The Ottawa Hospital

UPDATE 2018-2019

The Transformative power of stem cells and regenerative medicine

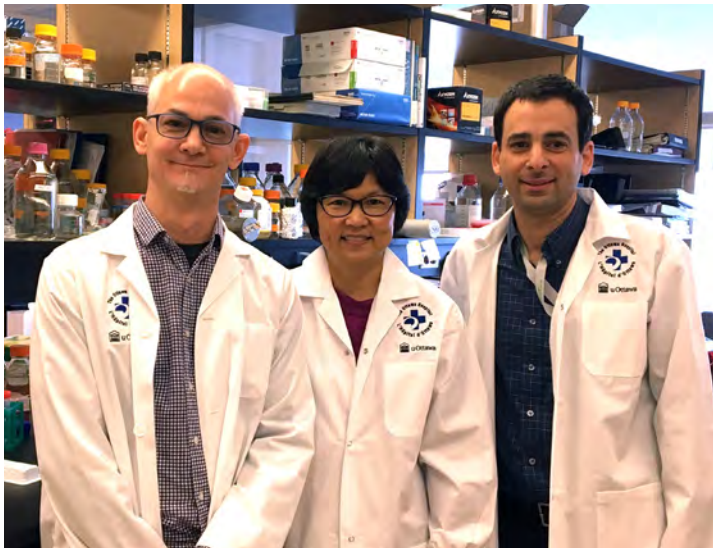
Thank you for supporting The Ottawa Hospital's Regenerative Medicine Program, a major centre for the growing area of stem cell research. Our program includes the Sprott Centre for Stem Cell Research, the Sinclair Centre for Regenerative Medicine and currently houses 15 scientists and about 240 clinician investigators, trainees and staff.

Your generous support is helping our researchers develop new treatments and transform lives. As donors, you can take pride in knowing that you have helped our dedicated team make major advances in patient care and research, and that every dollar you donate enables our researchers to secure up to 10 dollars in external research funding. It is your critical funding that supports new initiatives in the lab and the clinic like the projects outlined in this update.

Stem cell model leads to potential breakthrough in treating blood cancer

In 2011, Dr. William Stanford, an emerging star in regenerative medicine, was recruited to The Ottawa Hospital's Sprott Centre for Stem Cell Research. He had previously worked in top research centres in Toronto and the United States.

"I came to Ottawa because of this city's growing strength in stem cell research and because of the great support for basic scientists like me, who want to translate their research into new therapies," he said at the time.



Drs. William Stanford, Caryn Ito and Mitchell Sabloff hope to start clinical trials at The Ottawa Hospital with a new therapy for acute myeloid leukemia.

Today, Dr. Stanford has realized his dream of translating basic laboratory research on stem cells into a potential new therapy. Using stem cells as a model, Dr. Stanford discovered a fatal flaw in how DNA is packaged in certain kinds of blood cancer cells. He then teamed up with Ottawa Hospital hematologist Dr. Mitchell Sabloff and senior lab researcher Dr. Caryn Ito to investigate this in patients and mouse models. This led to the discovery of a new drug combination that can destroy chemotherapy-resistant blood cancer cells. The experimental treatment cured 100 percent of mice with the condition, while mice that received the standard treatment all died.

"We were blown away when we saw the results," said Dr. Stanford. "If these findings hold up in clinical trials, we could have a new treatment for people who would almost certainly die of their disease today."

Dr. Stanford recently received The Ottawa Hospital's Chrétien Researcher of the Year Award for his groundbreaking research on blood cancer. Using stem cells as a model, he has also made major advances in research on diseases such as osteoporosis, premature aging and a rare lung disease called LAM.

"Most scientists tend to focus on one or maybe two diseases, but Bill's research spans a huge spectrum, and he's making important contributions in all these areas," said Dr. Duncan Stewart, Executive Vice-President of Research at The Ottawa Hospital. "He's a bit of a renaissance man in science."

Souped-up stem cells hold the power to repair blood vessels

Blood vessels are at the root of some of the most life-threatening conditions, from heart attack to stroke to blocked blood vessels in the limbs. Stem cells hold great potential for treating these diseases because they can repair many different kinds of damaged tissues, including blood vessels.

Dr. Marjorie Brand, a senior scientist at The Ottawa Hospital Sprott Centre for Stem Cell Research, recently made a major discovery that could greatly advance this field. She is investigating a form of stem cell that could create new blood vessels that bypass damaged ones. However, these cells are slow to reproduce, and don't repair the blood vessels fast enough to be effective.

"The idea is to repair blood vessels as fast as possible, so time is really an issue," said Dr. Brand. "What we do in my lab is try and improve the function of these blood vessel stem cells."

Her team is testing different drugs that have the ability to speed up the process, making this slow process much quicker.

Dr. Brand, originally from France, joined The Ottawa Hospital in 2004.

Dr. Marjorie Brand has found a way to soup-up stem cells to enhance blood vessel repair.

Bone research gets a break

The recruitment of a star researcher in regenerative medicine is helping to blaze a trail to effectively halt the degenerative process, to help make injuries heal quicker and more reliably.

"Ottawa is the place to be for stem cell research", said Dr. Daniel Coutu. He should know. He's a bone stem cell expert recruited from Switzerland.

Dr. Coutu is the inaugural holder of the Research Chair in Regenerative Orthopaedic Surgery. He is based at The Ottawa Hospital's Sinclair Centre for Regenerative Medicine.

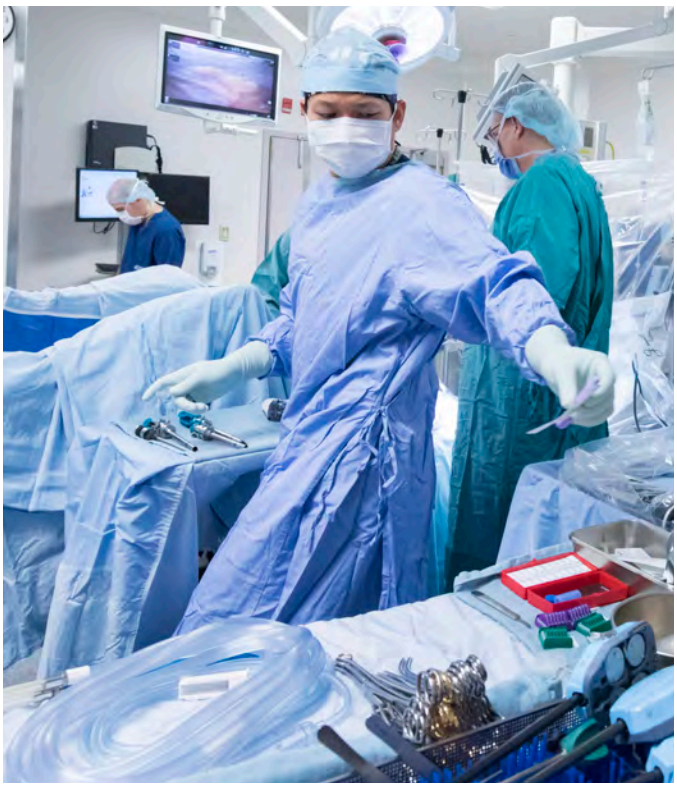
In his new role, Dr. Coutu will focus on the fundamental biology of bone stem cells. Bone plays a key role in the health of tissues, such as muscle, tendons, and cartilage that are connected to it. Dr. Coutu will lead research to help understand how bone regenerates, repairs and heals. He'll also investigate the impact trauma, aging, and chronic degeneration has on bones.

Dr. Coutu was part of a team in Switzerland that took on this challenge and developed microscopy techniques to enable scientists to analyze bone and see where stem cells are and what they do.

"Because of these techniques, we are just starting to understand the fundamental biology of bone stem cells," he said.

Although Dr. Coutu will primarily be conducting research in the lab, he will be working with clinicians to develop new therapies to treat patients. To better understand clinicians' and patients' needs, he will attend rounds with surgeons in the hospital, as well as attend clinical conferences. He said the visibility conferences provide and the clinical knowledge he'll gain will position The Ottawa Hospital as a leader in regenerative orthopaedic surgery.

"Collaboration between basic scientists and clinicians is the best recipe for impactful orthopaedic research," said Dr. Beaulé, Head of the Division of Orthopaedic Surgery at The Ottawa Hospital. "We, in the Division of Orthopaedic Surgery, are extremely excited to support the recruitment of this scientist whose research will lead to discoveries that will translate into effective treatment of orthopaedic-related injuries and trauma."



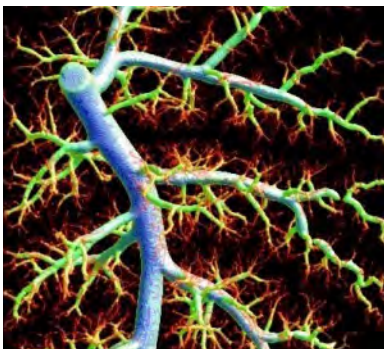
"To look at what is happening inside the bone, I use the analogy of cutting through a cup of coffee without breaking the cup and not spilling the coffee inside," said Dr. Daniel Coutu. "It's very tricky and that is what it is like to cut bone to see what's happening inside."

Stem cell therapy offers hope for rare lung disease

Our researchers are playing a major role in a new Canada-wide clinical trial of stem cell therapy for pulmonary hypertension. This rare and deadly disease happens when the arteries that supply blood to the lungs become so damaged that blood can't flow properly to take up oxygen. It often affects women in their prime but can strike anyone at any age.

The experimental therapy starts with collecting a patient's own white blood cells and sorting them into different components. One component is grown in the laboratory under special conditions to obtain cells called endothelial progenitors. These cells can promote repair and regeneration of blood vessels, acting like stem cells. The cells are then genetically engineered to produce greater amounts of nitric oxide, a natural substance that enhances their regenerative activity and enlarges blood vessels. The gene-enhanced cells are then injected directly into the same patient through a simple intravenous injection to be carried to the lung. The cells are genetically engineered and manufactured at The Ottawa Hospital's Biotherapeutics Manufacturing Centre.

The trial will use an innovative design to test whether the therapy is effective inpatients at up to nine centres across Canada.



A laboratory model of pulmonary arterial hypertension, courtesy of Dr. Ketul Chaudhary

Breakthrough treatment for MS continues to change lives

The Ottawa Hospital continues to lead the world in stem cell transplantation for aggressive multiple sclerosis (MS). To date, 56 patients with aggressive MS have had the procedure, which was pioneered at The Ottawa Hospital. Active brain inflammation has been eliminated in all patients, and many have been able to resume normal lives. The same treatment has been given to 44 patients with other autoimmune disorders. Two other sites in Canada – Calgary and Montreal – are now using the treatment with the same positive, life-changing results.

One of the MS patients treated at The Ottawa Hospital was Heather Harris. She was driving her fiancé to a golf tournament one morning in 2001 when her right foot went numb. By the end of the day, the numbness had spread up the entire right side of her body. The then-24-year-old Thunder Bay resident had an MRI, which showed signs of MS.

Heather Harris and her husband, Shawn Mizon, holding their daughter Zoe at a friend's wedding in September 2014.

Heather got an appointment with Dr. Mark Freedman at The Ottawa Hospital after hearing about a world-first clinical trial that he and Dr. Harold Atkins had launched to investigate whether patients with early, aggressive MS would benefit if their immune system was wiped out with chemotherapy and then regenerated with blood stem cells.
Dr. Freedman confirmed Heather had MS and that it was progressing rapidly. Within a short time she lost the ability to work the clutch in her car, tend her beloved garden, and had to abandon camping with her new husband. Several times she lost vision in one eye. Soon, even walking became difficult.
If things continued at this pace, doctors expected her to be in a wheelchair within five years.

Heather, a newlywed at the time, understood that the chemotherapy could cause sterility, "but this was my only chance to stop the disease," she said.
Heather and her husband moved to Ottawa for a year while she took part in the trial. She had the stem cell transplant in November 2006.

"It was pretty brutal, but I had such good care. Everyone at The Ottawa Hospital – the nurses and staff – were all amazing," she said. "After the treatment, I never had another attack. I just started to feel better, and totally recovered."

Heather, who now works full-time as a school principal, is back to camping, skiing, running and driving a manual car. "It's now 11 years since my stem cell transplant," she said. "I really feel like I'm cured."
A few years later, Heather underwent in vitro fertilization treatments and, with her sister as an egg donor,had a baby in 2014. Her daughter Zoe is now four years old.
"A couple of years ago, Heather showed up for her appointment with this little baby. It brought me to tears," said Dr. Freedman. "I've kind of had two miracles. I am so lucky and incredibly grateful," said Heather.

Discovery provides "profound new insight" into Duchenne muscular dystrophy

Dr. Michael Rudnicki, Director of The Ottawa Hospital's Regenerative Medicine Program, continues to be successful in developing innovative treatments for Duchenne muscular dystrophy (DMD), a severely debilitating and lethal disease that affects approximately 1 in 3,500 boys.

This year his team discovered a completely new function for a protein complex containing dystrophin protein. They found this complex brings two other proteins together in muscle stem cells. This triggers a genetic program that ultimately produces new muscle fibres. In laboratory models of DMD, this interaction never happens, so any new muscle fibres have a faulty genetic program. This new finding builds on Dr. Rudnicki's landmark discovery in 2015, showing that DMD directly affects muscle stem cells.

"This research represents a profound new insight into Duchenne muscular dystrophy and brings us another step closer to developing new treatments for this devastating disease," said Dr. Rudnicki.

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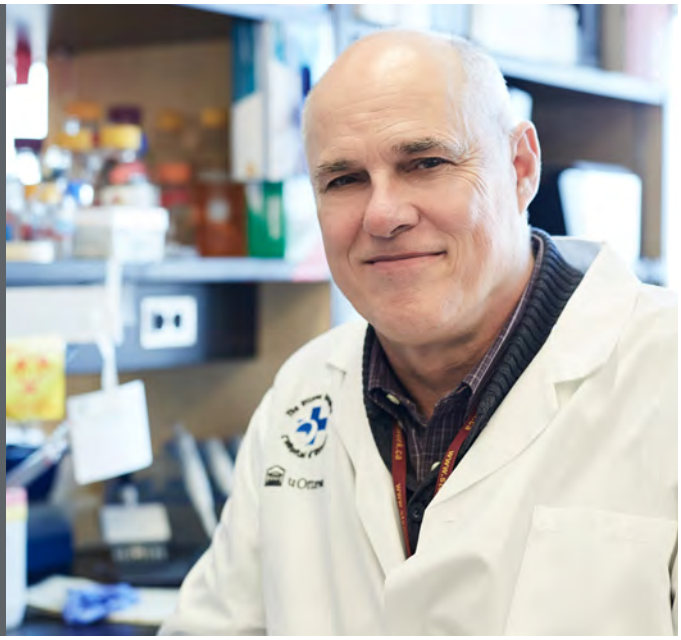

Diabetes drug could enhance stem cell treatment for stroke

Imagine removing blood or skin cells from a patient after a stroke, turning them into powerful stem cells in the lab, and then transplanting them back into the same patient's brain so they can give rise to new neurons to repair the damage. This is the promise of induced pluripotent stem cell (iPSC) technology, and new research led by Dr. Jing Wang could help make it a reality.

Dr. Wang and her team discovered that metformin, an established diabetes drug, can stimulate neural stem cells derived from iPSCs, helping them integrate into the brain and give rise to more neurons. In a stroke model, animals that received metformin-treated neural stem cells showed signs of increased regeneration in the brain and had faster recovery of gross motor skills compared to animals that received untreated cells.

Future research will examine if other combinations of stem cells and drugs could be even better.

Your legacy is making a difference to lives in Ottawa

A great hospital is one of the cornerstones of a successful city. In Ottawa, we are proud to be one of those key cornerstones for our community. The Ottawa Hospital deals with the most challenging medical cases in the region and we approach each case with a unique mixture of medical excellence, innovation, and humanity. We are proud to contribute to the community not only by providing excellent care, but also by being a magnet that attracts some of the brightest and most capable researchers in the world to Ottawa.

You are a critical part of our success and we hope you will continue this important journey with us as we transform regenerative medicine, stem cell research, and patient care in Ottawa and beyond. On behalf of the thousands of patients and families who need The Ottawa Hospital, thank you for your tremendous support.

For more information about the impact of your gift, please contact Jennifer Van Noort, Vice President, Philanthropy and Leadership Giving at :
613-798-5555 x 16090, or visit ohfoundation.ca.

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