

# NANOVAX NEWS

Nanovaccine Institute newsletter

Volume 3: Summer 2021

## Where are they now?

### Shannon Haughney

Associate Principal Scientist  
Merck

Shannon Haughney earned a PhD in Chemical Engineering from Iowa State University in 2014. While at ISU, she worked with Nanovaccine Institute research teams as a Graduate Research Assistant in the lab of Balaji Narasimhan. She then spent almost three years working as a Scientist for Novozymes Biologicals Inc. in Raleigh-Durham, NC. In this role, Shannon was involved in the manufacturing of enzymes used in production processes such as bread, beer and laundry detergent. She also worked in the biologics division developing bacterial species used for animal health and nutrition applications.



In 2017, Shannon accepted a position as Associate Principal Scientist with Merck in West Point, PA where she currently works in the vaccines process development division. Shannon helps to develop processes for Merck's live viral vaccine portfolio. She shared that she enjoys being back in the "vaccine space" where she can "draw back on [her] knowledge from ISU on vaccines and immunology and have a context [for process design] ..."

Shannon appreciates that her time at ISU taught her how to "how to do research – how to set up an experiment and how to think through the results." In 2020, she had the opportunity to work on a project involving a vaccine candidate for COVID-19. She enjoyed the feeling of "contributing to something that will become a product." Shannon has multiple patent applications pending and is currently competing a Leadership Program with Merck.

When not in the lab, she enjoys the trails and green spaces in the Philadelphia area, as well as traveling with family. ●

## CTO Corner



### Mike Roof

Chief Technology  
Officer  
Vaccines &  
Immunotherapeutics  
platform  
Iowa State Univ.

In the first half of 2021, four major objectives were identified to support the expansion of opportunities in the Bioscience Platform – Vaccines and Immunotherapeutics.

1. Strategic meetings with >5 members of the Top 10 Animal Health Companies
2. Virtual meeting focused on Vaccines and Immunotherapeutics
3. ISU Vice President of Research – Seed Funding Round
4. Commercialization Support Team

### Animal Health Strategic Partners

We have met with the executive teams of seven of the top ten animal health companies which then led to topic-specific technical discussions with a variety of faculty and research teams. These discussions have included advanced diagnostics and biosensors, use of SMART LEARNING and artificial intelligence for vaccine targets, pathogen specific vaccine approaches, microbiome, and platform technologies such as nanoparticle and vector-based protein production. In the future, we hope to continue these productive conversations by bringing teams to campus to further facilitate collaboration.

### Vaccines and Immunotherapeutic Virtual Meeting

As a relatively new program, a virtual meeting offered the chance to connect with stakeholders and expand our network, while respecting pandemic and travel restrictions. This meeting, conducted in partnership with the ISU Research Park on May 12-13, targeted industry business development and R&D leaders responsible for strategic direction and covered:

- Human vaccines and cancer
- Advanced biosensors and diagnostics
- Animal vaccines and pathogen prevention
- Microbiome/probiotics
- Industry relevant institutes and advanced functions
- Vaccine-related startup pitches

Meeting attendance exceeded expectations with over 150 registrants and companies from across the globe including Germany, Japan, Argentina, and India. The meeting expanded contacts with existing partners and provided exposure to new collaborators. To date, six companies without an existing presence in Iowa have reached out to discuss technology and partnerships. The presentations were recorded and are available [for review](#).

### ISU Vice President of Research Seed Grants

The seed grant program is designed to accelerate ideas that could support future commercialization of technology in the Vaccine and Immunotherapeutics platform. The grants require an industry partner and a partner with commercial ties to the State of Iowa. The number of applicants was significantly higher than in previous rounds and \$250,000 was awarded to 5 different faculty and research efforts. Please see feature below to learn more.

### Commercialization Support Team

To further support Vaccine and Immunotherapeutic advancement, we have formed a commercial support team who

will advise and support others to expedite technology development, transfer, and licensure. To leverage and optimize existing programs, we have included members from Pappajohn, iCORP, CyBIZ, Startup Factory, SBDC, BioConnect Iowa, ISU Research Park, Ames Seed Cap, and Ag Startup Engine as well as industry-specific legal and intellectual property experts, USDA and EU regulatory experts, and production/manufacturing experts. Please reach out to [mroof@istate.edu](mailto:mroof@istate.edu) if your company would benefit from the support of this powerful team! ●

## Congratulations!



Congratulations to **Adam Mullis** who will be starting a new position as a post-doctoral researcher in the Biomedical Engineering Department at Tufts University in Massachusetts! Adam

previously worked as a postdoc and graduate research assistant for the Nanovaccine Institute under the supervision of Dr. Balaji Narasimhan. After a B.S. in Chemical Engineering from North Carolina State University in 2014, he began his graduate studies at Iowa State, earning his PhD in Chemical & Biological Engineering in 2020.

**Zahra Davoudi** joined ISU in August 2015 as a PhD student in Mechanical Engineering. In 2016, she changed her major to Chemical Engineering and began working in the lab of Qun Wang. Davoudi graduated in December 2019 and successfully defended her thesis in July 2020. Her thesis resulted in the publication of multiple journal articles, including the recent article in *Marine Drugs*: [“Gut Organoid as a New Platform to Study Alginate and Chitosan Mediated PLGA Nanoparticles for Drug Delivery.”](#)



Zahra Davoudi and Qun Wang, Dec. 2020

In this study, the impact of surface charge on delivering 5-ASA loaded PLGA nanoparticles into the lumen of

organoids was investigated. It was concluded that the positively charged chitosan nanoparticles were more readily transported across the epithelium into the lumen than the negatively charged alginate nanoparticles. Davoudi is currently seeking an industrial position as a research scientist and enjoying time with her 5-month old daughter and husband.

Research Scientist **Metin Uz** will be leaving the Nanovaccine Institute in July for a new position as an Assistant Professor in the Chemical and Biomedical Engineering department at Cleveland State University in Ohio. While working on his PhD in Chemical Engineering at the Izmir Institute of Technology in Turkey, Uz was a visiting scholar at Iowa State, researching multi-functional gene delivery systems with Nanovaccine Institute member Surya Mallapragada. He returned to Iowa State a year later, working seven years as a postdoc and then associate scientist in Mallapragada’s lab.



His research at the Nanovaccine Institute included biomaterial-based 3D platforms for tissue regeneration, flexible graphene electronics for biomedical applications, and polymers and hydrogels for drug, gene, and vaccine delivery. He also co-founded Degimflex LLC, an Ames, IA start-up developing novel fabrication techniques for biodegradable, implantable, and flexible electronics. ●

## Researcher Spotlight

**Nigel Reuel**  
Skroot Laboratory



Reuel and a team of his students developed sensor stickers that lab technicians can apply to the outside of flasks and other single-use bioreactors. Now his startup, **Skroot Laboratory, Inc.**, established in 2018 and based in Iowa State’s Roy J. Carver Co-Lab on the north side of campus, is selling that technology.

The Skroot sensor resonates, or absorbs electromagnetic radiation, at a specific frequency. As cells grow in the reactor, there is a change in permittivity which modulates this resonant frequency. A custom, wireless reader placed near the reactor takes real-time measurements of cell concentration and pushes notifications for cell feeding and harvesting. This process takes place without contacting cell cultures or changing reactors.

That means no more monotonous measurements and weekend lab visits. (Thus the company’s name, Skroot, an Anglicized version of the Polish word for shortcut, a word Reuel remembered from living in Poland for two years as a church service volunteer.)

The big idea for the technology, as it says on the [company website](#), is all about “Helping make medicine.”

“Research is good,” Reuel said. “But it’s even better if it leads to contributions that can do something to better the world.” ●

## Research Updates

**Sean Murphy**

University of Washington Medical Center

**Dose Spacing for Malaria Vaccine**



Nanovaccine Institute member **Sean Murphy** is working on a vaccine to prevent malaria. Murphy’s study, published in *PLoS Pathogen*, revealed that the presence

of blood stage malaria parasites had a profoundly negative effect on the efficacy of the vaccine. Vaccinations given seven days apart conferred no protection in study subjects; this timing coincides with the emergence of parasites into the blood from the liver after the previous doses. By changing the timing between doses to five days, a regimen first reported in *Nature*, PfSPZ-CVac protective efficacy dramatically increased to 75 percent.

“This study demonstrates the capacity of the malaria parasite to manipulate immune responses of the human host in

favor of its own survival and demonstrates how we can optimize the spacing of doses of PfSPZ-CVac to overcome this negative impact,” commented [Nanovaccine Institute member] Sean Murphy, first author of the paper and Associate Professor at the Department of Laboratory Medicine and Pathology, University of Washington, US. “Given the high prevalence of malaria infection, these results also have profound implications for malaria vaccine immunization strategies in Africa.” ●

## Quoted

“The major advantage of mucosal vaccines would be to create a strong immune response at the initial site of virus entry. If you can stop the virus here, it won’t be able to get into the lungs to cause damage.”

—Nanovaccine Institute member **Richard Kennedy**, PhD, of The Mayo Clinic, who studies the development of immune responses after vaccination



[Read the full article](#)

## Nanovaccine Institute teams awarded seed grants

To support innovation and advancements in the biosciences, Iowa State University is working in partnership with the Iowa Economic Development Authority and the Iowa Innovation Corporation to offer bioscience-based research seed grants made possible by funding through the Iowa Legislature. The essence of the program is to “foster commercialization of new technologies and innovations and help the state continue to grow and diversify its economy.”

The Office of the Vice President for Research recently awarded grants for the 2021 fiscal year to three projects at the Nanovaccine Institute. The Vaccines and Immunotherapy Seed Grant funding will allow Principal Investigators to advance their research and make discoveries that

can lead to future commercialization or additional funding opportunities.

Vaccines and Immunotherapy Seed Grant Funding Recipients:

**Principal Investigators:** Jodi McGill and David Verhoeven



Jodi McGill and David Verhoeven

**Project Title:** “Cost-favorable production of a prefusion F subunit vaccine for bovine respiratory syncytial virus”

**Project Description:** The project will focus on vaccine development to prevent bovine respiratory syncytial virus (BRSV) infection in cattle. BRSV is a cause of bovine respiratory disease complex, a leading cause of morbidity and mortality in the US beef and dairy industries. In partnership with Elanco Animal Health, the project will explore cost-favorable strategies for producing a safe and efficacious recombinant protein-based vaccine that can be delivered needle-free by intranasal vaccination.

**Principal Investigator:** David Verhoeven

**Project Title:** “Investigation of baculovirus produced fiber and hexon for protection from adenovirus in chickens”

**Project Description:** Fowl adenovirus are significant viruses of birds that leads to numerous diseases and major economic losses for the poultry industry. In partnership with Arko Laboratories in Jewell IA, the Verhoeven laboratory will investigate a recombinant protein vaccination generated in insect cells for efficacy against infection in chickens.

**Principal Investigators:** Michael Wannemuehler and Surya Mallapragada



Michael Wannemuehler and Surya Mallapragada

**Project Title:** “Use of Pentablock Copolymer Micelles to Enhance the Immune Response of Goats for the Induction of Serum Antibody”

**Project Description:** This project will assess a novel nanovaccine formulation for its ability to enhance the immune response in goats following vaccination. Given that goats are commonly used to generate the antibodies used in diagnostic medicine, the ability to improve antibody production would be highly beneficial to this type of industry. ●

## St. Jude awarded NIH funding for flu research and response

The National Institute of Allergy and Infectious Diseases, an affiliate of the National Institutes of Health, is providing an estimated \$24 million to support five Centers of Excellence for Influenza Research and Response, including at St. Jude Children’s Research Hospital.



The federal contract includes more than \$8.9 million in first-year funding to support St. Jude research to better understand, predict, track and treat emerging flu and other viruses.

“This award provides an opportunity to build a global collaborative network and continue the long history of St. Jude supporting global public health,” said [Nanovaccine Institute member] **Richard Webby** of the St. Jude Department of Infectious Diseases.

[Read the full article](#)

## Welcome new Nannovaccine Institute members!

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

### Mazen Animal Health Jennifer Filbey, CEO



Mazen Animal Health delivers game-changing animal disease prevention with orally-delivered, RT stable, cost effective vaccines for a healthier planet.

[www.mazenanimalhealth.com](http://www.mazenanimalhealth.com)

### Genvax Technologies Joel Harris, CEO



Genvax Technologies is developing herd-specific, prescription vaccines for the livestock industry. Together, we hope to advance new products that will impact animal health.

[www.genvax.com](http://www.genvax.com)

## Publications

Please send announcements of publications and research updates to [carlyr@iastate.edu](mailto:carlyr@iastate.edu) for inclusion in future newsletters and social media.

Stephens LM, **Ross KA**, Waldstein KA, **Legge KL**, McLellan JS, **Narasimhan B**, **Varga SM**. [Prefusion F-Based Polyanhydride Nanovaccine Induces Both Humoral and Cell-Mediated Immunity Resulting in Long-Lasting Protection against Respiratory](#)

[Syncytial Virus](#). The Journal of Immunology. 2021 May 1; 206(9): 2122-2134.

**Kelly SM**, Larsen KR, Darling R, Petersen AC, **Bellaire BH**, **Wannemuehler MJ**, **Narasimhan B**. [Single-dose combination nanovaccine induces both rapid and durable humoral immunity and toxin neutralizing antibody responses against Bacillus anthracis](#). Vaccine (Elsevier). 2021 Jun 29; 39(29): 3862-3870.

Schlichtmann BW, Hepker M, Palanisamy BN, **John M**, **Anantharam V**, **Kan-thasamy AG**, **Narasimhan B**, **Mal-lapragada SK**. [Nanotechnology-mediated therapeutic strategies against synucleinopathies in neurodegenerative disease](#). Current Opinion in Chemical Engineering. 2021 March; 3: 100673.

Olson KE, Namminga KL, Lu Y, Schwab AD, Thurston MJ, Abdelmoaty MM, Kumar V, Wojtkiewicz M, Obaro H, Santamaria P, Mosley RL, **Gendelman H**. [Safety, tolerability, and immune-biomarker profiling for year-long sargramostim treatment of Parkinson's disease](#). EBioMedicine (The Lancet). 2021 May 1; 67: 103380.

## Nannovaccine Institute Updates

### New Staff

**Carly Ross** joined the Nanovaccine Institute staff at Iowa State University as a research administrator in April. In her role, she focuses on post-award grant management and financial management, as well as marketing and communications.



Carly brings grant administration, program management, fundraising, and leadership experience from her career as Executive Director of JDRF Greater Iowa and as Director for the U.S. Committee for Refugees and Immigrants, Des Moines Field Office.

Carly has a B.A. in Women's and Gender Studies from Carleton College and a Graduate Diploma in Gender and Development from the Asian Institute of Technology in Thailand. Carly worked

and traveled extensively overseas before settling in Des Moines to raise her two daughters. She is a Certified Integrative Nutrition Health Coach from the Institute for Integrative Nutrition.

Carly's email address is [carlyr@iastate.edu](mailto:carlyr@iastate.edu).

### Postdoc Job Opportunity

The Nanovaccine Institute has a new National Institute of Biomedical Imaging and Bioengineering (NIBIB) funded **Postdoc Research Associate** position with [Rizia Bardhan](#). The position will focus on designing nanoparticles for imaging and immunotherapy in cancer treatment. The application deadline is July 14. [Learn more](#).

### Follow the Nanovaccine Institute on social media!

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



### Nanovaccine Institute

Iowa State University  
5001 ATRB, 2213 Pammel Drive  
Ames, IA 50011-1101  
[www.nanovaccine.iastate.edu](http://www.nanovaccine.iastate.edu)

*The Nanovaccine Institute is a consortium of 75 researchers at 22 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.*