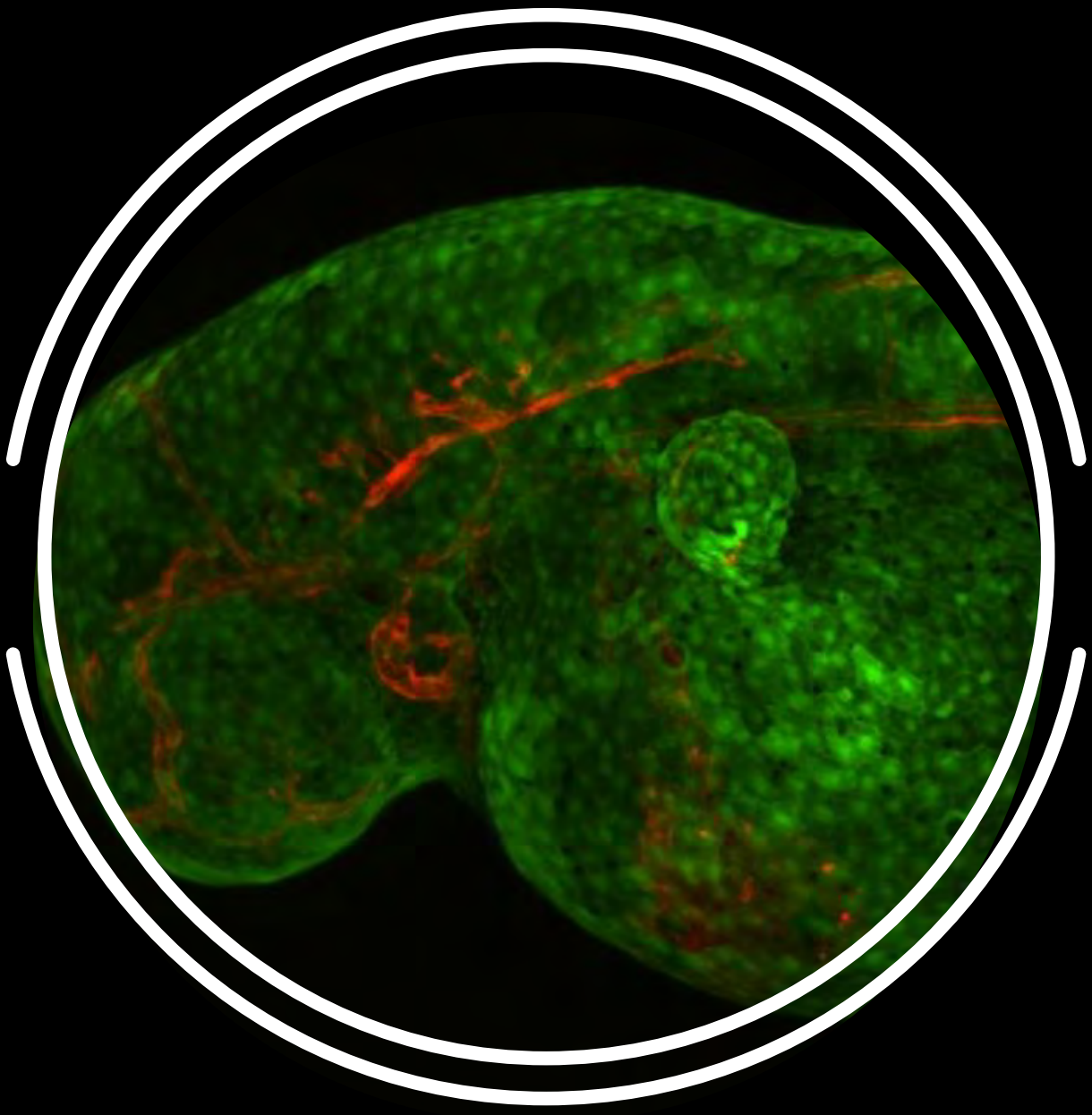
Stem Cell & Regenerative Medicine Center

UNIVERSITY OF WISCONSIN–MADISON



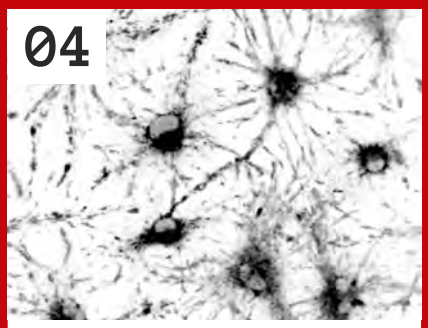
Annual Report

2024

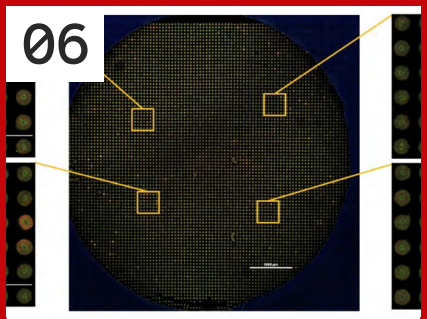
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Anterior end of a two-day, post-fertilization embryonic zebrafish from the ET33-1A enhanced trap line, displaying EGFP expression in the endocardium and epidermis. Florescent protein mCherry marks kdrl expression involved in the development of the circulatory system.


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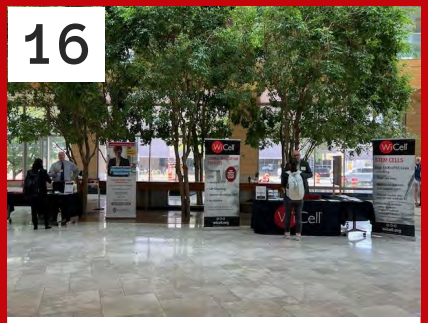
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Directors' Statement

Dear Colleagues and Friends,

This has been a year of collaboration and connection, which has propelled stem cell and regenerative medicine research forward. Thanks to your continued support and the amazing work of our members, the Center has expanded our reach and grown in our mission to advance the science of stem cell biology through faculty interactions, research support, and education.

Thanks to your generous gifts, we supported five trainees in 2024 through the SCRMC Research Training Awards (page 13). This program assists the trainees as they conduct cutting-edge research, fosters interdisciplinary collaborations among campus investigators, and gives them opportunities to explore leadership as they help to plan the annual SCRMC Fall Conference (page 15). We also welcomed six new Summer Undergraduate Research Fellows (SURF). The SURF program supports UW–Madison undergraduate students as they pursue research in stem cell science and regenerative medicine (page 12).

Additionally, our SCRMC Focus Groups are hard at work advancing research in five key areas, with the neural regeneration group funding two collaborative pilot research projects. This research is only possible through your support, and we are thankful to all who have invested in the Center.

The new Job Fair at the Fall Conference provides critical connections for trainees to look at next steps for advancing their careers in stem cells and regenerative medicine. We are incredibly grateful for our SCRMC Industry Partners (page 16) who participated in the Job Fair to advance stem cell and regenerative medicine research while supporting the biotechnology ecosystem throughout Wisconsin and beyond. This partnership connects industry, students, and campus experts to advance research innovations, expand outreach, and provide networking opportunities for students.

We hope you will join us in 2025 as we continue to create connections that will further our mission and increase stem cell and regenerative medicine innovation. We are grateful for your support, both in-kind and financially, as every donation aids our efforts to positively transform the future of medicine.

Sincerely,



Timothy Kamp, MD, PhD

Director, Professor of Medicine and Cell and Regenerative Biology, School of Medicine and Public Health



Randolph Ashton, PhD

Associate Director, Associate Professor of Biomedical Engineering, College of Engineering

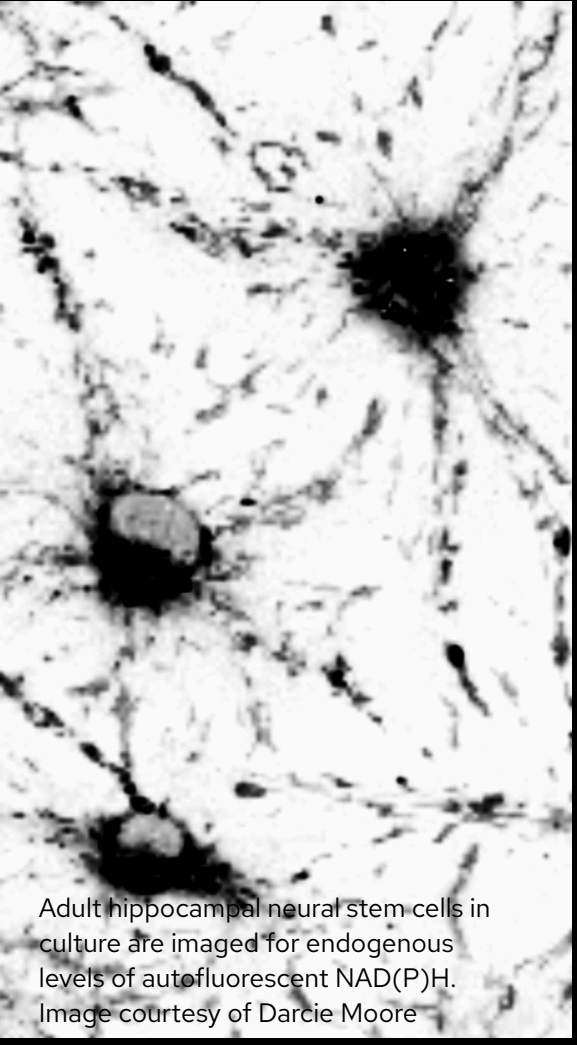
Our Mission

The UW–Madison Stem Cell and Regenerative Medicine Center (SCRMC) operates under the School of Medicine and Public Health (SMPH) and the Office of the Vice Chancellor for Research. The center provides a central point of contact, information, and facilitation for campus stem cell researchers. SCRMC faculty members collaborate across multiple UW–Madison schools, colleges, and centers, including SMPH, UW Health, College of Engineering, Wisconsin Institute for Discovery, Morgridge Institute for Research, Waisman Center, Wisconsin National Primate Research Center, School of Veterinary Medicine, and many others.

The center's mission is to advance the science of stem cell biology and foster breakthroughs in regenerative medicine through faculty interactions, research support, and education.

Our Goals

- Maintain UW–Madison as a leader in stem cell and regenerative medicine research and application
- Foster increased stem cell and regenerative medicine communication within campus and beyond its borders
- Support stem cell and regenerative medicine research: basic, translational, clinical, bioethics, and public policy
- Develop educational, training, and outreach programs
- Foster philanthropic support



Adult hippocampal neural stem cells in culture are imaged for endogenous levels of autofluorescent NAD(P)H. Image courtesy of Darcie Moore

NEW TOOL PROVIDES RESEARCHERS WITH IMPROVED UNDERSTANDING OF STEM CELL AGING IN THE BRAIN

By Bekah McBride

Researchers are one step closer to understanding the cellular mechanisms underlying stem cell aging in the brain thanks to a new tool developed at the University of Wisconsin–Madison. The tool allows scientists to use autofluorescence, or the natural emission of light by a biological specimen, to study adult neural stem cells in their different cell states, previously limited by available techniques.

The new tool combines autofluorescence and single-cell RNA sequencing to study neural stem cell behavior. Autofluorescence is often considered a negative feature of cells as it obscures the fluorescent labels researchers use to track specific signals within a cell. In this case, however, researchers have determined that autofluorescence signatures can be used to better study the substates of neural stem cells including the key stage of quiescence, also known as the stem cell's dormant state.

"Our goal was to create a new tool that could identify if an adult neural stem cell was quiescent and its different substates (dormant or resting quiescence) or if the cell is activated, entering into the cell cycle," says Darcie Moore, the senior author on the study, an associate professor in the Department of Neuroscience, and a member of the Stem Cell and Regenerative Medicine Center. "The quiescent state is very important because the exit from quiescence is the rate-limiting step in making newborn neurons in the adult brain. Aging and neurological diseases limit this exit from quiescence, so we have a great need to study adult neural stem cells in their different cell states."

Moore partnered with Melissa Skala, a professor at the Morgridge Institute for Research and the Department of Biomedical Engineering, and also a member of the Stem Cell and Regenerative Medicine Center, to develop this tool.

"I was excited by the high rigor of this study, which relates an experimental measurement (autofluorescence lifetimes) to standard measurements of cell function and identity," says Skala. "I was also excited that these natural signals within the cell can reliably identify cell function and identity. It's like nature is trying to tell us all the secrets of life."

By identifying and decoding these autofluorescence signatures, Moore and Skala have developed a tool that will not only aid in the study of adult neurological diseases and aging, but potentially expand beyond neuroscience.

"We have many projects that we will use with this new system," says Moore.

For example, they've already begun working with Colin Crist, an associate professor in the Department of Human Genetics at McGill University to investigate the unique autofluorescent

signatures present in muscle stem cells

While the study, which was published in Cell Stem Cell on March 22, has resulted in a key discovery that will impact the future of biomedical research, the original research was so novel that it was considered high-risk in terms of its ability to bring a discovery forward. As such, Moore is thankful for the support of the Vallee Scholar Award from the Vallee Foundation, which provided her with flexible, unrestricted funding.

"As a high-risk project, their support was critical to allow us to perform this work," says Moore, who also received additional support from the National Institutes of Health. "Trying new approaches is always risky but can also provide unexpected knowledge and high reward. Today's general funding schemes from government-funded agencies are typically very risk-averse, and that limits innovation. I'm so happy we were funded and supported in this work by the Vallee Foundation, and that we can show how stepping outside of one's scientific comfort zone can reap great benefits."

Additionally, Skala was supported through the Carol Skornicka Chair at the Morgridge Institute for Research and the Retinal Research Foundation Daniel M. Albert Chair.

In addition to the funding, Moore notes that this discovery would not have been possible without collaboration across campus.

"This work could never have been done without the amazing collaboration of Melissa Skala. She provided us with ideas and opportunities to play and try different things that led to these findings," says Moore. "It's important to surround yourself with people who, when you have a crazy idea say "yes! let's try it!" Melissa is one of those people, and working together we have found exciting ways our expertise can work together to move science forward. This work is an example of what I love about science – the discovery and the collaboration."

Skala echoed those sentiments, "As an engineer, I was excited to learn about neuroscience and work with a talented team of dedicated scientists. It makes the whole process fun and exciting. I enjoy Darcie's energy and her big picture vision. She can understand and solve engineering problems while still focusing on the important mysteries of neuroscience. It has been a rewarding collaboration with a long runway to keep making progress. Fearless science at its best!"

Moving forward, Moore and Skala plan to explore how this discovery can further biomedical research.

"Now that we've discovered that this research created not only a tool but gave us unique insight to cellular processes that are different between quiescent and activated neural stem cells, I feel even more strongly that identifying a cell based on how they act versus how they express one protein will shift studies from studying static systems to dynamic systems," says Moore. "That we can study these cells as they change throughout time without destroying them, while also seeing how these functional measures change is very exciting."



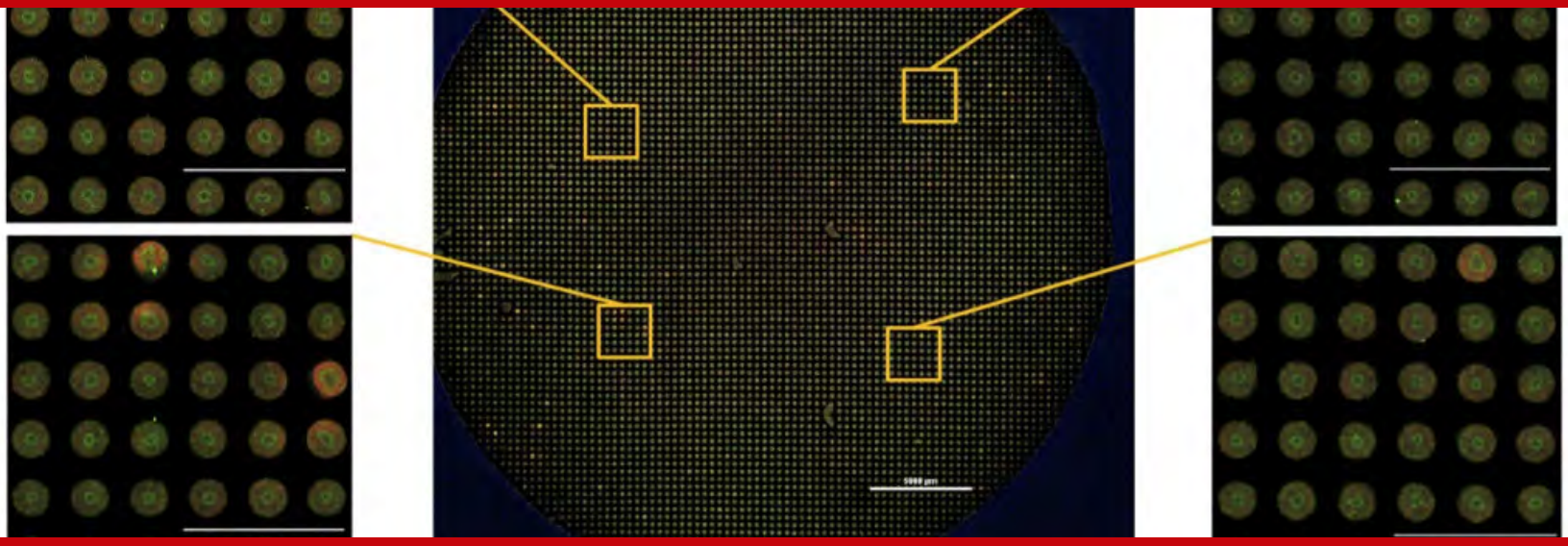
Darcie Moore, PhD
Associate Professor, Department of Neuroscience and SCRMC Executive Commiteee Member



Melissa Skala, PhD
Professor at the Morgridge Institute for Research and the Department of Biomedical Engineering

This research was supported in part by grants from the National Institutes of Health (P30 CA014520, 1S10RR025483-01, T32GM008688 and 1DP2OD025783) as well as the Vallee Foundation, Morgridge Institute for Research and Retina Research Foundation.

Stem cell technology developed at UW–Madison leads to new understanding of Autism risks



RosetteArrays, developed at UW–Madison, grow fields of neural rosettes — embroynic versions of scaled-down, simplified brain structures — from stem cells, giving scientists the opportunity to study the development of disorders like autism, spina bifida and epilepsy. Image courtesy of Neurosetta

By Bekah McBride

Technology developed at the University of Wisconsin–Madison to grow "rosettes" of brain and spinal tissue gives scientists new ways to study the growing human brain, including a recent study of how genetic mutations linked to autism affect early stages of human brain development.

It's the latest discovery using RosetteArray technology, a screening tool that uses stem cells to generate embryonic forebrain or spinal cord tissue structures called neural rosettes. Neural rosettes are the starting material for generating human stem cell-derived neural organoids — clusters of cells that resemble larger, more complex organs — and can be used to assess whether different genetic makeups or exposure to chemicals increase the risk of neurodevelopmental disruptions.

"This technology gives us access to an embryonic model of human central nervous system development that we would otherwise not have access to," says Randolph Ashton, a UW–Madison associate professor of biomedical engineering and associate director of the Stem Cell and Regenerative Medicine Center. "This is useful, because not only can we now understand more about human development, but we can get an understanding of when it goes wrong."

Ashton and Gavin Knight, a scientist at the Wisconsin Institute for Discovery who earned his doctorate in Ashton's lab, developed the technology behind RosetteArrays, which are marketed by Neurosetta, a company they co-founded with support from UW–Madison Discovery to Product and the Wisconsin Alumni Research Foundation's (WARF) Accelerator Program.

RosetteArray technology played an important role in a study published recently in Nature Neuroscience. The study, led by University of Southern California stem cell biologist Giorgia Quadrato, with Ashton and Knight as co-authors, investigated mutations of a gene called SYNGAP1.

SYNGAP1 mutations have long been associated with risk factors for autism spectrum disorder, epilepsy, neurodevelopmental disability and more, but until now the gene has mainly been studied in animal models and focued on the impact of SYNGAP1 on synapses, the structure at the tips of long brain cells called neurons that allow them to pass signals to neighboring cells.

In their new SYNGAP1 autism study, Quadrato and her lab used RosetteArray technology to grow neural rosettes from healthy human cells as well as from the cells of a patient with a disease-causing variant in SYNGAP1. By analyzing these young, developing neural organoids, Quadrato determined that human radial glia cells — the cells responsible for producing all the neurons in the outer layer of the brain called the cerebral cortex — can express SYNGAP1. When SYNGAP1 is mutated, it leads to disrupted organization of the cortical plate, an early brain structure that gives rise to the cerebral cortex. This shows that SYNGAP1-related brain disorders can arise through non-synaptic mechanisms.

Quadrato Lab and Neurosetta plan to partner on further



Randolph Ashton. PhD UW–Madison associate professor of biomedical engineering and associate director of the SCRMC.



Gavin Knight, a scientist at the Wisconsin Institute for Discovery who earned his doctorate in Asthon's lab.

studies to explore the extent of autism spectrum disorder genetic backgrounds that can be modeled using RosetteArray technology, which Ashton hopes will eventually lead to new precision medicine approaches.

"Simply being able to model early human development, in this case brain and spinal cord formation, gives you a very powerful platform to try to improve human health," says Ashton. "We've been surprised to see the effects of neurological disease-causing mutations in the earliest stages of these tissues' formation. RosetteArrays model approximately four to six weeks post conception, and we're learning that you can start to see markers for autism then, which is a disease that people typically aren't diagnosed with until post two years of age. So, the fact that we can see this very early in our model of human development is amazing."

Ashton says researchers using technologies like the RosetteArray are finding that the risk factors for autism spectrum disorder are boiling down to a couple of core pathways that seem to have roles very early in human brain development, which is helpful information as researchers work on treatments.

While this paper focused on studying brain tissue, Ashton has used the RosetteArray platform in his own lab to study defects in neural tube formation.

"(The neural tube) is a structure that goes from the head of the embryo all the way down through the back of the spinal cord. All brain, spinal cord and eye tissue comes from this neural tube," says Ashton. "It so happens that a lot of things can disrupt that process, and if that formation is disrupted early enough, then it causes lots of issues. It can cause congenital birth defects known as neural tube defects, for example spinal bifida, which is when the lower spine doesn't fully close. Or, if you have a failure of closure higher in the neural tube that leads to a failed pregnancy, so understanding this process is crucial."

Ashton and his lab members have been using RosetteArrays to investigate what may be causing spina bifida defects and how they can be mitigated.

"There are examples of known chemicals we use in our food supply, pesticides, and anti-cancer drugs that have historically been correlated with causing neural tube defects. So, it's important that we have a way to test new chemistries and chemical processes to make sure they don't have these effects on human development," says Ashton. "We've used rodent models but there's a difference between animals and humans. The RosetteArray provides a way to test these chemicals on early human brain and spinal cord development."

The RosetteArray platform may also be used for individualized medicine, as it can be used to screen individual patients' cell lines to better understand how mutations in a person's genomic background can lead to a disorder – as well as how the interaction between a person's genomic background and the chemicals that they're exposed to may lead to a health risk.

"We think this platform will be highly useful for both commercial applications for screening for chemicals that can cause neurodevelopmental risk, as well as for clinical application," Ashton says. "And I think the real power of the tool is for precision medicine and drug discovery."

Ashton and Knight developed the technology behind RosetteArrays, which are marketed by Neurosetta, a company they co-founded with support from UW–Madison Discovery to Product and the Wisconsin Alumni Research Foundation's (WARF) Accelerator Program.

Brain cell grafts in monkeys jump-start human trial for new Parkinson's treatment

Photo Credit: UW–Madison

By Chris Barncard

People with Parkinson's disease are receiving a new treatment in a clinical trial started after University of Wisconsin–Madison scientists demonstrated the safety and feasibility of the therapeutic delivery method in a study of non-human primates.

Parkinson's disease damages neurons in the brain that produce dopamine, a brain chemical that transmits signals between nerve cells. The disrupted signals make it progressively harder to coordinate even simple movements and cause rigidity, slowness and tremors that are the disease's hallmark symptoms. Patients are typically treated with drugs like L-DOPA to increase dopamine production. Although the drugs help many patients, they present complications and lose their effectiveness over time.



Marina Emborg, PhD, MD
Professor of Medical Physics, Director Preclinical Parkinson's Research Program, and SCRMC Executive Committee Member

Researchers at the Wisconsin National Primate Research Center successfully grafted brain cells called dopaminergic neuronal progenitor cells into the brains of cynomolgus macaque monkeys. California-based Aspen Neuroscience provided the cells, grown from multiple lines of human induced pluripotent stem cells, along with key pieces of the equipment for delivering them to specific parts of the brain.

"By the time of diagnosis, it is common for people with Parkinson's to have lost the majority of dopaminergic neurons, leading to progressive loss of motor and neurological function," explains Edward Wirth III, an expert in cell therapies, study co-author and Aspen's chief medical officer. "To replace these lost cells, we must target a very specific area of the brain with a high degree of surgical precision. Utilizing the latest advances in intraoperative MRI guided techniques, the patient's new cells are transplanted, a few microliters at a time, to the exact area where they are most needed."

Working with potential cell therapies in pursuing treatments for Parkinson's disease is a particular specialty of the team at Marina Emborg's lab and their primate center colleagues.

"Using autologous cells, a patient's own cells, avoids the need to use immunosuppression to keep the patient's body from rejecting or attacking the graft," says Emborg, a UW–Madison professor of medical physics. "Aspen has developed the technological methods for manufacturing, for quality control, that makes it feasible at scale to make autologous cells and get them to the patients."

The researchers' results in non-human primates, which supported Aspen's successful Investigational New Drug application to the Food and Drug Administration to begin human trials, were published today in the Journal of Neurosurgery.

"This study was an important step in our work to bring the promise of a cell-replacement therapy to people with Parkinson's disease," says Andrés Bratt-Leal, study co-author, Aspen Neuroscience co-founder and senior vice-president of research and development. "The results were instrumental in opening our first-in-human trial and informing how we deliver patients' own cells to them in the study."

The UW–Madison scientists, led by



Su-Chun Zhang, PhD, MD
Recently retired professor of Neuroscience, Neurology, SCRMC member and Waisman Center Senior Scientist

Parkinson's researcher Emborg, took up the Aspen-funded work fresh off their own success (published in 2021) reversing Parkinson's symptoms in monkeys by grafting neurons grown from the monkeys' own cells, called an autologous transplant.

The 2021 study, using cells grown by stem cell researcher Su-Chun Zhang of the UW–Madison School of Medicine and Public Health, added new dopamine-producing neurons to each animal's brain through injections guided in real time by MRI to an area of the brain called the putamen. Dopamine production increased dramatically, as did the monkeys' motor skills. At the same time, symptoms of depression and anxiety were reduced.

The new study was designed to test the delivery of Aspen's human cells. Wirth and Aspen scientists worked with Emborg's team to bridge the monkey-to-human application. While Emborg's previous study administered cells to the putamen through the top of the skull, the Aspen study examined cell administration through the back of the skull — an angle that could allow surgeons to reach their target with fewer insertions of the apparatus that delivers the new cells into the brain.

"The core idea is to decrease the risk of infection, the trauma, the surgical time the patient spends under anesthesia," Emborg says. "The fewer tracks you have to follow through the brain, the better for all of that."

Six monkeys received grafts of the human neurons through two paths in each side, or hemisphere, of their brains, with more cells deposited on one side of the brain than the other. A control group of three animals underwent the procedure without the cell delivery.

"In tissue samples taken seven and 30 days after the procedures, we found the grafted cells persisted in five of the animals," Emborg says.

The researchers confirmed the presence of Aspen's human neurons in the monkeys' brains, finding more cells in the hemispheres that were injected with a higher dose, more cells in the 30-day tissue samples compared to the seven-day samples and the presence of a protein produced by young neurons working to integrate with neighboring cells — all signs the cells grafts were successful.

It was a true collaboration, according to Emborg — between the Aspen scientists, her lab and the Wisconsin National Primate Research Center veterinarians and staff — to validate the company's procedures and equipment before study co-author Paul Larson, a neurosurgeon at Banner – University Medical Center Tucson and professor of neurosurgery at the University of Arizona College of Medicine – Tucson, began Aspen's first-in-human trial with people with Parkinson's in April.

The work done to refine the logistics, surgical equipment and techniques in the animal procedures will inform the way patients in the human trial receive and recover from the new therapy, providing hope for those struggling with a debilitating disease.

"Our results were all so exciting," Emborg says. "And then, when I saw they had been able to begin with a human patient this spring, I just had tears in my eyes."

This research was supported by Aspen Neuroscience and the National Institutes of Health (grant No. P51OD011106).



This weekly event brings researchers from campus and beyond to speak about their cutting-edge stem cell and regenerative medicine work. The seminar is held each Tuesday during the semester from noon-1 p.m. Central and is offered in a hybrid format. To learn more and see weekly locations and speakers, please scan the QR code on the right.

SCAN ME

SCRMC members lead the way in developing ISSCR standards that enhance reproducibility and rigor

By Bekah McBride

Stem cell research holds tremendous promise for the future of medicine, but successful therapies will require strong, evidence-based research that is conducted with scientific integrity. To support researchers in this pursuit, the International Society for Stem Cell Research (ISSCR) has developed standards that "identify quality standards and outline basic core principles for the laboratory use of both tissue and pluripotent human stem cells and the in vitro model systems" called the Standards for Human Stem Cell Use in Research.

These standards were developed through collaboration with researchers across the globe. Among those leading the charge were Stem Cell and Regenerative Medicine Center (SCRMC) members Tenneille Ludwig, PhD, a senior scientist and director of the WiCell Stem Cell Bank, and Anita Bhattacharyya, PhD, an associate professor of Cell and Regenerative Biology at the University of Wisconsin–Madison.

"We've had a lot of conversations within the community as a whole about the need for increased rigor and reproducibility in science in general," says Ludwig. For stem cell research specifically, Ludwig states, "We have data that we've generated that shows that 30 to 35 percent of everything we are receiving (at the WiCell Stem Cell Bank) from academic researchers for distribution has some sort of fatal flaw that will significantly impact the quality of data obtained from using it in research. And that's particularly alarming when you think about the fact that the material that people send us is what they consider their very best material."

Ludwig noted that the National Institutes of Health (NIH) has also become aware of the need for increased rigor and reproducibility and is now requiring all grant applications include a section on rigor and reproducibility. "To find that 35 percent of the submitted stem cell lines are not of the appropriate quality to be getting any sort of reliable data creates big issues for any conclusions and it creates an issue for the scientific journals as well. How do they know what is being published is reliable?" says Ludwig. "It doesn't matter how good the quality of your science is if the underlying materials are compromised. The ISSCR recognized this was an ongoing issue within



Tenneille Ludwig, PhD



Anita Bhattacharyya, PhD

the field and put together working groups to develop standards that are designed to increase the quality of science that we do as a global community."

When the opportunity came to officially develop the standards, Ludwig jumped at the chance to be involved.

"When asked if I would be willing to co-lead the initiative (with Dr. Peter Andrews from Sheffield University) it made sense given that my whole life's work is about improving quality, working towards consensus standards and identifying best practice," Ludwig said.

Together, they worked to select a steering committee that would drive the standards forward.

"We were very careful to select individuals from literally all over the globe," Ludwig says. "We wanted a gender balance, a regional balance, and leading experts in the field. So, to say that there are only four representatives from the US on the Standards Task Force and two of them are here at the University of Wisconsin is pretty exciting," Ludwig said of herself and Bhattacharyya, PhD, who was recruited to serve on a specific portion of the standards for disease modeling.

"Anita [Bhattacharyya] was on the working group for developing disease model systems thanks to her strong background working in Down Syndrome models. She was really one of the only experts we had who looks specifically at cellular models of disease as opposed to organoids and gene editing, so it was fabulous to have her contribution," says Ludwig.

Bhattacharyya was thrilled to join the team as she has been keeping up to date on ISSCR initiatives and activities for more than 10 years.

"ISSCR has really provided me with resources and the information I needed not just as a researcher, but also as the chair of the stem cell research oversight committee and a working group for intellectual and developmental disorder research centers across the country" says Bhattacharyya. "I, like many people, felt that the ethical policies that were sent out in the last iteration of the ISSCR Guidelines were helpful, but we really needed to think more about the practical issues of working with human stem cells, it's not like working with other cells. You need to have some understanding of their provenance and what additional ethical considerations come along with the research."

With this in mind, Bhattacharyya, Ludwig, and the entire team began working on appropriate standards that could be adopted by labs of any size and budget.

"I was really impressed by the level of discussion and that people didn't always agree on what we wanted to set forth but worked well together to come to a conclusion," says Bhattacharyya. "We were constantly talking about how to set the bar and what is reasonable, while trying not to be too prescriptive."

Ludwig agreed, adding, "We worked very hard to get into a consensus driven decision when we met with each working group.

Certainly, there were a lot of opinions when you get that number of high-profile investigators together. You must find a way to come to consensus and compromise. And it was a really great team to work with because everyone was motivated to do that. There was an atmosphere of mutual respect that allowed open discussion and a common desire to understand different perspectives. Everyone was motivated to work together and make a difference."After several months of collaboration, the standards have now been released on the ISSCR website. The team is pleased to see their work come to fruition and they've received positive feedback, with Ludwig and Andrews receiving the 2024 ISSCR Public Service award. They've also received some comments that the guidelines have set the bar high.

"Since it's come out, I have received feedback from researchers who feel that it's a lot to do, it's going to cost more, and I completely agree because I have my own research lab and I understand that. But I think that the standards are important for us for to be able to move the stem cell field forward with rigor and reproducibility," says Bhattacharyya.



Several individuals involved in drafting the Standards for Human Stem Cell Use in Research gather for dinner after a working session. Photo courtesy of Jack Mosher

The ISSCR is also proud to release this document and honored to have the involvement of researchers like Ludwig and Bhattacharyya.

"The call for rigor and reproducibility in scientific research, and specifically stem cell research, has been growing. The importance of it has been raised by journal editors, effects of its absence have been documented in the literature, and the financial impact has been highlighted by funders," says Jack Mosher, PhD, a scientific advisor with ISSCR. "To address this problem, the ISSCR, in partnership with global stakeholders, developed the Standards for Human Stem Cell Use in Research. With significant contributions from UW scientists, Tenneille Ludwig, who co-chaired the project, and Anita Bhattacharyya, the document provides a set of best practices and reporting recommendations for pluripotent and tissue stem cell research for scientists worldwide."

SCRMC News

SCRMC Members receive WARF Innovation Award

By Jeanan Yasiri Moe

A WARF Innovation Award has been given to the University of Wisconsin-Madison's Ahmed Mahmoud, assistant professor of cell and regenerative biology; Timothy Kamp, professor of medicine; and Youngsook Lee, emeritus professor of cell and regenerative biology; for their work, Regenerating and Renewing Heart Tissue.

The team discovered a protein, LRRC10, that activates heart renewal and regeneration in animal models. This discovery could lead to a therapeutic that restores cardiac structure and function in human heart failure patients.



Ahmed Mahmoud, PhD



Youngsook Lee, PhD



Timothy Kamp, PhD MD



Eric G. Schmuck, PhD



Ying Ge, PhD



Steven Tur

Discovery to Product awards funds to SCRMC member startup

Eric G. Schmuck, SCRMC member, research assistant professor and director of research at the Center for Biomedical Swine Research and Innovation, with Cellular Logistics, will evaluate a biomaterial's potential to reduce post-heart attack damage and restore cardiac function in a swine model. Data from this UW–Madison and Cellular Logistics collaboration is crucial for supporting FDA filings for a first human clinical trial.

SCRMC member named to The Analytical Scientist Power List 2024

Ying Ge, a professor of Cell and Regenerative Biology, was named as one of 60 "leaders and influencers in analytical science whose work is transforming the world around us" and addressing major challenges. Ge's research aims to understand the molecular and cellular mechanisms underlying cardiovascular diseases via systems biology approaches. Her research features cutting-edge ultra high-resolution mass spectrometry (MS)-based comparative proteomics and metabolomics in conjunction with functional studies.

Tur receives prestigious Graduate Hematology Award from the American Society of Hematology (ASH)

Steven Tur, who works in SCRMC member Marjorie Brand's lab, has received the prestigious Graduate Hematology Award from the American Society of Hematology (ASH). With only nine recipients, Tur will receive funding for his research focusing on T-cell acute lymphoblastic leukemia (T-ALL), a severe hematological malignancy characterized by the aberrant expression of oncogenic transcription factors, transforming T-cell progenitors into malignant cells.

Tur shared that his research will focus on using advanced single-cell technologies and machine learning to map the networks that support cancer cell growth, discovering new treatment targets, and improving personalized medicine for T-ALL patients

"I am deeply grateful for the 2024 ASH graduate award," says Tur. "As an interdisciplinary student with a background in physics, nanoscience, and biotechnology, I am very excited for the opportunity to dive deeper into the field of blood cancers for my graduate research. I hope that using single-cell technologies to combat T-cell acute lymphoblastic leukemia will lead to new treatments for this devastating disease, improve patient outcomes, and advance the field of blood cancer research."

CONGRATULATIONS TO THE 2024 SUMMER UNDERGRADUATE RESEARCH FELLOWSHIP (SURF) AWARD WINNERS!

The Stem Cell and Regenerative Medicine Center labs will welcome six new members this summer, as a part of the Summer Undergraduate Research Fellowship (SURF), which supports motivated University of Wisconsin–Madison undergraduate students as they pursue research in stem cell science and regenerative medicine. These talented undergraduate students will be paired with mentors for more than 10-weeks of collaborative research and receive a $6,000 stipend.



Generous support for the SURF program has been provided by WiCell.

2024 SURF Mentors and Mentees

Mentee	Mentor	Lab	Project Title
Smriti Tiwari	Jamie Jones	William Murphy	Improving mRNA lipid nanoparticle stability for the treatment of infectious diseases and genetic eye disorders
Claire Peplinski	Austin Feeney	Sean Palecek	Improving Human Pluripotent Stem Cell-Derived Cardiomyocyte Differentiation and Maturation
Evan Tian	Abigail Cordiner	Sean Palecek	Identifying retinoid receptors involved in atrial specification of human pluripotent stem cell derived cardiomyocytes.
Bjorn Schoff	Matthew Wagner	Barak Blum	Characterization of DSCAM in pancreatic islets
Vivian Trach	Andrew Tak	Rupa Sridharan	Rejuvenation in aged mouse cells through targeted modulation of gene expression
Ellison Emrick	James Rolland	William Murphy and Sean Palecek	Mineral Coated Microparticle-Mediated Delivery of Ionizable Lipid Nanoparticles Containing Polycistronic mRNA to Direct a Blood-Brain Barrier Endothelial Fate

Meet the 2024 SCRMC Research Training Award Winners

The SCRMC Research Training Awards were established in 2008 to recognize and provide support for promising graduate students and postdoctoral fellows of all citizenships conducting stem cell and regenerative medicine research at the University of Wisconsin-Madison. The 2024 SCRMC Research Training Awards Program provides unique, interdisciplinary training for five future leaders in stem cell and regenerative medicine research. Additionally, this program will foster interdisciplinary collaborations among campus investigators.

The SCRMC and the awardees would like to thank those who philanthropically support the SCRMC and make these awards possible.

Sam Dettle



Mentor Igor I. Slukvin, MD, PHD and Trainee Award Winner Samuel Dettle

Project Description:

I am a chemistry major who was planning on going to medical school. In my gap year I worked in the Slukvin Lab on projects involving human and Non-Human Primate Hematopoiesis. I enjoyed the research so much that I switched my life plans and applied to graduate school under Dr. Slukvin. At the same point in time, I had gotten interested developing a protocol to derive hematopoietic stem cells from iPSCs, after attending a conference in Seattle focusing on translational stem cell hematopoiesis. My last year and a half of work has been focused on developing reporter cell lines in human and non-human primates along with a high throughput protocol screening system capable of identifying the proper cell culture conditions that yield engraftable hematopoietic stem cells from human and non-human primate iPSCs.

Trainee Statement:

I am excited to have received the SCRMC award as it has allowed me to pursue this project full time as well as has freed up funds to acquire an automated liquid handler robot which I've had the pleasure of coding this last month and a half. Additionally, I'm excited to get involved more with the SCRMC group here on campus in organizing events and other outreach events.

Natasha Méndez-Albelo



Mentor Xinyu Zhao, PhD and Trainee Award Winner Natasha Méndez-Albelo

Project Description:

My thesis project aims to understand the role of the brain-enriched RNA binding protein Fragile X autosomal homolog 1 (FXR1) in the development of human neurons. FXR1 is crucial for development because its loss of function is intolerant in humans and causes neonatal death in mice. FXR1 has been associated with a number of brain disorders including autism, bipolar disorder, and schizophrenia. However, the role of FXR1 in human brain development has not been investigated. Using human induced pluripotent stem cells (iPSCs) that have either FXR1 knockdown or knockout, I have found that FXR1 deficiency leads to reduced proliferation of neural progenitor cells and impaired morphological and electrical maturation of cortical excitatory neurons. The next step of my project is to investigate the underlying mechanism using transcriptomics.

Trainee Statement:

I am grateful and excited to receive this predoctoral award from SCRMC. I believe that this award will help me to advance my project and provide me with opportunities to explore new collaborations at UW-Madison. In addition, this award will significantly strengthen my professional growth as a stem cell biologist.

Matthew L. Russo, PhD



Trainee Award Winner Matthew L. Russo, PhD and mentor Anita Bhattacharyya, PhD

Project Description:

Down syndrome is the most common genetic cause of intellectual disability, but very little is known about what causes this intellectual disability. One potential explanation is that the formation of synapses, the points at which neurons communicate with one another, is disrupted during brain development in individuals with Down syndrome. The aim of my project is to determine what factors drive disrupted synapse development in Down syndrome.

Trainee Statement:

I am excited to receive this award because I am eager to engage more with the SCRMC community. I am excited to work with other postdoctoral and graduate student fellows in the SCRMC, as I believe it will substantially enrich my experience at UW-Madison.

APPLICATIONS OPEN THROUGH JANUARY 6

SCAN ME

Sayandeep Saha



Mentor Matthew E. Brown, PhD and Trainee Award Winner Sayandeep Saha

Project Description:

Human pluripotent stem cells (PSC) derived Arterial Endothelial Cells (AECs) can benefit a wide range of PSC-based therapies by promoting neovascularization; however, these are the first cells encountered and attacked by the recipient immune system in multi-cellular, PSC-derived grafts. They are therefore a prime target cell type for hypoimmune gene editing. AECs express cell adhesion molecules (AMs) which bind directly to ligands expressed on the surface of multiple types of effector immune cells that participate in allograft rejection. This project utilizes CRISPR-Cas9 gene editing to knock out a critical AM in PSCs and in PSC-AECs, thereby significantly diminishing innate and adaptive immune cell binding to our cell therapies in order to avoid allorejection.

Trainee Statement:

I'm honored to have received this award and excited to carry out this research project. With support from the Stem Cell & Regenerative Medicine Center, I'll have the opportunity to gain critical knowledge and skills in the fields of transplantation immunology and regenerative medicine. I look forward to publishing our results and exploring the next steps of understanding in vivo immune responses to the various cell types comprising PSC-derived cardiovascular cell therapies.

Shraddha Suryavanshi



Mentor Valentina Lo Sardo, PhD and Trainee Award Winner Shraddha Suryavanshi

Project Description:

Our lab studies non-coding genetic variants linked to risk for Coronary artery disease, in particular, the 9p21.3 CAD risk locus. This non-coding region is human-specific and iPSCs are an ideal model to understand how this locus works and how it induces increased risk of developing CAD.

For my project I focus on the role of this genomic region on vascular smooth muscle cells (VSMCs), one of the main cell type of the coronary arteries. We have preliminary evidence indicating that the 9p21.3 locus regulates mRNA metabolism and splicing processes. My project will focus on investigating this mechanism, to explore further which splicing genes are dysregulated by the risk form of the 9p21.3 and what are the consequences of this dis-regulation. I will also leverage a new sequencing technology, based on long reads, to understand if this locus regulates specific gene isoforms at the genome-wide level.

Trainee Statement:

Being an international student, I have limited access to funding opportunities, so I am very grateful for the generous support of the SCRMC. I am honored to have been selected for this fellowship, as I know there were many fantastic trainees applying this year. I am very excited and thankful to receive this award, and I look forward to continuing to work in the Lo Sardo lab on this very exciting project.







Fall Conference and Job Fair

On September 6, nearly 200 students, researchers, and industry professionals gathered for the SCRMC Fall Conference and Job Fair at the Discovery Building. This annual scientific gathering for the stem cell community focused on Stem Cell Therapeutics and Transplant Biology with keynote addresses by Dr. Sonja Schrepfer (University of California San Francisco) and Dr. Matthew E. Brown (University of Wisconsin-Madison). We also welcomed several organizations for our stem cell and regenerative medicine focused job fair including several Industry Partners listed below.

SCRMC members and the Conference Planning Committee would like to thank all those who attended as well as our sponsors, judges, and everyone who submitted abstracts and images for consideration.





Thank you to the 2024 SCRMC Trainees Award winners who helpd to plan this event. In photo on left, from left to right, Sam Dettle, Natasha Méndez-Albelo, Matthew L. Russo, Shraddha Suryavanshi, and Sayandeep Saha. We also want to extend a special thank you to our keynote speakers.

Congratulations to the Fall Conference Award Winners!

Blitz Talk Award Winner: Caterra Leavens

The beta cell "Invisibility Cloak" – developing stem cell derived pancreatic islets that are protected from the immune system

Poster Award Winner: Elsa Salido

9p21.3 coronary artery disease risk locus induces cell state transitions in vascular smooth muscle cells

Cool Image Award Winner: Steffani Manna

Anterior end of a two-day, post-fertilization embryonic zebrafish from the ET33-1A enhanced trap line, displaying EGFP expression in the endocardium and epidermis. Florescent protein mCherry marks kdrl expression involved in the development of the circulatory system.







Photos from the 2024 Job Fair

Thank you to everyone who participated in the 2024 Job Fair portion of the conference. We had a great turnout that included students, postdocs, and several organizations who are a part of campus or our Industry Partnership Program. This program connects SCRMC members and students with industry to help advance stem cell and regenerative medicine science and support the biotechnology ecosystem throughout Wisconsin and beyond. This is a critical part of the Center's mission to foster increased stem cell and regenerative medicine communication within campus and beyond its borders.

Thank you to our Fall Conference and Job Fair sponsors including our Industry Partners!

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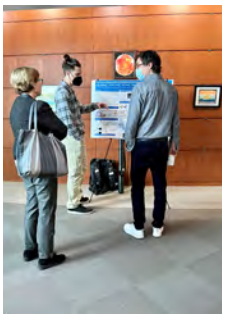
Save the Date for the 2025

Fall Conference & Job Fair

September 5 at the
WI Institutes for Discovery

Wisconsin Stem Cell Symposium

On April 17, more than 350 students, researchers, and industry professionals gathered for the 18th annual Wisconsin Stem Cell Symposium at the Biopharmaceutical Technology Center (BTC) on the Promega Corporation Campus in Fitchburg, Wis. The event, Blood Stem Cells: Mechanisms, Pathogenesis, and Genome Editing, included a poster session and competition as well as presentations from scientific leaders who discussed fundamental and translational advances, which inform broader aspects of stem cell biology and molecular medicine.







Congratulations to the WI Stem Cell Graduate Scholar Award Winners!

These scholars were selected to attend the conference and spend an additional day meeting with UW faculty to learn about postdoctoral opportunities in stem cell biology at UW-Madison. Look for more information on the 2025 program application process coming soon to the SCRMC website.

Arushana Maknoja, Baylor College of Medicine
Grace Meaker, University of Oxford
Meg Schaefer, University of Nebraska Medical Center
Jonas Their, Karolinska Institutet

The University of Wisconsin-Madison Stem Cell & Regenerative Medicine Center (SCRMC) is committed to training future leaders in stem cell research and is a proud sponsor of this program.

Congratulations to the poster competition award winners!

Thank you to everyone who submitted abstracts for consideration and congratulations to the finalists and the award winners:

1st Place: Steven Tur, UW-Madison
Trimodal single-cell profiling of T-cell acute lymphoblastic leukemia identifies leukemic stem cells

2nd Place: Meher Gayatri, UW-Madison
A gain-of-function p53 mutant synergies with oncogenic NRAS to upregulate KLF4 and promote acute myeloid leukemia

3rd place: Gyuhyung Jin, Purdue University
Macrophages from Human Pluripotent Stem Cells



The annual Wisconsin Stem Cell Symposium is coordinated by the University of Wisconsin–Madison Stem Cell & Regenerative Medicine Center and the BTC Institute. It is held at the Biopharmaceutical Technology Center (BTC) on the Promega Corporation Campus in Fitchburg, WI.

The theme for 2025 will be Translational and Commercial Applications of Stem Cell-Derived Technologies. Speakers will discuss how stem cell-derived technologies and computational tools are being used to enable diverse translational and commercial biomedical applications. The agenda includes speakers from academia and industry, a panel discussion with local industry representatives, and the traditional poster competition/session.

Registration is now open!
The registration fee is $120, discounted to $60 for students and post-doctoral researchers.

Posters are also now being accepted for consideration. Thirty posters will be accepted. To be considered for the contest, you must be a graduate student or post-doctoral researcher. Abstracts will be reviewed as received until the total has been reached. The final submission deadline is Wednesday, March 19, 2025.

Highlighted topics for 2025 include:

- Clinical translation of iPSC-derived retinal cell therapies
- Commercialization of CNS cell therapies, research and regulatory tools, and disease models
- Clinical translation of iPSC-derived blastoid models
- iPSC models of cardiac tissue for translational regulatory applications and disease modeling
- Endodermal organoid bioengineering and translation
- Cell therapy development in Biotech
- Machine learning applied to single-cell sequencing in Biomedicine
- Applying AI/Machine Learning in biotechnology research and development

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Learn more and donate through the enclosed envelope or online at:
stemcells.wisc.edu/make-a-gift-2/

Or contact Pete Schmeling if you would like more information on how to give.

Pete.Schmeling@supportuw.org
608-354-9388





Photo Credit: UW–Madison



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