

Epidermal differentiation of iPS cells derived from a patient with lamellar ichthyosis. (Photo courtesy of Teng lab.)

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FROM THE DIRECTOR

Welcome to our Spring 2011 SCRMC newsletter. Please look at this newsletter to find out what's new at the SCRMC and how the center is working to help foster stem cell and regenerative medicine research and education.

Change is a constant in life and on campus, and many of these changes are reasons for excitement. We are excited to see the launch of the new Department of Cell and Regenerative Biology which includes many of our members. The SCRMC looks forward to partnering with CRB. The Wisconsin Institutes for Discovery has opened since our last newsletter, and the weekly Tuesday noon Campus Stem Cell Lab Meeting is thriving in the Forum space there. Come join us and experience WID pizza as well. The most important change for SCRMC members is the addition of Bill Murphy as Associate Director. Bill has been a tremendous contributor to many programs of the SCRMC, and his formal role in the center will be a great asset.

Also emerging since the last newsletter is a very active education committee led by Karen Downs. The committee is working hard to establish a certificate program in Stem Cell Science for undergraduates and contributing to efforts to advance the graduate curriculum. In addition, efforts to establish several scientific focus groups in the SCRMC organized by Bill Murphy are moving forward. Stay tuned to this, so you can participate in the most relevant group(s).

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Joyce Teng visits with a patient at her UW Health clinic at 1 South Park Street. Teng, who is Madison's only board-certified pediatric dermatologist, recently won an SCRCM/ICTR pilot grant for translational research using patient-specific iPS cells to model skin diseases. (Image by J. Lenon)

Dermatologist Pushes Translational Work with Stem Cells

by Marianne English

When **Joyce Teng** tells parents she's looking to use stem cells to potentially develop treatments for their children, it brings tears to their eyes.

"They oftentimes just think this will be the way of life and there will never be any hope," she says.

But she understands these parents' positions all too well. Teng, a UW-Madison assistant professor of dermatology and SCRCM member, has cared for her own daughter's severe atopic dermatitis—an inflammatory skin condition that can cause intense itchiness and rashes—for five years. Her first-hand experience with a skin condition came at an ironic time, as Teng juggled her first few years of

medical school at Vanderbilt University in the mid '90s. Fortunately, she says, her daughter's condition subsided, but the experiences led her to pursue a career in pediatric dermatology—an area in which she continues to do pioneering work on a national level.

In addition to serving as Madison's only board-certified pediatric dermatologist, Teng wears multiple hats on campus. But most recently, her translational research using patient-specific iPS cells to model skin diseases has drawn interest to her small lab and busy clinic.

New Woman on Campus

Teng, who earned her doctorate in cellular immunology from the Medical College of Wisconsin and her M.D. from Vanderbilt University, joined the faculty at UW-Madison in 2006 and became the director of pediatric dermatology in 2007. Currently, she has clinics at both UW Health as well as

the American Family Children's Hospital.

She began interacting with SCRMC members more than two years ago and was invited to participate in a multi-disciplinary project to collect skin specimens to generate patient and disease-specific pluripotent stem cells. Despite advances in other medical fields, stem cells are relatively new tools in the dermatology community, she says.

She has established collaborative projects with **Vijay Setaluri** from the dermatology department and **Sean Palecek** from the chemical and biological engineering department – both researchers are SCRMC scientists as well.

The group's pilot grant project, partially funded by the SCRMC, focuses on disease modeling in three-dimensional culture using iPS cells generated from lamellar ichthyosis and epidermolysis bullosa (EB) patients. Individuals with lamellar ichthyosis have thickened scaly skin due to abnormal cornification that leads to increased morbidity during infancy and lifetime problems including pain, disfigurement, secondary infection, growth delay,

depression and ocular complications. The disease is relatively rare, affecting one out of every 200,000 people living in the United States, according to the U.S. National Library of Medicine. On the other hand, patients with EB will have increased risk of blistering, infection, scarring and cutaneous malignancy.

But lack of prevalence doesn't limit the value of studying this disease, Teng says.

Because lamellar ichthyosis is caused by a single genetic mutation, Teng believes it will be easy to model and may even serve as a proof of concept to look at other diseases, skin-related or otherwise. This type of work may also lead to better methods to test drugs and therapies *in vitro*.

For the project, she and her colleagues study the differences in differentiation and biological behavior between patients' iPS cells and the wild-

type iPS cells generated from normal controls or those provided by the **James Thomson lab**.

Teng and colleagues' efforts to create fully functional three-dimensional skin tissue in culture using iPS cells make their project unique, as no current model exists.

"Animal studies can be difficult sometimes," Teng says. "That's why we came up with the idea that instead of using an animal model, we could first try to engineer skin in culture to see whether we can duplicate the disease process."

Palecek, one of Teng's collaborators and a professor of chemical and biological engineering on campus, works with her to achieve this goal. He and his lab members study the mechanical forces and cellular interactions that affect stem cell differentiation. He also has experience deriving epidermal keratinocytes, which constitute the outermost layer of skin, from human embryonic stem cells and iPS cells.

"[Joyce's work] is really unique in using iPS cell lines to model human skin disease —I don't know anyone else who's come

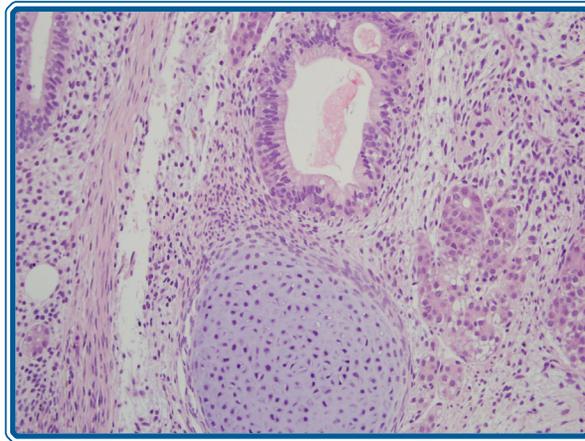
close to that," Palecek says of the group's idea to create functional skin from patients' cells. "Her disease model is a powerful new tool for addressing defects in skin development."

If successful, the investigators will next experiment with gene correction in the iPS model as early as next fall to gauge whether they can reverse the disease's phenotype in engineered skin culture.

A Caring Clinic

Amid a busy research schedule, it's surprising that Teng still keeps more than 400 dermatology appointments per month. She sees her pediatric patients, who range from newborns to college-aged individuals, for a wide spectrum of cutaneous disorders.

Some chronic skin diseases, she says, are harder



Teratoma generated from a lamellar ichthyosis patient's iPS cells demonstrates pluripotency. (Photo courtesy of Teng lab.)

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to work with than others because of their impacts on a person's quality of life. For instance, patients with dystrophic epidermolysis bullosa, the most severe blistering skin disease, could spend hours daily on dressing changes, and the estimated cost for medical dressing alone could reach \$75,000 per month. Living with this disease and others similar to it is not only physically painful, but emotionally demanding as well. Skin disease is different: "you can't hide from being in your own skin," Teng adds.

"That's going to be the way of their lives," she says, emphasizing that without new treatments, there's only so much doctors can do. "I can make them feel slightly better by relieving the symptoms and manage some of the complications, but it's not going to change the quality of life fundamentally."

Teng's realistic approach to treating patients is why her work focuses on techniques and treatments with direct translational applications. Having a two-armed approach to a disease allows her to become more intimate with her work and maintain better working relationships with patients and their families. "Those types of experiences are very gratifying to me," Teng says. "The clinical experience inspires me to pursue intriguing research; and I get very excited when my research benefits patients and has an immediate clinical outcome."

Marianne English is a graduate student in science journalism at UW-Madison.

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Another look at EB disease and stem cell research in the news:

<http://www.wfrv.com/news/local/Debate-over-stem-cell-research-119024389.html>



**Stem Cell & Regenerative
Medicine Center**

UNIVERSITY OF WISCONSIN-MADISON

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Something new for the SCRMC

Find the University of Wisconsin Stem Cell and Regenerative Medicine Center on [Facebook](#). Join more than 300 followers keeping up with seminars, news and more.

(continued from page 1)

It is also the time of the year for the 6th Annual Wisconsin Stem Cell Symposium at Promega jointly sponsored by SCRMC and the BioPharmaceutical Technology Center Institute (BTCI). Emery Bresnick and Bill Murphy took the lead in organizing the meeting on Reprogramming and Controlling Stem Cell Phenotype. Check out the extraordinary group of scientists who will be presenting.

Finally, in a time when political protests and budgets are impacting our university in major ways, the SCRMC continues to provide public outreach and information regarding the promise and power of stem cell research.

Tim Kamp

Get the Facts on Embryonic Stem Cell Research

As posted on [Wisconsin Stem Cell Now](#), Feb. 25, 2011

The Stem Cell and Regenerative Medicine Center at the University of Wisconsin has issued a new fact sheet on human embryonic stem cell research. You can access the fact sheet [here](#). The center posts additional fact sheets in its [newsroom](#) covering topics such as ethics, the field of regenerative medicine and an explanation of induced pluripotent stem cells.

The funding debate over medical research has highlighted the need for the SCRMC to provide resources to better inform and educate the public, so that voters can make rational decisions that reflect the best interests of society. Despite our success, public education is hard work, as it requires constant vigilance and sustained effort in the face of deliberate attempts to misinform voters. As leaders of stem cell and medical research, we have an obligation to stay informed and do our part to inform friends and colleagues about the facts.

Remember: You can help keep our website up-to-date by sending [Sue Gilbert](#) updates for your webpages and [job announcements](#).

Want an easy way to keep up with the keep up with advances in the field of stem cell research? Check out [25 Best Blogs for Following Stem Cell Research](#) published by <http://www.nursingdegree.net/>.

Bill Murphy is new SCRMC Associate Director



We are excited to welcome Bill Murphy as our new associate director at the SCRMC. An associate professor of biomedical engineering and orthopedics and rehabilitation, Murphy has made numerous contributions to the center since its inception in 2007. He has spearheaded our fellowship training programs, serves on the SCRMC Executive Committee and headed the last faculty retreat planning committee. He is also co-chair of the 2011 Wisconsin Stem Cell Symposium, serves on the SCRMC education committee and is a member of several faculty search committees in regenerative medicine.

Murphy's latest effort on behalf of the SCRMC is to organize new Scientific Focus Groups within the SCRMC. These groups will work with existing groups on campus to improve communication, research best practices and more. (See *article on page 7.*)

In Murphy's Bioinspired Materials Laboratory, he and his team develop "smart" biomaterials for tissue engineering applications. Read more about the Murphy lab [here](#).

"Under Tim Kamp's leadership, the SCRMC has become a powerful force to promote interdisciplinary research and education at UW," Murphy said. "I look forward to working with center faculty to support and expand Wisconsin's international leadership in stem cell science and regenerative medicine."

Kamp emphasized that Murphy has been an active contributor to many aspects of the SCRMC. "I am delighted that he has agreed to take an even greater role in the center," Kamp said. "His enthusiasm, creativity and passion for interdisciplinary research will enable the SCRMC to continue its growth and better serve its members."

SCRMC Member Services

The following core services are available to SCRMC members and appear on our website at www.stemcells.wisc.edu/research/.

- Immunology and Pathology Services
- Nonhuman Primate Services
- Cellular and Molecular Imaging Services
- Small Animal Imaging Services
- WiCell Research Institute and WiscBank
- Research Materials and Services
- Training Courses

...and more

Your SCRMC Executive Committee

All SCRMC members contribute and benefit from the center, but we especially receive leadership and guidance from our executive committee. Current members, elected Nov. 30, 2010, are **Tim Kamp** (Medicine), **Erik Forsberg** (WiCell Research Institute), **Bill Murphy** (Biomedical Engineering), **Linda Hogle** (Medical History and Bioethics), **Emery Bresnick** (Cell and Regenerative Biology), **Derek Hei** (Waisman Center), **Brenda Ogle** (Biomedical Engineering, Material Science Program) and **Su-Chun Zhang** (Neuroscience, Neurology, Waisman Center).



Focus Group at first Faculty Retreat, Sept. 2009 (Photo by J. Lenon)

Join SCRMC Scientific Focus Groups

Our center is now organizing five new Scientific Focus Groups coordinated by new SCRMC Associate Director **Bill Murphy**. Our goal is to bring together researchers with similar interests from across campus to improve communication, collaboration, resource sharing, fund raising and other activities within these specialized groups.

Current Scientific Focus Groups

- * Stem Cell Bioengineering: **Brenda Ogle**
- * Cardiovascular Regeneration: **Amish Raval**
- * Musculoskeletal Regeneration: **Ben Graf**
- * Molecular Hematology: **Emery Bresnick**
- * Neuroregeneration: **Anita Bhattacharyya**

Group chairs will first work with center staff to put in place administrative support for these groups and also link them to other established research groups on campus with similar interests to aid their development. The second phase of growth requires creating websites to facilitate organization, communication and fundraising for each group and its members. Third, the center will help establish pilot grant programs and other logistical support for these scientific groups. The groups will steer their own direction, using center staff and resources to assist them, to establish leadership, meetings, goals and activities with the common goal of furthering all stem cell and regenerative medicine research on campus.

“Our goal is not to have the center take ownership of these scientific focus groups, but to interact with them and help them grow,” Murphy said. “Ideas from those interested in forming and participating in these groups so far have included hosting periodic retreats and mini-conferences, and launching Internet discussion forums within and among the groups. These groups will ultimately serve as ‘hubs’ to connect researchers across the UW campus, resulting in new multi-investigator research initiatives.”



News Briefs

UW-Madison scientists report chromosomal changes comparable in iPS & hES cells

April 8, 2011 (Courtesy WiCell Research Institute)

Induced pluripotent stem cells acquire similar chromosome abnormalities at a similar rate as human embryonic stem cells according to a paper published April 8 in *Nature Biotechnology*. Scientists from the WiCell Research Institute and University of Wisconsin–Madison have determined that cultures of induced pluripotent cells develop chromosomal changes at a rate comparable to cultures of human embryonic stem cells. The work, led by **Karen Dyer Montgomery**, Cytogenetics Department (WiCell) and Pathology (UW-Madison), provides another example of how the two types of cells are similar.

Like embryonic stem cells, induced pluripotent stem cells can potentially become any of the 220 mature cell types in the human body. However, scientists are still working to understand subtle differences between human embryonic and induced pluripotent stem cells.

Embryonic stem cells are known to acquire chromosomal abnormalities during long-term growth in cultures. Because induced pluripotent stem cells are derived from mature cells, it was once thought that they may not develop these chromosome abnormalities. Wisconsin scientists have now shown that induced pluripotent stem cells acquire some of the same chromosomal changes when they are cultured for extended periods.

[Read More](#)



Study shows patient's own cells may hold therapeutic promise after reprogramming, gene correction

April 4, 2011 by Jennifer Sereno

Scientists from the Morgridge Institute for Research, the University of Wisconsin-Madison, the University of California and the WiCell Research Institute moved gene therapy one step closer to clinical reality by determining that the process of correcting a genetic defect does not substantially increase the number of potentially cancer-causing mutations in induced pluripotent stem cells.

The work, led by **James Thomson's** lab, was published the week of April 4 in the online edition of the journal *Proceedings of the National Academy of Sciences*. The research, funded by a Wynn-Gund Translational Award from the Foundation Fighting Blindness, suggests that human induced pluripotent stem cells altered to correct a genetic defect may be cultured into subsequent generations of cells that remain free of the initial disease.

[Read More](#)



Private alumna leaves millions to UW

Philanthropy benefits SCRMC, School of Veterinary Medicine

Feb. 12, 2011 By Jim Stingl

The daughter of Czech immigrants, Martha Pavcek lived simply and apparently frugally. She taught in Milwaukee schools for many years and never married.

You wouldn't take her for a multimillionaire. Yet the University of Wisconsin Foundation has just announced that Martha left \$2.7 million to the school in her estate.

[Read more](#)

New induced stem cells may unmask cancer at earliest stage

Feb. 4, 2011 by Terry Devitt

By coaxing healthy and diseased human bone marrow to become embryonic-like stem cells, a team of Wisconsin scientists has laid the groundwork for observing the onset of the blood cancer leukemia in the laboratory dish.

"This is the first successful reprogramming of blood cells obtained from a patient with leukemia," says University of Wisconsin-Madison stem cell researcher **Igor Slukvin**, who directed a study aimed at generating all-purpose stem cells from bone marrow and umbilical cord blood. "We were able to turn the diseased cells back into pluripotent stem cells. This is important because it provides a new model for the study of cancer cells."

[Read more](#)



IN THE NEWS

Wisconsin stem cell pioneer wins Faisal and Albany awards

(From UW-Madison news releases)

James Thomson, director of regenerative biology at the Morgridge Institute for Research and a University of Wisconsin-Madison researcher since 1994, learned in January that he was this year's co-winner of the prestigious King Faisal International Prize in Medicine. Thomson received the prize, established in 1977 by the King Faisal Foundation, from the king of Saudi Arabia during a March ceremony in the country's capital of Riyadh.

[Read more](#)

In March, Thomson was named a co-recipient of the 11th annual Albany Medical Center Prize in Medicine and Biomedical Research, in recognition of his pioneering work in isolating human stem cells. Thomson is often considered the founder of stem cell science due to his groundbreaking discoveries in culturing nonhuman primate and human embryonic stem cells in the 1990s.

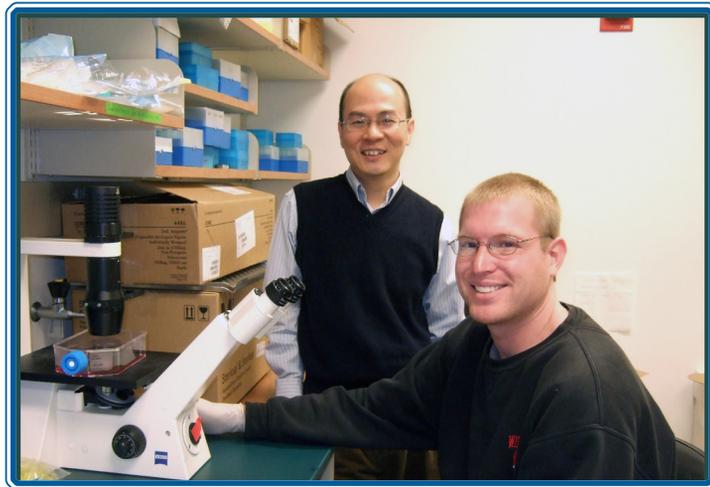
[Read more](#)

Winners of the 2010 SCRMC Fellowship Competition

The **SCRMC Fellowship Program** is an interdisciplinary pre- and post- doctoral program that aims to support the training of UW graduate students and post-doctoral fellows in interdisciplinary stem cell and regenerative medicine research. Our SCRMC-supported 2010 fellowship winners, announced February 2011, are:

Graduate fellowship:

Andrew Handorf from **Wan-Ju Li's** laboratory, Orthopedics and Rehabilitation; Biomedical Engineering.



Pictured are Wan-Ju Li, left, and Andrew Handorf. *(Photo by S. Gilbert)*

Post-Doctoral Fellowship:

Sanal Kumar from **Emery Bresnick's** laboratory, Cell and Regenerative Biology.



Pictured are Emery Bresnick, left, and Sanal Kumar. *(Photo by S. Gilbert)*

6th Annual Wisconsin Stem Cell Symposium

April 27, 2011

BioPharmaceutical Technology Center, Madison, WI

Reprogramming and Controlling Stem Cell Phenotype

Register Now ([Click here](#))

Poster Session Deadline: April 22, 2011 (*Send poster to [Karin Borgh](#)*)

Organizing Committee: **Emery Bresnick** (Cell and Regenerative Biology), **Bill Murphy** (Biomedical Engineering), **Karin Borgh** (BTCL) and **Tim Kamp** (Medicine).



Presenters:

[Kristi Anseth, Ph.D.](#) (Tisone Professor, Associate Professor of Surgery, HHMI Investigator, Chemical and Biological Engineering, University of Colorado-Boulder, Boulder, CO)

[Helen Blau, Ph.D.](#) (Donald E. and Delia B. Baxter Professor & Director, Baxter Laboratory for Stem Cell Biology, Stanford University School of Medicine, Stanford, CA)

[Shen Ding, Ph.D.](#) (Professor, Chemistry Department, The Scripps Research Institute, La Jolla, CA)

[John Gurdon, Kt DPhil DSc FRS](#) (Emeritus Professor & Distinguished Group Leader, The Wellcome Trust/Cancer Research UK Gurdon Research Institute, University of Cambridge, UK)

[Juan Carlos Ispisúa Belmonte, Ph.D.](#) (Professor, Gene Expression Center, Salk Institute for Biological Studies, La Jolla, CA)

[Laura Kiessling, Ph.D.](#) (Professor, Department of Chemistry and Department of Biochemistry & Director, Keck Center for Chemical Genomics, University of Wisconsin-Madison, Madison, WI)

[Stuart Orkin, Ph.D.](#) (Professor, Department of Pediatric Oncology, DFCI; Children's Hospital and Dana Farber Cancer Institute; Howard Hughes Medical Institute; Harvard Stem Cell Institute, Boston, MA)

[James Thomson, Ph.D.](#) (Director, Regenerative Biology, Morgridge Research Institute, University of Wisconsin-Madison, Madison, WI)



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