everyone in the Office of Research, thank you for your contributions and partnerships as we continue to make meaningful discoveries that save and improve lives and strengthen Emory's reputation as a leading research university.

Deborah W. Bruner, RN, PhD, FAAN
Senior Vice President for Research
Robert W. Woodruff Professor of Nursing

Infectious Diseases

Immunology is a key pillar of Emory's pursuit of excellence in health care and medicine. By developing targeted solutions for big problems from HIV to Ebola to COVID-19, Emory researchers seek to improve patient outcomes, enable specialized health care services for complex illnesses, and generate discoveries that would not otherwise exist. These achievements speak to the scope and precision of Emory's ability to discover and deliver innovative immunology research.

FY22 Expenditures by Top Sources



Emory has been in the top 5 funded institutions by the NIH National Institute of Allergy and Infectious Diseases for the last 10 years

Working towards an HIV vaccine and potential cure

Rama Rao Amara and **Eric Hunter** received a $5.8 million grant from NIH to advance research aimed at developing an HIV vaccine and potential cure by studying cell immunity among nonhuman primates. The grant will augment the ongoing research being conducted through The Emory Consortium for Innovative HIV/AIDS Vaccine and Cure Research in Nonhuman Primates (CIAR-NHP), a collaborative research project that combines resources from the Emory Vaccine Center and the Emory National Primate Research Center.

Contributing to a clinical trial for an HIV vaccine

Emory is participating in Phase I of a clinical trial for an HIV vaccine. Emory's lead investigator for the trial, **Srilatha Edupuganti**, joins a team that will determine whether HIV immunogens delivered through Moderna's mRNA technology can induce specific B-cell responses that have the potential to lead to broadly neutralizing antibody development, which is a primary goal of HIV vaccination. The researchers will enroll a total of 56 healthy, HIV-negative adult volunteers across all sites. 48 participants will receive one or two doses of the mRNA vaccine, with 32 receiving an additional boosting immunogen. Eight participants will receive the boosting immunogen alone. Researchers will evaluate the resulting immune responses and monitor the participants for safety for six months following vaccination.

Creating a sustainable COVID-19 vaccine and vaccination

Nadine Rouphael was named the Innovator/Researcher winner of the *Atlanta Business Chronicle's* 2022 Health Care Heroes awards. The award stems from her work managing COVID-19 prevention and therapeutic trials. In addition to leading a team that undertook the U.S.'s first COVID-19 vaccine study, Dr, Rouphael co-leads the global Sanofi/GSK vaccine clinical trials that are testing the efficacy of a protein-based approach against SARS-CoV-2 and is Emory's PI for a study of the second-generation Gritstone vaccine, which aims to build broader immunity beyond the viral spike protein that is the basis for current vaccines. She is also investigating a sustainable vaccine strategy for COVID-19, including the potential to develop a vaccine that targets a range of variants.

Natalie Dean received $690,994 from NIAID to undertake a series of flexible vaccine trial design strategies tailored to settings with unpredictable spatiotemporal disease incidence, including unknown outbreak duration, and supporting simultaneous evaluation of multiple vaccine candidates.

Ignacio Sanz received $13.6 million in NIAID funding to undertake a range of projects related to B and T cells, including studying the different types of antibody-secreting cells (ASC) to help improve the ability to design safer and more effective treatments for multiple antibody-mediated diseases and modulatory strategies to optimize protective vaccine responses.

Phil Santangelo received a $701,552 grant from NIAID to develop a synthetic mRNA-based approach for delivery of broadly neutralizing antibodies against HIV to the female reproductive tract (FRT).

Maud Mavigner received $871,843 from NIAID evaluate novel pharmacologic agents targeting the Wnt/β-catenin signaling pathway that controls the self-renewal of long-lived memory CD4+ T cells. Ultimately this project will determine if these interventions disrupt HIV persistence in the rhesus macaque model.

Elizabeth Rogawski McQuade received $118,012 from NIAID to support a project that will bridge the gap between epidemiologic research and public health practice by accelerating the translation of scientific results from two observational and two intervention studies of enteric disease into findings more directly applicable to policy decision-making.

David Stephens received $23.5 million from NIAID to support a range of projects undertaken by the Infectious Diseases Clinical Research Consortium Leadership Group (IDCRCLG) chaired by Dr. Stephens. The IDCRCLG will support clinical research to address NIAID priorities in evaluating vaccines, biologics, therapeutics, diagnostics and devices for the treatment and prevention of infectious diseases and rapidly respond during an epidemic threat.

AI.Humanity

In early 2022, Emory launched the AI.Humanity initiative to enhance its ability to explore the social implications of AI and shape its ethical applications. In addition to ongoing research, an influx of 19 new AI.Humanity faculty will augment Emory's capacity to advance AI research. During the first year of the initiative, Emory researchers developed insights that epitomize the initiative's goals.

Using machine-learning assessment of liver fat to identity patients at risk for severe COVID-19

A recent addition to the School of Medicine as part of Emory's AI.Humanity initiative, **Anant Madabhushi** brings expertise in the development of AI systems to improve outcomes. One of his first successes at Emory was leadership of a team that found patients with nonalcoholic fatty liver disease were 1.5 times likely to develop severe COVID-19. As part of the study, Dr. Madabhishi and his team used a deep learning AI system to automate measurements of liver fat from CT scans. His considerable track record of scholarship and innovation also led to his appointment to the scientific advisory board of SimBioSys, a medicine platform that combines biophysical modeling and AI.

The ability for AI systems to recognize race based on medical imaging

Judy Gichoya, a multidisciplinary researcher in both informatics and interventional radiology, led a team that found an AI algorithm designed to assess medical images (such as CT scans) could also predict the patient's self-reported race. Dr. Gichoya is director of the Healthcare Innovations and Translational Informatics Lab (HITI Lab), a multidisciplinary unit that includes researchers trained in radiology and imaging sciences, systems software engineering, and computer science, among others. The Lab's work includes multiple AI-related projects, such as a machine learning tool to help predict if a COVID-19 patient will need hospitalization within 7 days of the RT-PCR test and an AI that uses mammogram imaging and clinical data to help treat and manage breast cancer.

Predicting and treating sepsis through AI-generated data

NIH's National Institute of General Medical Sciences (NIGMS) provided funding to a team of researchers that will use AI-generated data to identify physiological markers that might be able to predict the onset of sepsis, inform treatment options, and enable the discovery of sepsis sub-types. Led by **Rishikesan Kamaleswaran**, the sepsis AI project follows other AI-focused projects undertaken in conjunction with the Kamaleswaran Lab, including using unsupervised machine learning to analyze and profile airway fluid metabolites in pediatric acute hypoxemic respiratory failure and an equitable AI project that aims to create a publicly-available, high-resolution, labeled dataset of ICU demographic and treatment diversity.

Global Health

Today's global health challenges require a variety of skills, approaches, and insights to develop creative and sustainable solutions. Most importantly, global health requires leadership. The Emory Global Health Institute (EGHI), alongside other partners within and external to Emory, focuses on low- and middle-income countries with the highest burden of preventable disease, disability, and death.

Evaluating WASH interventions in low-middle and middle-income countries

Sydney Hubbard was the foremost Emory author on a *Lancet* article that estimated the burden of disease attributable to water, sanitation, and hygiene (WASH) and the effects of different types of WASH interventions on childhood diarrhoea in low-income and middle-income countries (LMICs). (Global Health). Results indicate that risk of diarrhoea was reduced by up to 50% with water treated at point of use; provision of an improved drinking water supply on premises with higher water quality reduced diarrhoea risk by 52%; providing sewer connection reduced diarrhoea risk by 47%; and promotion of handwashing with soap reduced diarrhoea risk by 30%.

Understanding the potential health effects of using liquefied gas

Emory researchers **Thomas F. Clasen** and **Lisa Thompson** co-authored studies on the health implications of liquefied petroleum gas cookstoves (LPG) in Guatemala, India, Peru, and Rwanda. Published in *Hypertension*, one study found that, compared to cooking with solid fuels, pregnant women who used a gas stove and fuel demonstrated a slight increase in blood pressure, but not at statistically significant levels. The other study, published in *The New England Journal of Medicine*, assessed a potential relationship between LPG cookstoves and birth weight and infant birth weight. The results indicate infant birth weight did not differ significantly between those born to women who used LPG cookstoves and those born to women who used biomass cookstoves. Dr. Thompson is also an an inaugural member of The Emory Climate Research Initiative, launched in late 2022 to address challenges related to climate change, particularly those that intersect with global health.

Recognition of early career research on COVID-19 and global infectious

Kayoko Shioda was was selected as a recipient of the prestigious Marie Skodowska Curie Award, which recognizes Japanese female researchers in the early phases of their careers. Her research has spanned infectious disease outbreak response work in more than 30 countries. In 2022, Dr. Shioda published several journal articles related to COVID-19 infection, vaccine, and lockdowns, including lead authorship of a *Lancet* article on interpretation of SARS-CoV-2 infection numbers. She is also a co-investigator of a World Health Organization (WHO) grant aimed at evaluating serology-informed vaccine strategies at the current stage of the COVID-19 pandemic.

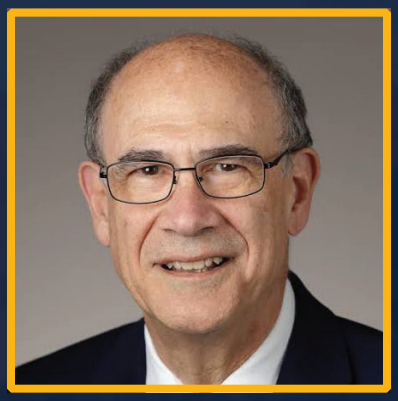
Brain Health

Emory researchers are at the forefront of brain health, helping patients and their families address disorders of the brain though applied research emanating from the Emory Brain Health Center and other Emory initiatives. With advancements in technology, and the proliferation of data collection, finding the proverbial needle in a haystack when it comes to optimal brain health is on the horizon.

The cerebral cortex and Parkinson's Disease

Thomas Wichmann is the principal investigator for a $6.3 million grant from the Aligning Science Across Parkinson's (ASAP) Collaboration Research Network. Alongside researchers from other universities, Wichmann will lead research into how the cerebral cortex factors into Parkinson's disease (PD). Ultimately, the goal is to develop new therapies that target the affected circuits in the cerebral cortex, in addition to developing new medications and genetic methods. To achieve these goals, Wichmann's team will work with animal models of PD and use technologies (such as optical imaging and electrical brain recordings) to study large groups of specific types of cortical neurons and explore how their activity and connections change when parkinsonism develops.

Muhammad Ali's onset of Parkinson Disease



Mahlon Delong co-authored a viewpoint paper in *JAMA Neurology* that concluded Muhammad Ali had young-onset levodopa-responsive Parkinson disease that emerged during the middle phase of his boxing career. By examining data from physical examination and PET imaging, Delong and his collaborators contributed new insight to ongoing questions about the extent to which Parkinson's disease contributed to Muhammad Ali's progressive tremor and cognitive impairment as opposed to repeated hits to the head during his boxing career. As the authors noted in the *JAMA Neurology* article, a key facet of this research is that it "reinforces the dangers of the press, public and health care professionals in speculating on medical diagnoses in the absence of an in-person examination."

Molecular approaches to monitoring neurodegenerative disease

Felipe Garcia Quiroz was awarded a 2022 NIH Director's New Innovator Award for his molecular approaches to monitoring intracellular clumps of disordered proteins associated with neurodegenerative disease. The research will advance sensors that could allow scientists to track disordered proteins thought to drive neurodegeneration – while the proteins move inside living brain cells. Many neurodegenerative diseases, such as Alzheimer's, Parkinson's, and amyotrophic lateral sclerosis (ALS), are characterized by clumps of sticky disordered proteins, which accumulate in aging brain cells. For his perfect score on the grant, Dr. Quiroz received an Emory 1% award.

Cancer

Through the Winship Cancer Institute and allied initiatives, Emory is advancing our understanding of cancer and patient-centered comprehensive treatment. We're not only advancing the world's understanding of cancer, but we're constantly investigating ways to treat it, and possibly in the near future, how to prevent it. At the forefront of their fields, Emory's researchers, faculty, and physicians have their sights on a cancer-free future, as evidenced through recent research achievements.

Preventing cancer through smoke-free homes

Michelle Kegler received grants from the National Cancer Institute to expand her ongoing work on smokefree homes. One of the grant-funded studies will partner with two large federally qualified health centers (FQHCs) in rural south Georgia to rigorously test the efficacy and potential scalability of integrating a smoke-free homes intervention into the 5A (Ask, Advise, Assess, Assist, Arrange) approach for tobacco cessation. The other will use a participatory approach to evaluate the effectiveness of a smoke-free homes intervention adapted for American Indian households in rural communities.

Exploring the role of genetic mutations in head and neck squamous cell carcinoma (HNSCC)stoves

NIH awarded a grant to **Yong Teng** for his proposed study on identifying significantly altered protein, gene mutation, expression, signaling pathways, and immune regulatory networks mediated by or associated with FAT1 mutants, which contribute to aggressive behaviors of head and neck squamous cell carcinoma (HNSCC). The study will use existing genomic and proteomic data from The Cancer Genome Atlas (TCGA), NCI's Clinical Proteomic Tumor Analysis Consortium (CPTAC), and other published HNSCC databases to perform bioinformatics and biostatistics analyses.

Understanding the burden of a common breast cancer subtype for black women

Findings of a large, global clinical trial led by senior author **Kevin Kalinsky** found that non-Hispanic Black (Black) women with Hormone Receptor positive/HER2-negative breast cancer, with one to three involved lymph nodes and recurrence scores below 25, have worse outcomes than non-Hispanic white (white) women with similar diagnosis. Black women had lower overall five-year invasive disease-free survival (IDFS) compared with the other racial and ethnic groups, and worse distant relapse-free survival (DRFS) than white women. DRFS is the length of time from the start of treatment for cancer that a patient is still alive and the cancer has not spread to other parts of the body.HR+/HER2- is the most common subtype of breast cancer, accounting for some 68% of the estimated 287,850 new cases diagnosed each year. If diagnosed early, it is also one of the most survivable with a 100% five-year survival rate if the disease is detected and treated before it has metastasized and involves any other area of the body.

Social & Racial Justice

In pursuit of our mission of service to humanity, Emory is a leader in understanding our past in order to better serve our community today and work toward a just future. With a track record of scholarship on civil rights, a strong African American studies program and Center for Ethics, and working relationships with organizations that focus on social and racial justice, Emory is positioned for leadership on a wide range of issues around social and racial justice. Researchers from across the university made key contributions towards a more just world.

Researching and recognizing Atlanta's racially-segregated public housing history

Christina E. Crawford published "Black Community Building: New Deal Programmatic Advocacy at Atlanta's University Homes," a journal article that emerges from her work on the Atlanta Housing Interplay Project, a project that seeks to map the architectural influence of historical racially-segregated public housing projects in Atlanta. Techwood Homes and University Homes were federally-funded housing projects for white families (Techwood Homes) and black families (University Homes) that were an early precedent for New Deal public housing and influenced by European social housing ideas. In 2022, both housing projects were granted Georgia Historical Markers due to the pioneering work of Dr. Crawford and the Atlanta Housing Interplay Project.

Uplifting a global culture of compassion

Lobsang Tenzin Negi co-founder and Executive Director for Emory's Center for Contemplative Science and Compassion-Based Ethics (CCSCBE), accepted a donation from the Rob & Melani Walton Foundation on behalf of CCSCBE and The Compassion Shift. The Compassion Shift is an initiative that seeks to help people uncover and evolve the compassion within and advance a global culture of compassion. At the invitation of His Holiness the Dalai Lama, CCSCBE held a global awareness event in Dharamsala, India to explore how the Compassion Shift is advancing towards a more compassionate, peaceful, and sustainable world.

Enhancing Arabic language competency through Moroccan cuisine

The National Security Agency's STARTALK initiative, a federal grant program aimed at funding K-16 educational programs with language-based learning outcomes, provided a grant to **Anouar El Younssi**. The grant will be used to support Oxford College's 2023 "Journey through Moroccan Cuisine and Festivities," an Arabic language immersion program for high school and college students (grades 9-14) at the Intermediate Level of Arabic language competency. The program will include two days of online pre-camp and post-camp sessions, with a residential summer camp to be held July 12-28, 2023 on Oxford College Campus.

Climate Change

In an environment where universities play a unique role at the frontlines of climate change, Emory is part of a select group of institutions in the U.S., sending delegations to the annual climate negotiations, strengthening research on global climate change, and taking an active role in our communities. Recent achievements and university-wide initiatives demonstrate why Emory is leading the way to a more sustainable, climate-conscious future.

A new research initiative to address climate change

In late 2022, Emory launched the **Emory Climate Research Initiative**, which draws together faculty with diverse expertise to advance climate-related research and curricula across the institution, focusing on areas where Emory can make unique contributions to humanity's efforts to understand and mitigate the impacts of climate change. A key area of focus for the new initiative will be research at the broad intersection of human health and climate. This includes work by Emory researchers such as Rebecca Philipsborn, who recently published "A pediatrician's guide to climate change-informed primary care," which aims to help pediatricians align practice with evidence-based climate literature.

Pursuing environmental justice through artistic and scientific collaboration

Eri Saikawa is an inaugural recipient of the Science Gallery Atlanta Faculty Research Fellowships, which is given to scientists who will further research in the Science Gallery network through scholarship that blend the arts and sciences. As a Science Gallery Atlanta fellow, Dr. Saikawa will invite students into participatory research that examines environmental justice in Atlanta's neighborhoods, and she will collaborate with artists to increase public awareness of air pollution and other effects of climate change. She envisions Science Gallery Atlanta as a place where researchers, students and local community members can come together to develop solutions. Dr. Saikawa is also one of the inaugural members of The Emory Climate Research Initiative.

Climate change and the transformation of the U.S. Corn Belt

The journal *Environmental Research Letters* published research by **Emily Burchfield** that indicates climate change will make the U.S. Corn Belt unsuitable for cultivating corn by 2100. Drawing from historical land-use data and publicly available data from the U.S. Department of Agriculture, the U.S. Geographical Survey, the WorldClim Project, the Harmonized World Soil Database and other public sources, she built a model to project shifts in cultivation under low, moderate, and high emission scenarios. Even under moderate-emission scenarios, the cultivation geographies of corn, soy, alfalfa and wheat will all shift strongly north, with the Corn Belt of the upper Midwest becoming unsuitable to the cultivation of corn by 2100. The research is part of Dr. Burchfield's work undertaken through the FACES (Food, Agriculture, Climate, and Environment to support Sustainability) Lab.