IOWA STATE UNIVERSITY
Nanovaccine Institute
Revolutionizing how we prevent and treat disease

NANOVAX NEWS

Nanovaccine Institute newsletter *Volume 4: Fall 2021*

Where are they now?

Maria Torres
Senior Scientist
Istari Oncology

Dr. Torres completed a PhD in Chemical Engineering at Iowa State University from 2003 – 2008. Balaji Narasimhan and Surya Mallapragada served as her PhD mentors. Dr. Torres reflects, "I was very lucky because every grad student of my class wanted to part of that project and I was chosen. It was my first choice and I was very lucky to work with such talented professors. As mentors, they inspired and motivated me to give my best. That was one of the greatest experiences that I had when I moved from Puerto Rico to the United States for my PhD." Dr. Torres's PhD research involved designing amphiphilic polymers for vaccine delivery, suitable for protein delivery and protein stabilization.

She then moved to the University of Nebraska Medical Center (UNMC) where she worked as a Postdoctoral Fellow with [Nanovaccine Institute member] Surinder Batra from 2008 – 2013. At UNMC, Dr. Torres conducted research on pancreatic cancer development, therapies, and diagnostics.

She then switched from academia to industry in 2014, working as a Molecular Research and Development Scientist for Streck in Omaha, NE from 2014 – 2020. She switched her focus from immunology and cancer treatment to research and development, where she worked on microbiology field and antibiotic resistance. "Academia and industry are very different environments," she says. She shared that she found it rewarding to work on projects that would eventually become commercially available to detect the growing concern of antibiotic resistance mechanisms in bacteria.

In 2020, Dr. Torres moved to Durham, NC where she joined start-up Istari Oncology as a Senior Scientist. In this capacity, she is working on a vaccine for glioblastoma, or brain cancer. "I'm really excited about this new role and to move back to the immunotherapeutic field for cancer treatment," she says. She said she gets to see new therapies for late-stage brain cancers including the possibility of clinical trials and FDA-approved treatments for brain tumors and melanoma.

Dr. Torres shared that her time at the Nanovaccine Institute impacted her entire career and formed the basis for what she knows and uses every day in her work. A major lesson she learned from her time at Iowa State was *persistence*. She says, "I remember how challenging it was to work with the amphiphilic polymers, [I remember] late nights and working weekends. But I was a firm believer in these polymers so I learned to be persistent. That was the basis for my research and all that I do."

CTO Corner

Mike Roof
Chief Technology Officer
Vaccines & Immunotherapeutics platform
Iowa State Univ.

The State of Iowa has identified four core investment areas where they believe Iowa can be a global leader in technology and economic development. These are:

- Digital and Precision Agriculture
- Biobased Chemicals
- Medical Devices
- Vaccines and Immunotherapeutics

Based on the success of the efforts to date, the State of Iowa has continued funding for 2022. Within the Vaccines and Immunotherapeutics platform, these funds will continue seed grants for Iowa State faculty, invest in market research for start-up companies, consider fellowships focused on commercial development, and invest in infrastructure to support vaccine technology development and scale-up.

New Vaccine Development Infrastructure
New infrastructure to support vaccine development is under consideration. Based on feedback from faculty and industry partners, we have entered discussions and planning to develop both a cGMP nanoparticle manufacturing and formulation lab as well as a USDA compliant vaccine laboratory. Many nanoparticle researchers require a facility where they can manufacture and formulate large-scale vaccine batches, and industry partners require cGMP quality for large-scale

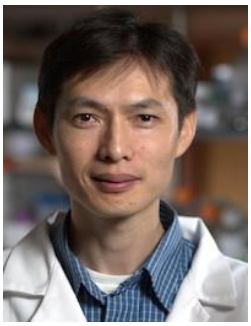
testing and regulatory studies. In addition, many of our faculty and partners are looking to expedite the technology transfer of vaccine research to partners in the animal health industry. Discussions with the USDA Center for Veterinary Biologics, ISU Research Park, and ISU faculty have focused on the development of a USDA compliant vaccine laboratory for master seed development, USDA standard documentation and testing, potency and analytical methods, and bioprocess/scale-up to manufacture USDA compliant clinical material. We are interested in connecting and learning from potential users of such a facility to understand their needs and to ensure functionality. For additional information or to be included in laboratory development discussions, please contact mroof@iastate.edu.

Vaccines and Immunotherapeutics Advisory Team
A variety of supportive training and entrepreneurial programs exist to support those interested in start-up formation and taking technology from the research lab to commercial space (Startup Factory, CyBiz, ICorp, Cystarters, Ag Startup Engine, Pappajohn Center for Entrepreneurship, BioConnect Iowa, etc). Faculty and small companies each have unique needs and challenges that require customized support. For this reason, an advisory team has been formed that includes leaders from the major entrepreneur programs as well as private legal support (both commercial law and intellectual property law), regulatory (USDA and FDA), and manufacturing expertise. If you would like to utilize the V&I Advisory Team to jump start or accelerate your efforts, please contact mroof@iastate.edu to schedule a meeting.

Congratulations!

Jodi McGill of Iowa State University was appointed as the John G. Salsbury Endowed Chair in the College of Veterinary Medicine.

Rizia Bardhan of Iowa State University was appointed Associate Editor of ACS Applied Materials and Interfaces earlier this year.



Hua Bai of Iowa State University received the 2021 College of Liberal Arts and Sciences Award for Early Achievement in Research.

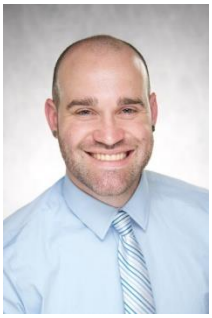
Quoted

"We are now in a desperate but unseen and barely noticeable race of variant versus vaccine, of ignorance versus knowledge, of disease versus health, and we are losing. To know is science; to believe one knows absent data is simply ignorance."

— **Gregory Poland**, Mayo Clinic Vaccine Research Center, "Mayo forum discusses vaccine misinformation, consequences of ignoring science." LaCross Tribune 2021 Sep 18.

Researcher Spotlight

Aaron Scherer
University of Iowa



Aaron Scherer, Assistant Professor of Internal Medicine at the University of Iowa was featured in the Center for Disease Control's (CDC) Morbidity and Mortality Weekly Report. The article focused on the acceptability of adolescent COVID vaccination among adolescents and parents of adolescents using survey data collected just prior to FDA expanding the Emergency Use Authorization to ages 12-15 years.

Scherer says, "It's the first survey we ran under the five-year cooperative agreement we have with CDC to conduct 3-4 surveys a year on 'important vaccine-related issues.'" Data collected through this project may help to inform the recommendations of the Advisory Committee on Immunization Practices, such as slides 53 – 55 of this CDC presentation. Co-authors include Nanovaccine Institute members Christine Petersen (University of Iowa) Andy Parker (RAND Corporation).

Funding Announcements

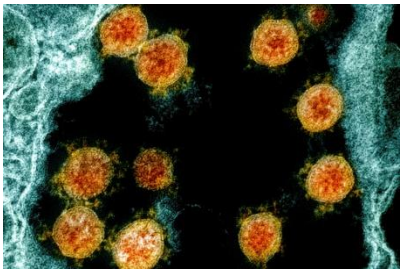
Thomas Friedrich
University of Wisconsin - Madison

The University of Wisconsin-Madison has joined an international effort to create a pandemic prevention institute aimed at helping researchers, public health officials and governments respond quickly to future pandemics. The Pandemic Prevention Institute is being funded by the Rockefeller Foundation.

UW-Madison professor of virology, **Thomas Friedrich**, said the campus is one of four universities in the United States receiving funding from the Rockefeller Foundation. He said UW-Madison is getting around $350,000, and about half of that will go toward increasing partnerships between researchers and

public health departments at the national, state and local levels.

"The goal is to take advances in genome sequencing technology that we and others have been applying to understand how the coronavirus is spreading and make those advances more directly applicable to public health," said Friedrich.



This electron microscope image made available and color-enhanced by the National Institute of Allergy and Infec-tious Diseases Integrated Research Fa-cility in Fort Detrick, Md., shows Novel Coronavirus SARS-CoV-2 virus parti-cles, orange, isolated from

Gregory Phillips
Iowa State University

Gregory Phillips, professor of Veterinary Microbiology and Preventive Medicine at the Iowa State University College of Veterinary Medicine and his research group received a grant from the U.S. Department of Defense to study how the microbiome could be modified to make vaccines more effective. The first year of the grant totals $550,000 with options for two additional years for an estimated total award of $1.6 million.

Quoted

"In science we have learned that everything is a Goldilocks system."

— Ashutosh Mangalam, University of Iowa, Pathology, "Isoflavone diet ameliorates experimental autoimmune encephalomyelitis through modulation of gut bacteria depleted in patients with multiple sclerosis." Science Advances 2021 Jul 9.

Iowa State researchers receive NSF CAREER awards

Nigel Reuel **and** **Hua Bai** of Iowa State University were selected to receive Faculty Early Career Development Program (CAREER) awards from the National Science Foundation (NSF). Considered to be the most prestigious award of the National Science Foundation (NSF), the CAREER program supports early-career faculty who have the potential to serve as academic role models in research and education.

Hua Bai, assistant professor in genetics, development and cell biology received a $1,212,704 for his proposal titled "Understanding Peroxisomal Stress Responses." Bai and his team will continue the development of interventions for treating liver, heart and neurodegenerative diseases.

Nigel Reuel, associate professor of chemical and biological engineering received $554,338 for his proposal titled "Real-Time Control of Cell Differentiation Using Reinforcement Learning." Reuel's project will test the hypothesis that active control (machine learning assisted learning from real-time sensors) will improve the reproducibility of differentiated cells over current static recipes.

Read more

Welcome new Nannovaccine Institute members!

We are thrilled to welcome four new members to the Nanovaccine Institute!

W. Allen Miller

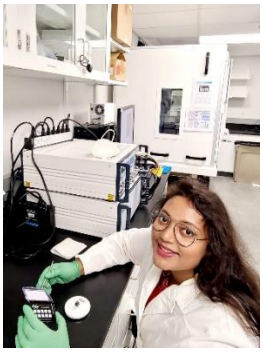
Dr. Miller is a professor in Plant Pathology at Iowa State University. While continuing research on plant viruses, he is branching into human virology with collaborative projects on Zika virus RNA and mRNA vaccines.

Satyayanarayana Rachagani

Based at University of Nebraska Medical Center in the Department of Biochemistry and Molecular Biology, Dr. Rachagani's research studies pathogenesis and targeting strategies for pancreatic and colorectal cancers through miRNA, natural agents and other novel combination therapies using human and mouse derived cell lines and GEM models.

Mike Roof

Dr. Roof serves as Chief Technology Officer for Iowa State University's Vaccines and Immunotherapeutics research and innovation platform, which supports the state of Iowa's biosciences-based economic growth initiative. "I'm excited to help explore greater opportunities to leverage platforms... to create technologies that benefit both animal and human health," he said.



Anwesha Sarkar

Since Fall 2020, Dr. Sarkar has specialized in bioengineering as an adjunct assistant professor in the Iowa State University Department of Electrical and Computer Engineering.

Quoted

"Every year, anywhere between 20 to 30 percent of the population gets its immunity sort of boosted and stimulated by being exposed to the flu virus. We are not going to have that this year. We don't really have a clue… We're in uncharted territory. We haven't had an influenza season this low, I think as long as we've been measuring it. So what the potential implications are is a bit unclear."

— **Richard Webby**, St. Jude Children's Research Hospital, "COVID-19 Booster Shots, the Flu and You." BioSpace 2021 Aug 23.

Publications

Jensen SN, Cady NM, Shahi SK, Peterson SR, Guptakatherine A, Gibson-Corley N, **Mangalam AK.** Isoflavone diet ameliorates experimental autoimmune encephalomyelitis through modulation of gut bacteria depleted in patients with multiple sclerosis. Science Advances. 2021 Jul 9. Vol 7(28).

Schlichtmann BW, Kalyanaraman B, Schlichtman RL, Panthani M, **Anantharam V, Kanthasamy AG, Mallapragada SK, Narasimhan B.** Functionalized polyanhydride nanoparticles for improved treatment of mitochondrial dysfunction. Journal of Biomedical Materials Research Part B Applied Biomaterials. 2021 July.

Liu L, **Wannemuehler MJ, Narasimhan B.** Biomaterial nanocarrier-driven mechanisms to modulate anti-tumor immunity. Current Opinion in Biomedical Engineering. 2021 July. 20(100322).

Senapati S, Darling RJ, **Ross KA**. Self-assembling synthetic nanoadjuvant scaffolds cross-link B cell receptors and represent new platform technology for therapeutic antibody production. Science Advances 7(32), eabj1691 (2021).

Unnikandam SR, Doghyul-Iwang V, Correia J, Bartlett MD, **Schneider IC.** Cancer cell migration in collagen-hyaluronan composite extracellular matrices. Science Direct (Elsevier). 2021 August; Vol 130 (183-198).

Crooke, SN, Goergen KM, **Ovsyannikova IG, Kennedy RB**. Inflammasome Activity in Response to Influenza Vaccination Is Maintained in Monocyte-Derived Peripheral Blood Macrophages in Older Adults. Frontiers in Aging. 2021 Aug 20.

Briggs RE, Billing SR, Boatwright WD, Chriswell BO, Casas E, **Dassanayake RP**, Palmer MV, Register KB, Tatum FM. Protection against Mycoplasma bovis infection in calves following intranasal vaccination with modified-live Mannheimia haemolytica expressing Mycoplasma antigens. Physician's Weekly 2021 Aug 30.

Su H, Sravanam S, Sillman BJ, Waight E, Makarov E, Mathews S, Poluektova L, Gorantla S, **Gendelman HE**, Dash P. Recovery of Latent HIV-1 From Brain Tissue by Adoptive Cell Transfer in Virally Suppressed Humanized Mice. Journal of Neuroimmune Pharmacology. 2021 September.

Upcoming Events

The Nanovaccine Institute is holding monthly seminars via Zoom with 45 minutes of presentation followed by 15 minutes of audience Q&A. The seminars feature researchers from leading biomedical and animal health labs and institutions across the country. Learn more about the wide-ranging and innovative research being conducted by Nanovaccine Institute members and partners! To present, contact carlyr@iastate.edu.

Oct. 28, 2021, 3 – 4 PM CT

Dr. Qun Wang, Adjunct Assistant Professor of Chemical and Biological Engineering at Iowa State University

"Developing New Oral Vaccines Using Organoids Derived Mucosal Immunological System."

No November seminar due to Thanksgiving holiday; next seminar Thursday, Dec. 2nd

Follow the Nanovaccine Institute on social media!

The Nanovaccine Institute maintains an active presence on social media: Twitter, LinkedIn, Instagram and YouTube. Follow us to hear about research updates, publications, funding announcements, partnerships, new members, and other updates from your labs.

Please send any updates for social media, the website, or the next edition of Nanovax News to carlyr@iastate.edu.

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The Nanovaccine Institute is a consortium of 79 researchers at 23 universities, research institutes, national laboratories, and companies, coordinated by Iowa State University. Our research is a transdisciplinary merger of expertise in immunology, nanotechnology, materials science, microbiology, neuroscience, cancer biology, gerontology, clinical science, and social science. We are developing nanovaccines and nanotherapeutics for respiratory infections, neural disorders, tropical diseases, cancer, aging, and veterinary diseases. Our vision is that nanovaccines and nanotherapeutics will revolutionize how we prevent and treat disease.