2024

ANNUAL REPORT

PhRMA Foundation

MISSION

The PhRMA Foundation fosters biopharmaceutical innovation and value-driven health care by investing in the frontiers of research. The Foundation catalyzes the careers of promising researchers through competitive, peer-reviewed grants and fellowships.

VISION

A healthier world where all people have access to innovative, life-changing medicines.

VALUES

Integrity

We strive to be scientifically independent and evidence-based in our decision-making.

Innovation

We invest in cutting-edge research and ideas that will improve patient health.

Collaboration

We support collaborative research efforts that are diverse and inclusive.

PhRMA Foundation

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2024 YEAR IN REVIEW

37 AWARDS TOTALING $3.86M

13 in Drug Discovery

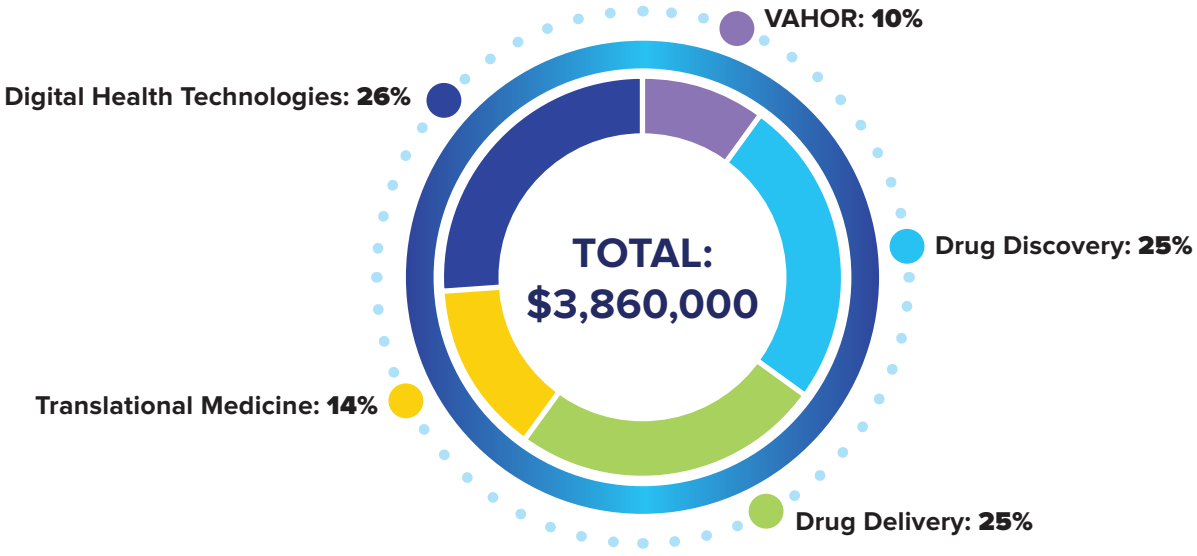
11 in Drug Delivery

5 in Translational Medicine

6 in Value Assessment and Health Outcomes Research

2 in Digital Health Technologies

Funding by Research Area



Awardee Demographics

54% Women

46% Men

17 Predoctoral Students

8 Postdoctoral Fellows

12 Faculty Members

8% Black

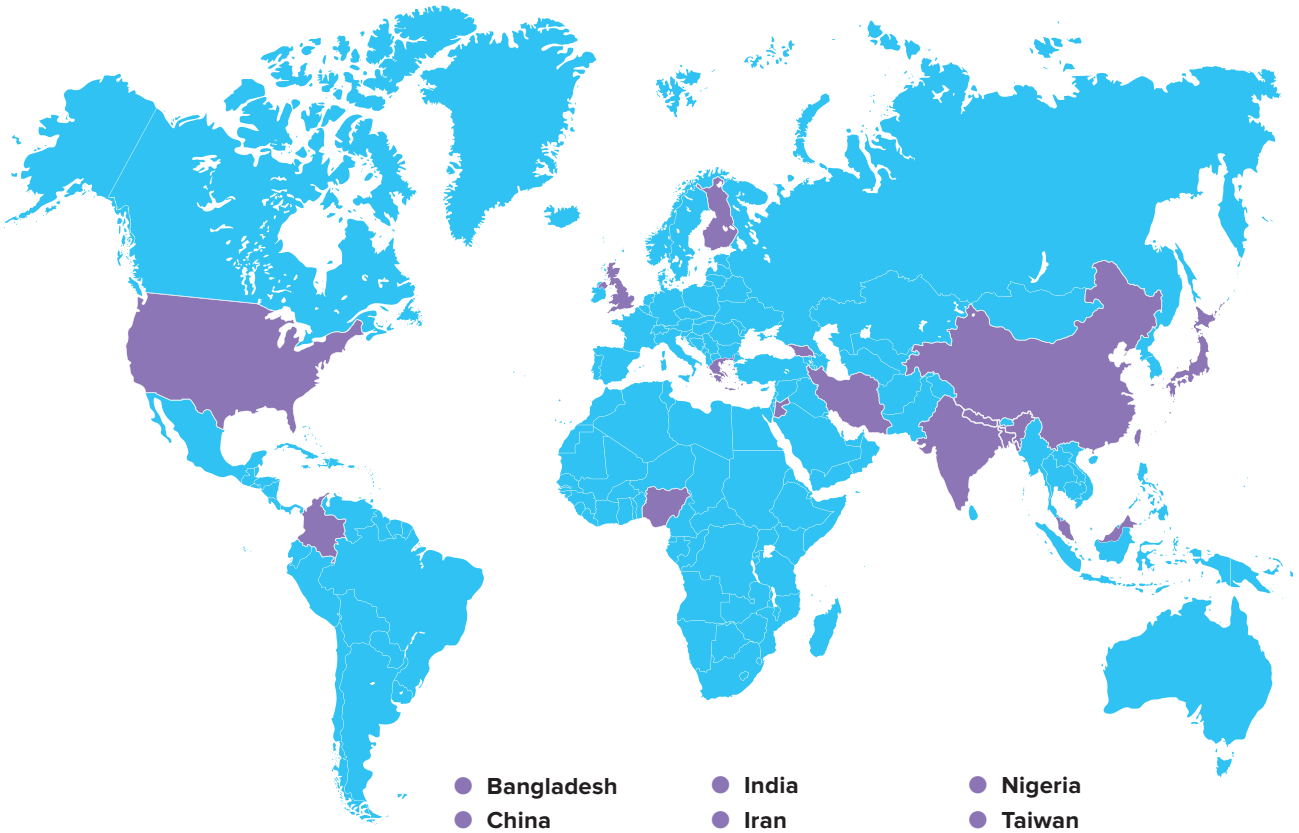
46% Asian

38% White

8% Other

5% Hispanic/Latino

Awardees From Around the World



- Bangladesh
- China
- Colombia
- Finland
- Georgia
- Greece
- India
- Iran
- Japan
- Jordan
- Malaysia
- Nepal
- Nigeria
- Taiwan
- United Kingdom
- United States

PhRMA Foundation

SUPPORTERS

MESSAGE FROM THE PRESIDENT AND CHAIR

Nearly 60 years ago, a group of pharmaceutical executives came together to create the PhRMA Foundation, a nonprofit dedicated to furthering the science of therapeutics. At that time, the Foundation focused on funding toxicology research to build scientific rigor around medication safety and train scientists to develop new drugs.

Over the years, the PhRMA Foundation has nimbly evolved our scientific funding programs to focus on advancing research in areas that are critical to the pharmaceutical industry but are often underfunded by the National Institutes of Health (NIH) or other funding organizations. We are deeply grateful to the pharmaceutical companies who not only provide generous financial support, but also offer employee volunteers to help guide our programs to ensure we continue to invest in cutting-edge science.

The Foundation looks forward to celebrating our 60th anniversary in 2025 and honoring our legacy of supporting early career scientists conducting innovative research. Since our founding in 1965, the PhRMA Foundation has awarded more than $100 million to over 2,700 scientists at hundreds of U.S. universities and institutions. Our awards are an investment in the next generation of researchers, those who will become leaders in their fields and make scientific breakthroughs that improve patients' lives.

Supporting Diverse Early Career Researchers

Securing funding is challenging for researchers at the beginning of their career. To address this need, the PhRMA Foundation provides competitive, peer-reviewed fellowships and grants for graduate students pursing their PhDs, postdoctoral fellows working to hone their research skills, and early-career faculty just starting their independent research careers. In 2024, we awarded more than $3.8 million to 37 researchers working in areas including digital health technologies, drug targets and pathways, novel drug delivery, and health outcomes research. You can learn more about the groundbreaking research conducted by scientists recognized with PhRMA Foundation grants and followships on our website.

The Foundation is also committed to diversity in science and encourages researchers from underrepresented groups to apply for our awards. More than half of our recent grantees are women, and more than half are people of color. We are also one of the few nonprofit funders that gives awards to international students and faculty at U.S. institutions. In 2024, we funded scientists from 16 countries who are pursuing research in the U.S.

Our award recipients are conducting exciting research to identify new therapeutic targets for cancers and other disorders, deliver drugs via innovative methods such as microneedles and needle-free vaccines, implement AI to personalize treatments, and assess the safety and effectiveness of medicines using real-world data.

Encouraging Equity in Digital Health Technologies

Health equity has also become a core focus of our funding. In addition to our annual early career awards, the PhRMA Foundation awarded two $500,000 grants to researchers studying how digital health technologies (DHTs) can be used to enhance health equity for populations underrepresented in clinical trials. The

Foundation developed this call for research in response to a Food and Drug Administration (FDA) report outlining important research areas to advance the digital health landscape. The two awardees will use the funding to develop DHTs and generate robust evidence to support their use in making health care more accessible and equitable for underserved communities.

Looking Ahead

In 2025, we will further grow our reach and impact in priority research areas by expanding our Challenge Awards program through partnerships with scientific journals. Our Challenge Awards are competitive calls for papers awarding authors for outstanding manuscripts addressing pressing research questions. This expansion will specifically focus on providing opportunities for trainees to share their research and perspectives with the scientific community on important hot topics.

The 37 talented scientists who received our awards this year represent only 8% of the total applicants, with many unfunded proposals coming from outstanding scientists with scores well above our bar. While the PhRMA Foundation is incredibly thankful for the continued support of our contributors, Board of Directors, and other partners, our goal heading into the next 60 years is to gain additional supporters and thus invest in an even greater number of promising scientists. By fostering biopharmaceutical innovation and value-driven health care, we can create a healthier world where all people have access to innovative, life-changing medicines.

Amy M. Miller, PhD
President, PhRMA Foundation

Andrew Plump, MD, PhD
Chair, PhRMA Foundation

HIGHLIGHTS FROM THE YEAR

Exploring Careers in Industry

In recent years, more than 60% of newly minted biomedical PhDs had an industry job lined up after graduation, according to the National Science Foundation. The PhRMA Foundation is helping our audience of early career scientists learn about pharmaceutical industry career paths through an ongoing webinar series, which began in 2022.

Transitioning From Academia to Industry: This webinar featured a panel of scientists from Merck, Pfizer, and Novartis who made the jump from academia to an industry role. They shared their career journeys and discussed key topics such as factors to consider when making the move, how to identify and apply for suitable job opportunities, and advice for navigating the transition and excelling in industry.

Eli Lilly and Company's Postdoctoral Fellowships: In this informational webinar, experienced program leaders and recent postdocs from Lilly discussed what it's like to work at a global medicine company as a postdoctoral scientist. This was the Foundation's fifth webinar showcasing company programs, with previous events featuring UCB, Biogen, AbbVie, and Bristol Myers Squibb.

Sharpening Communication Skills

In addition to providing financial support to early career researchers, the PhRMA Foundation also offers resources to assist these scientists in honing important professional skills such as writing strong funding applications and communicating their research.

Writing Innovative Grant Applications — An Industry Perspective: David Aldous, PhD, Head of Global R&D Processes and Operations at Sanofi, provided webinar attendees with insight into what he looks for when reviewing grant applications as a longtime PhRMA Foundation Scientific Advisory Committee member.

Mastering the Art of Networking: In this webinar, PhRMA Foundation President Amy M. Miller, PhD, discussed the importance of networking, with an emphasis on informational interviewing to advance your career.

Communicating Your Research to Non-Scientists: PhRMA Foundation Head of Communications Emily Ortman conducted a training exclusively for 2024 award recipients on the importance of science communication, including guidance on writing a lay summary, giving an elevator pitch, and preparing for an interview.

Q&A with a Science Journalist: Awardees also had the opportunity to engage directly with Turna Ray, a reporter and editor for Precision Medicine Online and GenomeWeb. They participated in a dialogue about science journalism and how researchers can better engage with members of the media.

Promoting Our Awardees and Their Research

The PhRMA Foundation challenged our 2024 award recipients to put their newly refined communications skills to the test. We interviewed 33 awardees about their career journeys thus far, their research, and their goals for the future. We shared these interviews, our webinars, and other educational content on our website, YouTube, LinkedIn, and X (Twitter).

DIGITAL HEALTH TECHNOLOGIES

Digital health technologies (DHTs) such as sensors, apps, and wearables have great potential to improve health care broadly, but they could be especially beneficial for underserved communities if designed and tested with equity in mind. In 2022, the FDA released a report outlining important research areas for advancing the digital health landscape. To help focus these research efforts, the PhRMA Foundation issued a call for research on the use of DHTs in underrepresented populations in clinical trials to advance FDA regulatory decision-making.

Empowering Health Care Equity: Harnessing Digital Health Tools for Inclusive Regulatory Decision-Making

In 2023, based on letters of intent, the PhRMA Foundation awarded $25,000 planning grants to seven researchers to develop comprehensive proposals that would compete for a larger, multiyear grant.

In 2024, the Foundation awarded two $500,000 grants:

A Personal Sensing Mobility Intervention to Improve Health and Reduce Disparities in Vulnerable and Underserved Populations

David G. Armstrong, DPM, MD, PhD | *University of Southern California*

Armstrong, a professor of surgery and neurological surgery at Keck School of Medicine of USC, will lead a project that aims to improve treatment for diabetic foot ulcers (DFU) using special smart boots that relieve pressure from specific areas of the foot. DFUs affect 15% of patients with diabetes — more than 1 million people annually — and if inadequately treated, can lead to amputation. Individuals from racial and ethnic minority groups are more likely to develop DFUs, receive amputations, and experience complications, leading to a lower survival rate. While pressure offloading boots are considered the gold standard of care for DFU, patients struggle with using them because of discomfort, aesthetics, and mobility restrictions. Armstrong's team seeks to improve patient outcomes with a new smart boot design that allows for remote monitoring of patient activity and adherence to the treatment.

> **This grant from the PhRMA Foundation empowers us to enhance our smart offloading boots, tailoring them to fit the unique cultural and behavioral aspects of minority populations who are most at risk for hospitalization and amputation. Our project is a step forward in making state-of-the-art health care accessible and equitable for all, particularly those in underserved communities.**
>
> **David G. Armstrong, DPM, MD, PhD**
> *University of Southern California*

Patient-Centered Mobile Health TECHnology Enabled Atrial Fibrillation Management (mTECH Afib)

Nino Isakadze, MD, MHS | *Johns Hopkins University*

Isakadze, a clinical cardiac electrophysiology fellow and new faculty at Hopkins' School of Medicine, will lead a project to test a digital health intervention for the management of atrial fibrillation (Afib), the most common type of heart arrhythmia. Afib is associated with poor quality of life and increased risk of stroke, heart attack, and death. Evidence shows that modifying risk factors such as weight, physical activity, and tobacco and alcohol use can reduce Afib burden. Isakadze's team is working with diverse patients, clinicians, and key stakeholders to design and test an Afib care management program that integrates 1) an Apple watch to track heart health data 2) a mobile app to educate and empower patients in tracking their health and setting health goals, 3) a clinician dashboard with patient data from the mobile app and smartwatch, and 4) individualized weekly health coaching to promote adherence to the virtual program.

Receiving the PhRMA Foundation grant will allow us to generate robust evidence to support the use of digital health technologies to enable risk factor modification for diverse patients with Afib and bridge the critical gap in Afib management. I am confident that digital health tools have tremendous potential to reach people where they are and transform health care delivery.

Nino Isakadze, MD, MHS
Johns Hopkins University

VALUE ASSESSMENT AND HEALTH OUTCOMES

Value assessment and health outcomes research provide evidence about the benefits, risks, and costs of treatments to help guide health care decision-making. The PhRMA Foundation Value Assessment and Health Outcomes Research (VA-HOR) Program funds researchers investigating challenges in evaluating the delivery, safety, effectiveness, and value of health care interventions.

In 2023, the PhRMA Foundation awarded two $500,000 Frontier Awards to researchers conducting empirical studies testing patient-centered value assessment frameworks. The three-year award allows the researchers to assess whether their frameworks can reliably guide value assessment, incorporate relevant diverse elements of value, and identify appropriate patient-centered outcomes. Below are brief progress updates from the awardees.

Using Patient-Centered Multicriteria Decision Analysis to Assess the Value of Multiple Sclerosis Treatments: Voices from the Deep South States

Surachat Ngorsuraches, PhD | *Auburn University*

Ngorsuraches, associate professor of health outcomes research and policy in Auburn's Harrison College of Pharmacy, is assessing the value of therapies for multiple sclerosis using patient-centered multicriteria decision analysis (MCDA), with a focus on the perspectives of patients and families in the Deep South. MCDA is a decision-making tool that helps capture and weigh multiple factors important to stakeholders, including nontraditional measures of value. Patients with MS and their family members from Deep South states (i.e., AL, MS, and LA) are overwhelmingly interested in participating in this project. Ngorsuraches and his team have engaged patients and stakeholders in developing training materials for the value assessment and MCDA to reinforce the patient-centeredness of the project. Their next phase is to train patients and family members before they take part in the MCDA process.

Eliciting Patient Preferences for Estimating Novel Value Elements in the Conduct of Generalized Risk-Adjusted Cost-Effectiveness (GRACE) Analysis for Cancer Outcomes

William Padula, PhD | *University of Southern California*

Dr. Padula, assistant professor of pharmaceutical and health economics at the USC Mann School of Pharmacy and Pharmaceutical Sciences, is investigating applications of GRACE for valuing cancer therapies. GRACE aims to improve health care valuation by accounting for patients' preferences as they relate to the value of hope, insurance value, and health equity to quantify optimal cost-effectiveness thresholds that rise for more severe diseases and reduce for milder conditions. Padula and colleagues are tailoring generic patient-preference instruments to provide customized input on the values of patients with metastatic forms of breast cancer and prostate cancer. In addition, the research team is examining updated trends in the cost of illness and burden of disease among these cancer patients using the Optum Clinformatics Database. The team looks forward to engaging with its stakeholder advisory board of patients, caregivers, providers, and advocacy groups in 2025, and obtaining preference measures from patients that could be used for disease-specific GRACE analyses of treatments for cancer.

$30,000 per year of stipend support for up to two years

Examining How Treatment of Depression Affects Clinical Outcomes During Buprenorphine Therapy for Opioid Use Disorder

Iftekhar (Sharaf) Ahmed | *Purdue University*

Opioid use disorder is characterized by a problematic pattern of opioid use where a person cannot stop using opioids despite the harms caused by them. Buprenorphine is a medication that is effective in managing opioid use disorder. However, nearly one-third of patients with opioid use disorder also have depression, which increases the risk of opioid use and overdose and is associated with poor retention to buprenorphine therapy, meaning individuals stop taking their medication before treatment is complete. It is, therefore, likely that treatment of depression with antidepressants will improve retention to buprenorphine therapy and treatment outcomes. However, the effect of antidepressant therapy on clinical outcomes during buprenorphine therapy remains largely unknown. This study aims to investigate the impact of antidepressant treatment on retention to buprenorphine, relapse to opioid use, opioid overdose, and mortality. This is a population-based study using data from the Indiana Network for Patient Care. Overall, this study will inform clinicians about the effective management of opioid use disorder in patients with co-occurring depression.

Assessing the Effectiveness of Blood Pressure Drugs for Preventing Heart Failure in Breast Cancer Patients

Udim Damachi | *University of Maryland, Baltimore*

As the most commonly diagnosed cancer in women, breast cancer represents a quarter of all cancer cases. Anthracyclines are one of the most used treatments for breast cancer patients. Despite their ability to improve survival for women with breast cancer, anthracyclines can cause severe short- and long-term heart failure, particularly in patients with pre-existing heart disease. To protect the heart, medications used to treat high blood pressure — such as angiotensin-II receptor blockers (ARBs), angiotensin-converting enzyme (ACE) inhibitors, and beta-blockers — are recommended for individuals taking anthracyclines. However, there's not a lot of evidence supporting the use of these blood pressure medications because the clinical trial studies conducted have been in small groups of people and did not include people with heart diseases. Therefore, I aim to use real-world data to investigate the use of these drugs in preventing heart failure in early breast cancer patients with and without heart disease. Finding effective agents to prevent heart failure caused by anthracyclines is important for breast cancer patients to improve overall survival and ensure they receive optimal cancer treatment.

Safety of Kidney Transplant Medications in Children

Wesam Ismail, MS | *University of Iowa*

Induction therapy is a group of drugs that help prevent the body from rejecting a new kidney after a transplant. However, these drugs work by weakening the immune system, making the patient more prone to infections. In 2021, around 94% of children who had a kidney transplant used some form of this therapy. Different transplant centers choose different drugs for their patients as these drugs achieve the same goal. Currently, we do not have enough information about how the use of these drugs affects the risk of infections in children with kidney transplants. In this study, we will investigate the risk of developing infections in children who did or did not use these drugs. We will use data from children who had kidney transplants at different transplant centers across the United States between 2000 and 2019. Our goal is to learn how to make treatments better for children and improve their health outcomes.

Understanding the Long-Term Effects of Programs for Veterans Targeting Social Determinants of Health

Piaopiao Li, MS | *University of Florida*

Social determinants of health (SDOH) are the various non-medical factors that influence our well-being, such as where we are born, live, learn, work, play, worship, and age. Many programs exist to help veterans with these factors of their lives. However, most of the research on the effectiveness of these programs has focused on the short-term effects for specific health outcomes. What's missing is an understanding of how these programs affect veterans' overall health in the long run. Evaluating the long-term effects is challenging because social determinants of health interact with each other and with different health conditions in many ways. To tackle this challenge, we will create a microsimulation model that mimics how veterans age and how chronic diseases progress over time. This model will use advanced machine learning techniques based on electronic health records from veterans. It will help us understand how effective and cost-effective these programs are over a veteran's lifetime. Our goal is to provide policymakers with valuable insights into how these programs work and how they can be improved to better benefit veterans.

$60,000 per year of stipend support for up to two years

A Case Study for Integrating Patient Preferences When Assessing the Value of Health Care Services

Nabin Poudel, PhD | *University of Maryland, Baltimore*

Imagine you have a medical condition that requires monitoring aspects of your health. You might prefer one monitoring method over another due to factors such as ease of use, how well it works, and cost. Yet when researchers assess the value of different health care interventions, they typically compare costs and health benefits, while patient preferences are often overlooked. Quality-adjusted life years (QALYs), a commonly used metric when assessing the cost effectiveness of medical interventions, accounts for improvements in length of life and quality of life. However, this approach can potentially discriminate against those with disabilities and doesn't account for patient preferences. Health years in total (HYT) is an alternative metric that aims to address some of the concerns with the QALY, but it still does not include patient preferences. We propose to combine patient preferences with the HYT measure to better reflect what patients value. We will test our new approach by assessing the value of different methods for monitoring the health of kidney transplant patients. This information will help health care providers select the most suitable and efficient methods, leading to improved health outcomes for patients and ensuring that limited resources are used in an efficient and fair way.

The PhRMA Foundation's Postdoctoral Fellowship provides me with an excellent opportunity to strive towards incorporating patients' preferences into value assessment research.

Nabin Poudel, PhD
University of Maryland, Baltimore

Faculty Starter Grant

$100,000 for one year of research project support

Improving Health Research for Older Adults Using New Medicare Advantage Data

Emilie Duchesneau, PhD, MSPH | *Wake Forest University*

My study aims to improve health research in older adult populations (65+ years) using Medicare data. Medicare, a publicly funded health insurance program for people over 65, has two types of plans: fee-for-service (FFS) and Medicare Advantage. Historically, research based on Medicare data has mostly used FFS data because detailed information for Medicare Advantage plans was not available until 2019. This new Medicare Advantage data could help researchers study more diverse groups of older adults, but its accuracy is uncertain. Our project has two goals. First, we will compare common health conditions and services in older adults, such as chronic conditions, vaccinations, and cancer screening, in FFS and Medicare Advantage plans. We will see whether differences in these conditions and services are due to actual differences between the plans' populations or how the data are collected. Second, we will check whether methods to identify frailty and dementia in Medicare Advantage data are as accurate as those used in FFS data by comparing them to well-known standards. This research will make aging studies more accurate and inclusive, leading to better health care for all older adults.

Real-world evidence is needed to understand intervention effects and health outcomes in older adults. Through this PhRMA Foundation award, I will lead innovative research that improves the quality of aging research that leverages real-world data, ultimately improving health and well-being in older adults.

Emilie Duchesneau, PhD
Wake Forest University

DRUG DISCOVERY

All people deserve access to innovative medicines that help them live longer, healthier, and more productive lives. Early scientific research plays a critical role in the discovery of cutting-edge technologies and therapeutic approaches for modern medicines. The PhRMA Foundation's Drug Discovery Program supports predoctoral students, postdoctoral trainees, and early-career faculty conducting early-stage research toward the creation of efficacious, safe, and differentiated treatment options for patients.

Predoctoral Fellowships

$30,000 per year of stipend support for up to two years

Learning From Psychedelics: Reprogramming the Brain to Be Flexible

Yung Yi (Michael) Hsiao, MS | *University of California, Berkeley*

For neuropsychiatric conditions such as depression and post-traumatic stress disorder (PTSD), the problem stems from the brain's inability to adapt to change. Selective serotonin reuptake inhibitors (SSRIs), commonly used antidepressants, can alleviate symptoms temporarily, but could psychedelics be a long-term solution? A single dose of psychedelics has been shown to alter the way our brain thinks for years, but we don't yet know the underlying changes inside the billions of neurons in our brain that allow for this to occur. My research aims to find the long-term changes in gene expression inside the individual neurons in our brain. We hope to learn from psychedelic medicine to create better drug targets. Using up-and-coming gene therapy tools such as CRISPR, I will look to replicate the therapeutic benefits of psychedelics by mimicking the gene expression changes — psychedelics without the negative side effects, if you will. We are also developing ways to package and deliver our gene therapy tools to the brain inside little protective spheres called nanoparticles, similar to how the COVID-19 vaccines worked.

Exploring a New Target for Treating Pulmonary Arterial Hypertension

Tamanna Islam | *University of Utah*

Pulmonary arterial hypertension (PAH) is a rare, progressive disease in which the blood vessels in the lungs become narrower, leading to high blood pressure and causing the heart to work harder and become weaker. Without treatment, PAH can be fatal within a year, and even with treatment, only 45% of patients survive beyond three years. In PAH, the blood vessels narrow as their walls thicken due to the abnormal movement of cells into the area. Like a plant sensing and growing toward sunlight, cells can detect and respond to forces in their environment, and in PAH, cells migrate toward stiffer tissue areas. Our research aims to study the mechanisms behind this cell movement in PAH using an organ-on-a-chip model that mimics the physiology and mechanical forces that cells experience in the pulmonary artery. Unraveling the pathways involved in cellular movement in PAH could help uncover new treatment strategies to reverse or inhibit this process, offering hope for better outcomes for patients.

Researching a New Drug Target for Treatment-Resistant Prostate Cancer

Min-Yu Ko | *Duke University*

Prostate cancer is one of the most frequently diagnosed cancers and is second only to lung cancer for cancer deaths in men in the United States. In patients with prostate cancer, male hormones, called androgens, acting through the androgen receptor, help tumors grow and spread. Thus, reducing androgen levels through hormone therapy has become the primary therapeutic strategy for prostate cancer. While hormone therapy works well in most patients as an initial intervention, the majority of patients will relapse, and their tumors will emerge as castration-resistant prostate cancer, where tumor growth continues despite exceptionally low levels of androgens. The role of androgen receptors when there are low/castrate levels of androgens remains largely unknown. Surprisingly, we discovered that low levels of androgens, such as those produced within tumors, facilitate activation of the mammalian target of rapamycin (mTOR) protein, resulting in increased tumor growth. These findings identify mTOR signaling as a direct target of the androgen receptor and establish the importance of this interaction in regulating prostate cancer cell growth. We are focused on developing drugs that exploit the axis of androgen receptor-mTOR as a therapeutic approach for prostate cancer.

An Approach to Bolster the Resilience of Aging Neurons

Alexander LeNail | *Massachusetts Institute of Technology*

Brain cells (neurons) are the longest-lived cells in our bodies, staying healthy for decades due to their capacity to respond to damage and preserve their function in the face of many changes as we age. Could neurons be coaxed into resisting degeneration indefinitely, allowing us to prevent the onset of brain diseases such as Alzheimer's and Parkinson's? In this research, I will examine whether we can enhance the repair machinery in neurons to reverse the molecular damage that accumulates during aging. We will use artificial intelligence (AI) to identify essential genes that are responsible for damage repair and then increase their dose in neurons and measure whether the neurons become more resilient against cellular damage due to aging.

Identifying New Therapeutic Targets for Visceral Pain

Annie Londregan | *Thomas Jefferson University*

Visceral pain, or pain that originates from abdominal or pelvic organs, is associated with irritable bowel syndrome with constipation (IBS-C) and affects an estimated >10% of the population. Current treatments for visceral pain include over-the-counter anti-inflammatory drugs, which have limited efficacy, and opiates, which can increase constipation. This highlights the need for new medicines to treat visceral pain. We have identified a unique population of intestinal epithelial cells, called neuropod cells, that form a direct connection between the gut and the nervous system. Activation of signaling in neuropod cells regulates visceral pain response in mice, presenting a novel target for treatment. My project aims to take advantage of this signaling pathway to identify therapeutic targets in neuropod cells for the treatment of visceral pain. My research utilizes drugs that are already FDA-approved, outlining a new paradigm for visceral pain treatment that can be translated to patients.

Boosting Brain Recovery: Blocking a Key Protein to Improve Stroke Outcomes

Carol Morris | *University of Arkansas for Medical Sciences*

Ischemic stroke is a leading cause of death and disability globally. Ischemic stroke occurs when blood flow to the brain is blocked, depriving it of oxygen and nutrients and leading to brain cell death. When blood flow is restored, further damage occurs due to an imbalance in harmful molecules, a condition known as oxidative stress. The process of clearing away these dead cells is crucial for brain recovery, but it is not well understood. Normally, dying cells display signals that prompt their removal by immune cells. However, the protein CD47 acts as a “don’t eat me” signal, preventing this cleanup. Our research has shown that CD47 levels increase in the brain after ischemic stroke, leading to an accumulation of dead cells and inflammation. We hypothesize that blocking CD47 will restore the clearance of dead cells, reduce brain damage, and improve recovery. Our study will test this hypothesis to understand the role of CD47 during recovery after ischemic stroke, potentially leading to new treatment options for stroke recovery.

Unraveling Parkinson's Disease: Early Molecular Insights and Potential Treatments

Daichi Shonai | *Duke University*

Parkinson's disease (PD) is a complex neurodegenerative disorder characterized by the progressive loss of nerve cells that produce dopamine, a chemical that helps these cells communicate with one another. This leads to movement issues such as tremors, rigidity, and stiffness. The reasons behind the selective loss of these cells remain unclear. My research focuses on uncovering the early molecular changes that occur within these cells, particularly disruptions in the transport of proteins, which are essential for cell function. We will map the locations of proteins within the cells and identify significant alterations in PD, much like using GPS technology to track the movements of city workers. By understanding these early molecular disruptions, we hope to identify early warning signs of PD and develop new treatments that target the root causes of the disease. This approach aims to not only provide better diagnostic tools but also to revolutionize the treatment of PD, potentially improving the quality of life for millions affected by this challenging condition.

Targeting a Shared Vulnerability in Breast and Ovarian Cancer

Xiyin Wang, MS | *Mayo Clinic*

Triple-negative breast cancer and ovarian cancer are challenging to treat because they often become resistant to existing therapies, making recurrence common and survival rates low. My research focuses on a protein called CTPS1 that is essential for these cancer cells to grow and survive. We have identified a new drug that can block this protein, effectively slowing down or stopping the growth of cancer cells. This drug shows promise, especially when used alongside standard treatments, and could lead to new, more effective therapies for patients. Our goal is to bring this drug to clinical trials, providing hope for better treatment options in the future.

And ... Cut! Reversing Therapy Resistance in Prostate Cancer by Targeting Gene Assembly

Marek Zorawski | *Duke University*

When making a movie, a lot of content is recorded, but only the best scenes are stitched together into the final film. In our cells, a similar editing process occurs for making proteins, the building blocks of cells. Our DNA contains all the information to create proteins — the full roll of film, so to speak — but then molecules called RNA are stitched together to form the final blueprint for making proteins. This assembly process, called RNA splicing, can go haywire in aggressive cancers, including a treatment-resistant form of prostate cancer. When prostate cancer has reached this form, patients have a poor prognosis, making RNA splicing an attractive therapeutic target to revert the patient's cancer to a treatment-sensitive form. My research focuses on finding a signal on a single RNA that we can target to help shut down the cancer-specific splicing. We hope to create new drugs that can block that signal and stitch together healthy RNAs that revert the cancer to treatment sensitivity and promote longer, healthier lives for patients with aggressive prostate cancer.

To me, the Drug Discovery fellowship offers a precious chance to further my experience in basic science that helps me to advance my career as a physician-scientist. The support has granted me the opportunity to delve deeper and explore with more sophisticated insight into developing novel targeted therapies, setting the stage for clinical translation of the approach, to the benefit of many patients.

Ali Nili, MD

Dana-Farber Cancer Institute

$60,000 per year of stipend support for up to two years

A Targeted Approach for Treating a Rare Autoimmune Disease

Ali Nili, MD | *Dana-Farber Cancer Institute*

Pemphigus is a rare autoimmune disease that causes painful blisters and erosions on the skin and the mucous membranes inside the mouth, nose, throat, and genitals. Pemphigus is most prevalent among people living in Israel, Iran, and the United States, particularly in the Ashkenazi population. Though uncommon, it can be devastating for those affected. In pemphigus, the body's immune system mistakenly attacks itself, with immune cells (called B cells) producing antibodies that attack the adhesive structures in the mucous membrane and skin. Current medications, such as corticosteroids, shut down the faulty immune cells as well as the entire immune system, increasing the patient's infection risk and causing severe side effects. Using protein engineering methods, I developed a novel targeted therapy that specifically clears out the harmful B cells without affecting the entire immune system. This therapy has demonstrated high efficacy and safety in several mouse models. My project also aims to develop more challenging models to better mimic real patient conditions before translating this treatment to the clinic. The next step would be to apply this treatment to other autoimmune diseases.

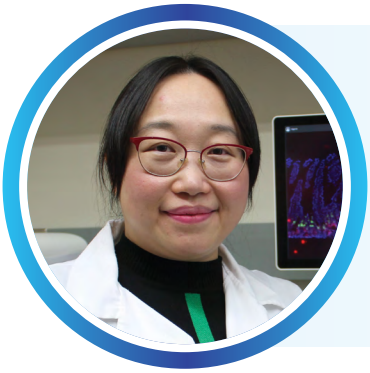
Designing New Opioids for Pain Relief With Fewer Harmful Effects

Nokomis Ramos-Gonzalez, PhD | *Washington University in St. Louis*

About 1 in 5 Americans suffer from chronic pain, and the best treatments currently are opioid drugs. However, the over prescription of these drugs has led to the opioid crisis in the United States. There is a need for safer drugs to treat pain without dangerous side effects. Most opioids that you may have heard of, such as morphine or fentanyl, act at the mu opioid receptor. A receptor is a protein that sits on the cell surface and translates a message from outside the cell, such as a drug, into the inside of the cell. Within the same family as the mu opioid receptor is the kappa opioid receptor, which is my protein of interest. Activating the kappa opioid receptor can give pain relief but comes with its own side effects: drowsiness, anxiety, depressive states, and effects on urination and the gut. Stimulating the kappa opioid receptor can activate multiple pathways in the cell. You could imagine these pathways as branches of a tree, and there is evidence that some of these pathways, or branches, may lead to more beneficial effects than others. In my project, I am designing and examining the pharmacology of new kappa opioid receptor drugs that activate specific pathways and that activate these pathways with less efficacy to hopefully avoid negative side effects.

Faculty Starter Grants

$100,000 for one year of research project support



Investigating Bile Acids as Diagnostic Markers and Treatments for Colorectal Cancer

Ting Fu, PhD | *University of Wisconsin-Madison*

Metabolic disorders such as obesity, colorectal cancer, and inflammatory bowel disease are closely linked to problems with bile acid regulation, imbalances in gut bacteria, and immune system disruptions. Bile acids play an essential role in the body's response after eating by signaling changes in diet and gut bacteria to the cells lining the intestines. A key player in maintaining bile acid balance is the Farnesoid X receptor (FXR), a protein that is a crucial target for new drugs. Our initial research has identified two specific bile acids produced by gut bacteria: 7-oxo-deoxycholic acid (7-oxo-DCA) and isodeoxycholic acid (isoDCA). We found that 7-oxo-DCA acts as a neutral FXR blocker, promoting the growth of intestinal tumors, whereas isoDCA is a strong FXR activator, significantly inhibiting tumor growth. Our project aims to investigate the high levels of 7-oxo-DCA in colorectal cancer as a potential diagnostic marker and explore the use of isoDCA as a possible new treatment for the disease. This research could lead to better diagnostic tools and therapies for colorectal cancer, potentially improving outcomes for many patients.

Reshaping Immune Response with Chemistry

Ziyang Zhang, PhD | *University of California, Berkeley*

Our immune system has special cells that act like security guards, checking for unusual lipids (fatty molecules) that might come from harmful bacteria. These guards are called natural killer T (NKT) cells. When they detect abnormal lipids, they proliferate quickly and send out alarm signals to other immune cells. This process relies on CD1d, a protein that presents lipids to NKT cells. Interestingly, the same NKT cells can produce very different responses depending on the chemical structure of the lipid presented by CD1d. We hypothesize that carefully designed small molecules that bind to specific areas (or "pockets") of CD1d could modify how NKT cells function. Our project aims to discover such compounds and investigate how they might reshape the immune response triggered by NKT cells. This research could lead to new ways of enhancing immune responses against cancer or reducing excessive reactions in inflammatory diseases, potentially creating more targeted treatments.

DRUG DELIVERY

Drug delivery research focuses on using novel methods to ensure patients get the most benefit from their medicines with the fewest side effects. The PhRMA Foundation's Drug Delivery Program funds predoctoral students, postdoctoral trainees, and early-career researchers studying ways to optimize drug composition, dosage, and delivery to make treatments safer, more effective, and easier to manage for patients.

Predoctoral Fellowships

$30,000 per year of stipend support for up to two years

A Needle-Free Alternative for Vaccine Delivery

Madison Davis | *University of Texas at Austin*

Nearly all recommended vaccines in the United States are administered via injection. This is an invasive and painful route of administration that requires medically trained personnel. My project aims to develop and evaluate the utility of a novel vaccine platform that works through the mouth's lining, known as the oral mucosa. Our lab developed a thin, pliable film that stabilizes viruses and other biologics for extended periods of time without refrigeration. Applying the film to the inside of the cheek or under the tongue offers a simple and effective vaccine platform. To assess the performance of the film-based vaccine, I will develop an in vitro model by growing cells in a lab-controlled environment to mimic the oral mucosa. I will use this model to identify the optimal formulation (combination of ingredients) for the film and monitor immune responses in real time. My project also seeks to enhance our film's formulation by incorporating an adjuvant, a substance that can help promote a strong and lasting response to the vaccine. Overall, I strive to showcase the oral mucosa as a robust yet underutilized target for vaccine delivery and highlight the utility of a film-based vaccine.

A Promising Therapeutic Platform to Fight Emerging Microbial Threats

Taylor Duval | *Cornell University*

P. aeruginosa is a gram-negative bacterium that is a major cause of hospital-associated infections, often leading to fatal outcomes in immunocompromised patients. Due to the emergence of antibiotic-resistant bacteria, clinicians are sometimes forced to rely on antiquated drugs such as polymyxins, considered a last resort therapeutic due to their propensity for kidney injury. To reduce the toxicity of Polymyxin B and novel antimicrobial therapeutics, we propose the development of an antibody-antimicrobial conjugate (AAC), a therapeutic molecule that links an antibiotic with an antibody (a protein produced by the immune system to fight off harmful substances). We will attach Polymyxin B to a P. aeruginosa-specific antibody, which will carry the drug directly to the infection site. Drug release will be triggered by enzymes that are amplified at the infection region. Due to the improved targeting, less drug will be required to clear the infection, in turn reducing or eliminating toxic side effects. This AAC approach will also be used to accommodate other novel or abandoned drugs, allowing us to engineer less toxic and more efficient therapeutics against potent bacterial or fungal threats.

A New Method for Expanding Cancer-Targeting T Cells in Immunotherapy

Si-Sim Kang, MSc | *Johns Hopkins University*

Adoptive cell therapy leverages the patient's own immune cells, called T cells, to target and kill cancer cells. First, T cells are taken from the patient's blood and enriched in the lab so they can learn to find proteins called antigens on specific cancer cells and kill these cells. The T cells are then reinfused back into the patient. While immunotherapy has been revolutionary for certain cancers, it is expensive and ineffective for some patients. Our research seeks to improve adoptive T cell therapy by focusing specifically on CD4 T cells, usually the "helper" T cells. We will use innovative nanoparticle-based artificial antigen presenting cells (aAPCs) to efficiently increase the amount and effectiveness of rare antigen-specific CD4 T cells produced during adoptive cell therapy. After incubating CD4 T cells with our aAPCs, the CD4 T cells acquired tumor-killing ability and the population of antigen-recognizing CD4 T cells increased from less than 1% to over 30% in some cases. By providing a controllable platform for T cell expansion and activation, our method offers new possibilities for personalized cancer treatments and deeper insights into T cell biology, potentially revolutionizing the field of cancer immunotherapy.

Receiving the award not only validates my contributions to advancing immunotherapy but also symbolizes a significant milestone in breaking barriers, fostering diversity, and inspiring future generations of underrepresented scientists.

Si-Sim Kang , MSc
Johns Hopkins University

Microneedles for Targeting Immune Cells in the Skin to Combat Autoimmune Diseases

Shrey Shah, MS | *University of Maryland-College Park*

About 1 in 5 Americans are living with an autoimmune disease in which their immune system mistakenly attacks their own healthy cells. About 75% of those affected are women. Currently, there are no cures for these diseases, and the available treatments tend to weaken the entire immune system, leaving patients vulnerable to other infections. One approach to tackle this problem involves training specialized immune cells, called dendritic cells, to restore immune system balance more selectively. These dendritic cells are highly concentrated in the skin, making it a promising target for autoimmune disease treatments. My project focuses on developing microneedles — tiny micron-sized needles applied like a Band-Aid — to deliver immune cues to dendritic cells in the skin to train them to selectively regulate the immune response. Upon completion, this project will provide proof of concept for targeting and training the dendritic cells in skin using microneedles to combat autoimmune diseases.

Receiving this fellowship is a great honor for me. By supporting my PhD research project, it not only represents a crucial step forward for my academic journey, but also enables me to make an impact in advancing the field of drug delivery.

Shrey Shah, MS

University of Maryland-College Park

$60,000 per year of stipend support for up to two years

Leveraging Nanoparticles to Deliver Gene Therapy for Hearing Restoration

Xiaoshu Pan, PhD | *University of Florida*

Hearing loss impacts millions worldwide, with half of these cases linked to genetic factors. Currently, there are no biological treatments available for people with deafness. Our project focuses on engineering natural extracellular vesicles (EVs) for delivering genetic medicine. EVs are tiny carriers that transport molecular "messages" in our body. We developed a scalable and effective method to mix and load drugs into EVs. We are using gold nanoparticles, which have high electrical conductivity, to enhance electrical stimulation applied to the EV membrane, making it more permeable so the genetic medicine can move into the EVs. To track these drug-loaded vesicles, we are creating a molecular barcoding and reporting system. This system helps us sort and enrich EVs with the desired drugs and confirm that EVs have delivered their cargo to the correct destinations. These therapeutic EVs hold great promise for improving the effectiveness and safety of delivering genetic medicine to treat genetic hearing loss, and we hope to pave the way for their use in clinical settings.

Developing Cell Therapy for Treating Pediatric Epilepsy

Anup Kumar Srivastava, PhD, MSc | *Children's National Medical Center*

Children with Dravet syndrome (DS) often experience repeated seizures, developmental delays, learning difficulties, and sometimes sudden unexpected death from epilepsy (SUDEP). This disease is caused by a genetic mutation affecting the function of sodium channels in brain cells called neurons. When this channel does not work properly, neurons have a hard time regulating electrical impulses in the brain, leading to seizures. My research aims to engineer cells that, when delivered directly to the affected areas, will develop into functional neurons, thereby aiding in the restoration of normal brain function. However, there are significant challenges to overcome, including ensuring the survival of these cells, preventing their uncontrolled migration to other areas of the brain, and promoting their proper integration into the brain network. To address these challenges, we use a 3D-printed micron-sized cell delivery vehicle. This innovative technology allows us to place the cells precisely where they are needed, supporting their growth and local integration. Thus, this cell therapy approach holds promise for restoring brain function, reducing seizures, and preventing SUDEP in children with Dravet syndrome.

$100,000 for one year of research project support

Designing a Novel Platform to Improve CAR T Cell Therapy

Chandrabali Bhattacharya, PhD | *University of Nevada, Las Vegas*

Chimeric antigen receptor (CAR) T-cell therapy uses a patient's own immune cells, called T cells, to fight cancer. This approach works very well against treatment-resistant acute lymphoblastic leukemia, a type of blood cancer that is common in children. However, CAR T cell therapy is expensive ($500k) and involves extracting the patient's T cells, modifying them in a lab so they can detect and kill the cancer, and then reinjecting them into the patient. Moreover, T cells are notoriously difficult to modify, making the process inefficient and resulting in unwanted side effects. In my lab, we aim to develop a platform for in vivo CAR T cell therapy, in which the modification of the T cells happens inside the body. Messenger RNA (mRNA) is a molecule that can be designed to reprogram the T cells to attack the cancer tumor. We will load the mRNA into specially designed lipid nanoparticles, tiny particles made of fats that can be used to deliver drugs in the body. Carbohydrates are involved in many critical biological processes including immune response, and we plan to fine tune our lipid nanoparticles using carbohydrates to ensure their delivery to the targeted T cells. If successful, this technology could have a tremendous impact on the field of immunotherapy by facilitating the development mRNA therapies for hard-to-reach immune cells.

Enabling Therapeutic Potential of Short-Chain Fatty Acids Via the Gut-Brain Axis

Shijie Cao, PhD | *University of Washington*

Imbalance in the gut microbiome — the community of microorganisms (e.g., bacteria) that live in our intestines — is associated with various inflammatory, allergic, and autoimmune disorders. As part of the digestion process, beneficial gut bacteria produce small molecules such as short-chain fatty acids (SCFAs), which have anti-inflammatory properties and can help relieve gut microbiome imbalance. My research team aims to leverage the therapeutic potential of SCFAs by developing a next-generation platform to deliver SCFAs to different sites of the body to inhibit inflammation in a controlled manner. We hope to overcome existing challenges with SCFA therapies, including the unpleasant odor and taste, limited effectiveness due to rapid absorption and metabolism by the body, and the consequently high dosage requirements. By slowly releasing SCFAs through enzymatic or bacterial digestion in the final section of the intestines, our approach seeks to achieve long-lasting microbiome and immune modulatory effects. Successful development of this platform could pave the way for new treatment approaches for neuroinflammation and enhance our understanding of the microbiome-gut-brain axis.

Particle Engineering to Develop Better Film Coating for Drugs

Tze Ning Hiew, PhD | *University of Iowa*

More than 90,000 drug products contain titanium dioxide, which is an opacifier added to tablet film coatings and capsule shells. Opacifiers protect the drug's active ingredients from light, which can cause them to degrade and shorten a medicine's shelf life. However, there have been emerging concerns surrounding the continued use of titanium dioxide. Titanium dioxide is approved by the U.S. Food and Drug Administration (FDA) as safe for use in drugs; however, it has been banned as a food additive in the European Union, raising concerns about a potential ban for pharmaceutical use as well. If restrictions are imposed on the use of titanium dioxide, many drug products may need to be reformulated, potentially causing product shortages and or/ withdrawals of some products from the market, thereby restricting patients' access to life-saving treatments. Using particle engineering, my research seeks to design a new generation of opacifiers that are titanium dioxide-free and satisfy the regulatory and functional needs of pharmaceutical drug products.

Breathing New Life: Tailored Gene Delivery to Lung Cells

Alexandra Piotrowski-Daspit, PhD | *University of Michigan*

Our lungs are vital for life, but many diseases, such as the genetic condition cystic fibrosis, compromise their ability to function. My research focuses on developing engineered biodegradable materials that can carry therapeutics directly to the afflicted lung cells. This innovative technology uses tiny, specially designed nanoparticles that can bypass the body's natural defenses. Once these carriers reach the lungs, they can release their gene therapy payloads into the cells, ideally correcting the root cause of the underlying genetic disease. Our goal is to refine this technique, modifying our nanoparticles to target specific lung cells impacted by disease while minimizing off-target effects and improving efficiency. The success of this approach could revolutionize how we treat lung diseases, leading to effective therapies with fewer side effects and improved patient outcomes.

Fine-Tuning Lipid Nanoparticles for Better Drug Delivery

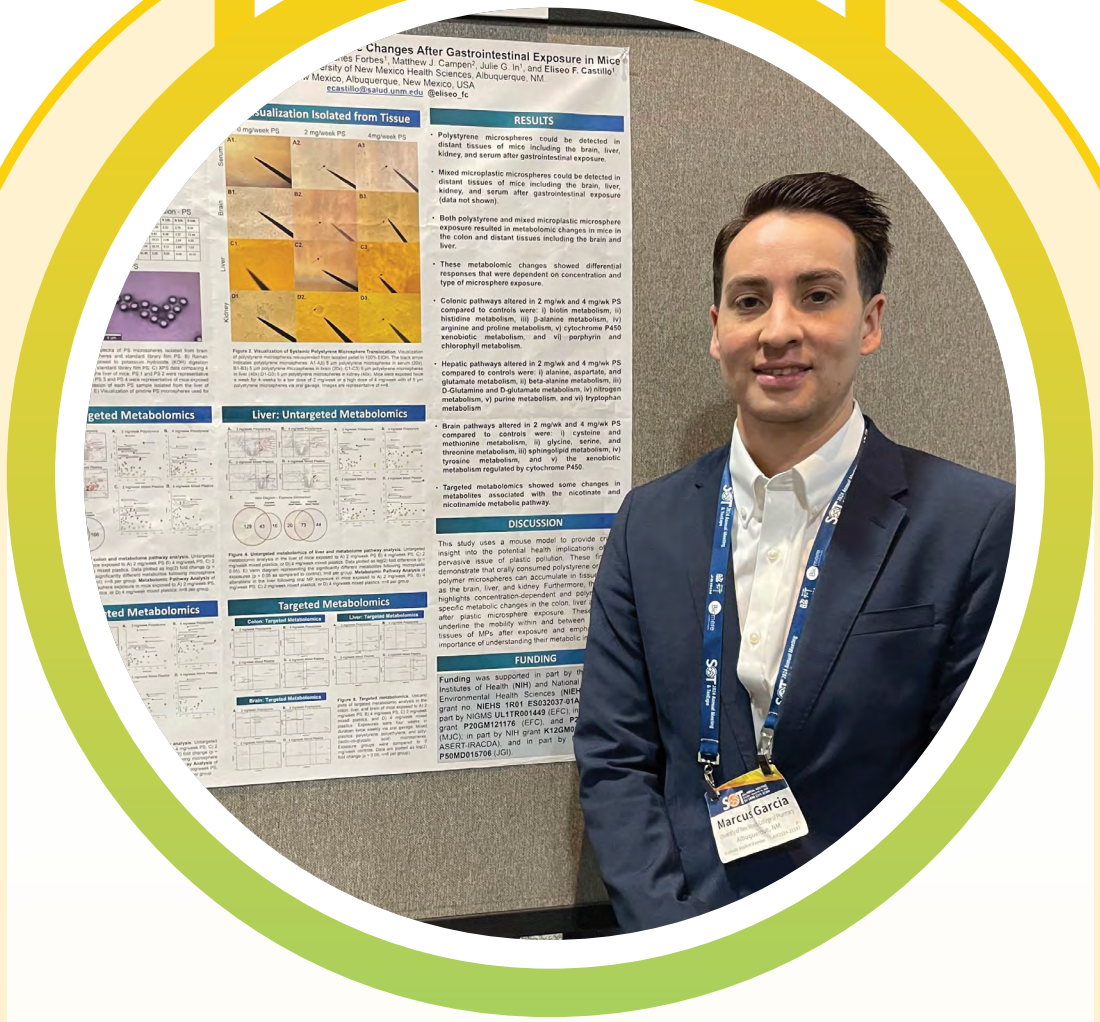
Briana L. Simms, PhD | *University of Cincinnati*

Lipid nanoparticles are tiny particles made of fats (lipids) that are used in various medical and scientific applications. One can imagine them as small, fat-filled bubbles that can deliver medicines or vaccines in the body. Recently, they were used to deliver vaccine ingredients safely into cells as a primary component of the COVID-19 vaccine. While effective, these lipid nanoparticles are comprised of a mixture of lipids, which decreases their overall efficiency to deliver to the targeted location in the body. To address this problem, my lab is developing a synthetic lipid nanoparticle made of a single component that allows us to fine-tune the nanoparticle's properties, such as size and flexibility, to improve its ability to deliver medicines. This allows us to identify the exact properties we need to deliver medicines to a specific site in the body and then fine-tune the lipid nanoparticle to match those properties.

This funding means that I get to design and develop a new generation of lipid nanomaterials, while empowering the next generation of STEM scholars. It's truly the best of all worlds.

Briana L. Simms, PhD
University of Cincinnati

TRANSLATIONAL MEDICINE



Translational medicine aims to bring scientific research and technological advancements from the laboratory to the clinic, where they can be applied to the prevention, diagnosis, and treatment of disease. The PhRMA Foundation's Translational Medicine Program funds postdoctoral fellows and early-career researchers working in collaboration with clinicians to develop new diagnostic, experimental, and computational approaches and technologies to improve patient care and management.

$60,000 per year of stipend support for up to two years

Creating an AI Tool to Closely Monitor How Rectal Cancer Responds to Treatment

Charlems Alvarez Jimenez, PhD | *Case Western Reserve University*

Every year, over 40,000 people are diagnosed with rectal cancer, and almost all of them receive presurgery treatment to shrink the tumor before having surgery to remove the rectum. One in three of these patients are found to have no remaining cancer cells in tissue removed during surgery. This means that presurgery treatment eliminated their cancer, but they already went through an invasive procedure that can affect their quality of life. Currently, there are no reliable ways to tell how well the presurgery treatment is working without examining the removed tissue. I will create a new method to predict treatment efficacy by combining computer analysis of tissue sample images with information from MRI scans. This tool could lead to more personalized and less invasive treatment options for rectal cancer patients in the future.

Treating Infectious Disease and Undernutrition in Young Children

Audrey Brown, PhD | *University of Virigina*

Globally, an estimated 149 million children under age five are undernourished. Shockingly, half of deaths among young children are linked to undernutrition, in part because undernourished children are more likely to become ill with infectious diarrheal diseases. However, this link between infections and nutrition is not well understood. Our group has discovered a single gene, called cAMP responsive element modulator (CREM), that protects against both low body weight and a common infectious diarrheal illness, amebiasis. I have discovered that CREM acts in the lining of the gut to change body weight, potentially by affecting nutrient uptake. Independent of this function, CREM also plays an important role in the stimulation and movement of immune cells to fight infection. We believe these changes to immune system function are how this gene protects against infectious diarrheal disease, such as amebiasis. We are exploring how CREM could be targeted for potential drug development to reduce the burden these two prevalent childhood conditions, undernutrition and diarrheal disease.

Measuring Microplastics in the Placenta and Their Impact on Fetal and Maternal Health

Marcus A. Garcia, PharmD | *University of New Mexico*

The amount of microplastics in our environment is doubling about every 12 years due to the breakdown of larger plastic items. These small plastics — tiny particles less than 5 millimeters in size — are capable of moving into the tissues of living organisms, potentially interfering with the body's ability to distinguish between its own cells and foreign particles and affecting embryo development. I have developed precise methods to measure plastic content in the placenta, and my initial findings show placental tissue contained an average of 130 micrograms of microplastics per gram of tissue. My data also suggests that higher plastic levels in the placenta are linked to lower APGAR scores, a system used to assess newborn health, indicating potential health impacts. I hypothesize that microplastics are absorbed in the gut with fats and delivered to high metabolism tissues like the placenta, possibly disrupting its function and affecting fetal development. This pioneering research aims to provide new insights into the health effects of microplastics and help develop strategies to minimize their impact on maternal and fetal well-being, offering potential benefits for future generations.

As a pharmacist and toxicologist, this honor resonates deeply with the significance of my research in addressing the urgent global issue of microplastic pollution and its effects on human health. This award allows me to extend my reach, influence policy, and drive meaningful change towards a cleaner, healthier future.

Marcus A. Garcia, PharmD
University of New Mexico

$100,000 for one year of research project support

Deciphering a Bacteria's Drug Resistance to Develop Better Treatments

Ashlan J. Kunz Coyne, PharmD, MPH | *University of Kentucky*

Infectious diseases are a global health challenge, especially those caused by bacteria that resist multiple antibiotics. One such bacterium, Stenotrophomonas maltophilia, is a growing concern in hospitals and communities, particularly for patients with weakened immune systems, like those undergoing treatment for blood cancers. S. maltophilia is difficult to treat due to its natural resistance to many antibiotics and the lack of effective management guidelines. Our research aims to develop better treatments for S. maltophilia by studying how various antibiotic regimens affect it. We will use advanced models to simulate human treatments and test these in mice to find the most effective antibiotics. By examining the bacterium's response at the molecular level, we hope to better understand its resistance mechanisms. Ultimately, our goal is to discover new ways to treat these infections and improve outcomes for vulnerable patients.

Analyzing Brain Tumors to Create a Noninvasive Early Detection Tool

Dimitrios Mathios, MD | *Washington University in St. Louis*

Brain cancer is a devastating and deadly disease, with about 23,000 new patients and 18,000 deaths each year. Earlier identification and assessment of brain tumors when they are smaller and asymptomatic could better guide treatment decisions and eventually lead to improved outcomes. My research focuses on molecular analyses of brain tumors, with the goal of using information from tumor analyses to improve cancer detection through a simple blood draw. Up until recently, blood tests to detect brain cancer were largely unsuccessful, as very little DNA from these tumors is shed in the blood due to the presence of a barrier between the brain and the bloodstream. However, new DNA sequencing technologies can more accurately and efficiently characterize the broad array of genetic and epigenetic changes occurring in the cancer genomes and thus can be used to profile the circulating DNA in the blood. My research leverages these technological advancements and the enhanced ability of artificial intelligence to identify patterns of molecular changes that differentiate patients with brain tumors from those without one. With this research, we hope to further enhance our ability to accurately detect brain tumors and provide molecular information about the tumor itself without the need for an invasive brain biopsy.

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FINANCES

Statement of Financial Position

As of December 31, 2024

Assets		2024
Cash and Cash Equivalents	$	2,768,034
Investments	$	24,721,524
Other Assets	$	78,561
Total Assets	**$**	**27,568,119**

Liabilities and Net Assets		
Accounts Payable	$	1,540,685
Net Assets Without Donor Restrictions	$	26,027,434
Total Liabilities and Net Assets	**$**	**27,568,119**

Statement of Activities

For the year ended December 31, 2024

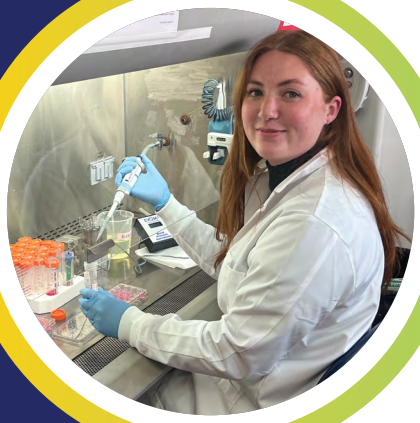
Revenue and Support		2024
Contributions Received	$	3,705,381
Contributed Non-Financial Assets*	$	64,884
Interest and Dividends	$	600,608
Realized and Unrealized Investment Gains	$	2,566,753
Total Revenue and Support	**$**	**6,937,626**

Expenses**		
Grants and Awards	$	4,364,341
Program Services	$	23,924
Supporting Services	$	598,715
Total Expenses	**$**	**4,986,980**

**Rent and services contributed by PhRMA*

***Expenses include allocated indirect overhead costs.*

Amounts reported above are derived from the PhRMA Foundation's unaudited financial statements for the year ended December 31, 2024.



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