Protection from radiation injury, Labrador genetics, tracking cancer and more

WARF Accelerator speeds the development of technologies with exceptional potential for commercial success. With targeted funding and expert advice from seasoned business mentors known as catalysts, the program helps inventors develop their technologies and advance to the marketplace. The latest developments:

**TECHNOLOGY MONITOR**

**FOOD AND AGRICULTURE**

**COMPANION HEALTH:**

Many Labrador retrievers develop a debilitating respiratory disease as they age. Susannah Sample and Peter Muir (School of Veterinary Medicine) are leading a genomic sequencing project to understand why.

Their team has completed sampling and DNA isolation from multiple dogs recruited for the study. To speed up progress, WARF Accelerator funding is helping the team to sequence the samples to a higher depth of genome coverage, with the overall goal of developing a genetic screening test for at-risk canines.

**RADIOPROTECTION THERAPY:**

Better therapies are needed to protect and heal patients who have been exposed to high doses of radiation for medical purposes (such as cancer treatment or bone marrow transplant), accidental trauma or even a terrorist attack.

A team led by Dr. Peiman Hematti (medicine) previously discovered that important immune cells, called macrophages, co-cultured with human mesenchymal stem cells (MSCs) can significantly enhance the survival of mice exposed to lethal irradiation. Now, with additional support from the NIH, they look to produce the therapeutic macrophages at scale using an FDA-acceptable manufacturing process – two keys to commercial viability.

**HEALTH CARE**

**BLOOD WORK:**

A project led by Mike Sussman (biochemistry) could one day enable a simple blood test for detecting and staging colorectal cancer – one of the most treatable cancers if caught early.

This project builds on years of previous work to identify a panel of blood proteins that are predictive of the disease.

As Phase 2 unfolds in the months ahead, Sussman’s team will develop monoclonal antibodies and test them against some 250 stored blood samples.

**BUILDING Momentum**

Happy New Year! Winter break meant campus was more quiet than usual, but things kept humming at WARF Accelerator. We closed 2019 with our second annual WARF Innovation Day. Over 400 industry professionals, campus researchers, investors and community members registered to hear six quick pitches from researchers at UW-Madison, UW-Milwaukee and UW-Platteville. Our presenters did a remarkable job explaining their technologies and the potential impact their innovations could have in the world. Please check warf.org/innovationday for more information on this event, including videos of the presentations.

The last quarter of 2019 also brought an Accelerator license for Professor Scott Reeder’s technology, a method that allows for accurate, noninvasive detection and quantification of iron overload of the liver using conventional MRI technology. This technology was licensed to Antaros Medical in October and could help doctors better treat and prevent liver disease.

This fall, Nhi Lê joined WARF as the Accelerator Associate. Nhi holds a Ph.D. in materials science from UW-Madison. She brings extreme enthusiasm for the commercialization of university research and extensive experience in working with startups to our team. She will help Accelerator provide more resources and support to our project teams and commercialization efforts. Welcome, Nhi!

We continue to expand our catalyst network as well. We welcomed four new catalysts last semester. Leigh Cagan joined the Computer Science and Engineering group while Dawn Muyres and Kurt Sedo came on board as Health Care catalysts; Hari Nair will share his expertise as part of the Clean Tech group. As we grow our networks, feel free to refer your recommended subject matter experts to our WARF Accelerator LinkedIn group.

Looking ahead, please save the date for our Accelerator Annual Meeting, which will take place in Madison on Thursday, April 23, 2020.

As you have heard me say many times, innovation takes a community. Thank you for being part of ours and we look forward to collaborating with you in the year ahead.

On, Wisconsin!
— Greg
Quality Control

Emerging cell therapies are giving hope to cancer patients. But to guide the process new analytical tools are desperately needed. Melissa Skala and her team are going all in.

There was a time when biomedical engineer Melissa Skala dreamed of becoming an astronaut. But at a young age a fascination with physics, and then with light, emerged. It was Lake Mendota that first drew Skala – a skilled sailor – to Madison.

Today, Prof. Skala leads the Optical Microscopy in Medicine Lab at the Morgridge Institute for Research. Her program is among the most diverse and dynamic on campus, bridging fundamental discovery to translation. Her lab develops optical imaging techniques to shed light on some of the grandest challenges of human health – from personalized treatment plans to predicting preterm birth.

Fueled by multidisciplinary collaborations, much of Skala’s research takes aim at cancer, including breast, oral and pancreatic.

Skala’s current Accelerator project stems from a celebrated invention disclosure from 2018. That year, Skala and collaborator Alex Walsh were awarded top WARF honors for an exciting discovery. Using sophisticated research-grade optical imaging, they found that they could distinguish activated immune T cells based on metabolites glowing faintly within them.

“That signal tells us about T-cell function, which is important for T-cell manufacturing,” Skala explains.

It was early stage, but clear that their work could be used to screen active immunotherapy cells from low quality ones, and thus provide vital support to emerging cancer treatments such as CAR T therapy.

In CAR T therapy, a patient’s T cells (so-called ‘soldiers of the immune system’) are removed from his/her body and engineered into cancer-targeting ‘super soldiers.’ Then they are reinjected into the patient.

Skala’s technology could be vital for quality control by evaluating cells prior to reinjection. It could answer critical questions such as: Does this patient have enough healthy immune cells? Is he or she likely to benefit from last line therapy?

Critical questions, says Skala, because these patients are some of the most vulnerable. And time is of the utmost essence.

CAR T cell therapies are given mostly to patients with B-cell cancers, both children and adults. These patients have endured chemotherapy and bone marrow transplants, and immunotherapy may be their last option.

“We’ve talked to lots of physicians and they say it’s hard to keep their patients alive long enough to get the T cells manufactured,” Skala says. “Currently it takes about five weeks from the time you draw the blood to get it back into the patient and they’re very sick already so it’s tough. We’re hoping to improve that process.”

Unlike competing technologies, Skala’s method does not destroy any of the cells during the evaluation process. Label-free and non-invasive, it could seamlessly integrate into the current biomanufacturing workflow because it uses only light to assess the cells.

There are some 500 CAR T therapies in clinical trials. It is still young science, and estimating time to market for a supporting technology like Skala’s is challenging.

But since 2018 Skala’s team has established across multiple human donors that autofluorescence – those ‘weak glows’ – can be used reliably to identify activated T cells. Now, WARF Accelerator support is helping the team develop a prototype based on these promising initial studies, validate the prototype in patient blood samples and ultimately commercialize a product.

Working with the Discovery to Product (D2P) program on campus has also been “a great experience.”

She says the team is in the throes of developing a prototype and “doing lots of market research in parallel” because there are multiple ways the technology could be deployed, such as a functional add-on to a microscope.

“We want to know what the eventual users would value,” she says. “The idea is to take this million-dollar research instrument that we took the original data on, and turn it into a prototype that is more reasonably priced so people can use it.”

Product development is new territory for Skala. She admits and embraces the challenge.

“We’re used to doing things like designing experiments and writing papers,” she says. “We’re used to following the science and letting it guide us. It’s a complete pivot to create a product. We know it’s important to get this out soon. The sooner the better. There’s just a sense of urgency.

“I’m going all in.”

Prof. Skala has expertise in both basic research and device design. This combination will really help move her innovations out of the lab and into the clinic.
Thank you to all who made WARF Innovation Day 2019 a success!

Now in its second year, this gathering of investors, researchers and innovators is becoming a signature event. More than 400 registrants were treated to sneak peeks of some of our most commercially promising technologies in development. From treating asthma to providing fresh drinking water, monitoring vulnerable patients to preventing crop disease, these are technologies that matter.

Innovation Day 2020 promises to build on this momentum. In the meantime, keep in touch via our LinkedIn group (contact Lori Allen at allen@warf.org to join). And reach out to us if you are in the Washington D.C. area in June. Our team will once again be at TechConnect!

Save the date! November 9, 2020
**COMPUTER SCIENCE AND ENGINEERING**

**WATCH THIS SPACE:**

The emergence of virtual and augmented reality will one day immerse us in life-like environments and transform how we learn, game and design. However, rendering complex ‘point cloud’ data is one of the challenges to making this vision a reality.

Kevin Ponto (design studies; Virtual Environments Group) looks to build a software solution inside a video game engine. Ponto’s approach is radically different from common visualization techniques currently in use. His team has presented this work at two professional conferences, including one sponsored by a leading development company of large-scale immersive display systems. They have demoed their software to potential partners and gotten valuable exposure to local industry.

**CLEAN TECH**

**DESLINATION BATTERY:**

A team led by Kyoung-Shin Choi (chemistry) has been busy engaging potential partners and formulating a commercialization strategy to advance a disruptive technology. Their innovation—a rechargeable desalination cell that could help avert a global crisis by turning seawater into fresh water. Unlike other tech on the market, Choi’s design is membrane-free and consumes almost negligible electrical energy.

So far the team has interacted with the city sewerage district and other local businesses struggling with high salt concentrations in their discharge water. They have engaged a venture capital firm focused on bringing technology to Africa and, on the invitation of a WARF Accelerator Catalyst, had the opportunity to participate in a technology de-risking workshop at 3M.

**SLIPS:**

David Lynn (chemical & biological engineering) has wrapped up a project to advance a new class of ‘slippery’ polymer coatings with improved anti-fouling and anti-microbial properties. The project achieved a straightforward and scalable method for coating the inside of narrow tubes such as catheters, which is difficult or even impossible to do with conventional methods.

Lynn has been working with a strategic collaborator in industry and is currently preparing and optimizing samples for evaluation by the company.