University of Minnesota

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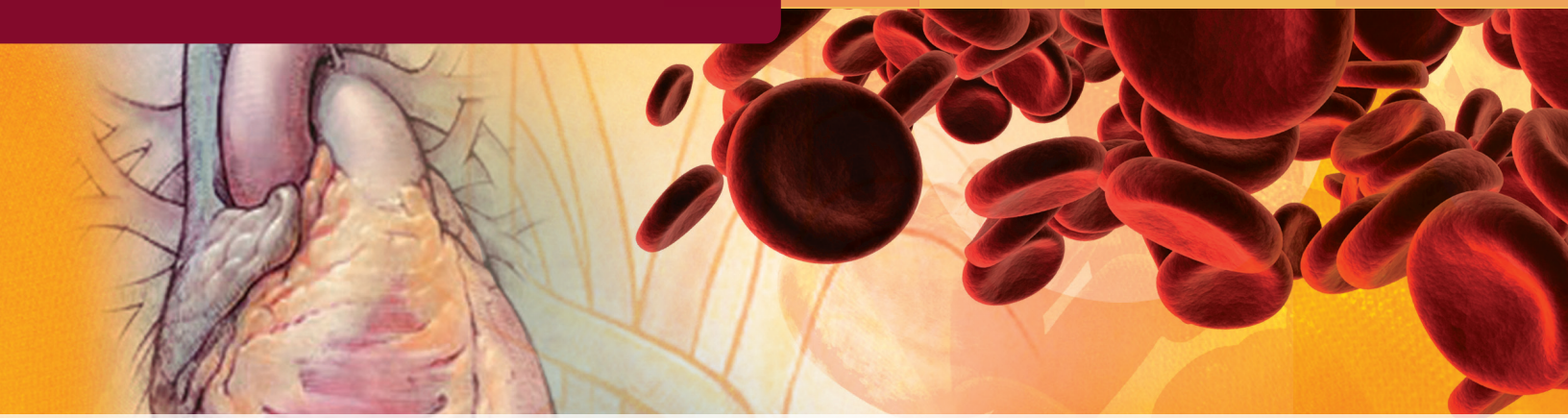

Innovators *at* Heart

A publication for those who support heart-related research, education, and care at the University of Minnesota

Just in time

Clinical trials test power of stem cells to help damaged hearts recover

Michael Johnson would have been shocked to learn last summer that his heart would fail by fall.

A seemingly healthy 66-year-old businessman, Johnson had been a patient in the hospital only once: at birth. Then came September 6, 2010, when he suffered a massive heart attack. An emergency angioplasty and stent procedure opened the blockage that caused his heart attack, but only 35 percent of his heart function remained.

"They told me if I wouldn't have come into the hospital, I would have been dead by the next morning," Johnson recalls. "I was in disbelief that my heart could suffer so much damage."

While recovering at Fairview Southdale Hospital and facing a future limited by significant heart failure, Johnson got another surprise: University of Minnesota researchers asked him to participate in an innovative cell therapy study that might improve his prognosis. He agreed, and 10 days after his heart attack, doctors injected 150 million of Johnson's own stem cells from his bone marrow into his heart.

The study in which Johnson is participating, known as Late TIME (Transplantation in Myocardial Infarction Evaluation), is designed to evaluate the safety and effectiveness of infusing stem cells into a patient's heart two to three weeks after a heart attack. Another similar study, known simply as TIME, evaluates the success of this therapy three to seven days after the patient's heart attack. Both are funded by the National Institutes of Health.

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Photo by Scott Streble

Michael Johnson hopes that participating in an innovative clinical study—along with exercising and eating right—will help him continue to recover after his heart attack.

Just in time *(continued from cover)*

Ganesh Raveendran, M.D., holds hope that cell therapy can help improve patients' heart function after significant damage.

Since the two multicenter trials began last year, more than 200 people have enrolled nationwide. Ten of them are at the University.

"The University of Minnesota has a long-standing tradition in both transplantation and cell therapy initiatives," explains Daniel Garry, M.D., Ph.D., chief of the Medical School's Division of Cardiology and executive director of the Lillehei Heart Institute. "Our goal with these studies is to look critically at the benefits of using a patient's own cell therapy following a heart attack."

Led by interventional cardiologist Ganesh Raveendran, M.D., the cardiac cell therapy research team includes Garry, cardiologist Cindy Martin, M.D., and cardiothoracic surgeon Ranjit John, M.D.

"There is no doubt that in recent decades we have continued to significantly improve treatments for patients who have had heart attacks. Despite this, their heart function doesn't recover as well as it should," says Raveendran. "Ultimately, we hope that cell therapy will improve health outcomes and quality of life for these patients."

In addition to helping to boost heart function after heart attacks, stem cell therapy may also increase the effectiveness of treatments for heart failure.

The U.S. Food and Drug Administration has recently authorized the team to conduct another study, in which patients in severe heart failure receive injections of their own stem cells during the implantation of a left ventricular assist device (LVAD), a device that pumps blood for a heart that is too weak to do so on its own. (An LVAD can allow the heart to rest for a time, or it can serve as a "bridge" therapy until a patient receives a transplant.)

"The holy grail of end-stage heart failure remains myocardial recovery, so our hope is that this therapy will help the heart recover better," says John, who directs the University's Ventricular Assist Device Program. "After a period of three to six months, we will gradually wean down the support given by the LVAD—then determine whether the function of the native heart is improving."

For Johnson, the innovative cell therapy seems to be helping. His heart function, now above 40 percent, continues to improve.

And after recently climbing a staircase with a load of briefcases, he noticed his heart pumping—and felt stronger.

"I think it has definitely helped me," Johnson says of the study. "I feel like I've done something really proactive—in addition to exercise and eating better—that gives me the extra edge I need to have the best possible outcome."

Photo by Sandhill Photography

A red hot fundraiser

The first-ever Red Hot Soirée, held April 30 at the Depot in Minneapolis, raised approximately $400,000 for the Lillehei Heart Institute at the University of Minnesota. About 600 guests enjoyed an evening filled with food, auctions, and dancing while supporting the University's quest to become one of the top cardiovascular care providers and research institutions in the world. Hope you can join us next year!

Groundbreaking work hits close to home for one family

Photo courtesy of Sally Turrittin

John (left) and Sally Turrittin support heart research that could one day benefit their son, Jeff (right), who was born with a faulty heart valve.

Sally and John Turrittin's son, Jeff, was born 29 years ago with a heart defect called aortic valve stenosis. In people who have this condition, the heart's aortic valve doesn't open fully, which causes decreased blood flow from the heart.

Thankfully, Jeff's disease was manageable throughout his childhood with annual visits to his cardiologist. But his family always knew that he would someday need to have surgery to replace the faulty valve.

So when Jeff was 12 or 13 years old and Sally Turrittin found a magazine article about researchers who were developing a way to grow a heart valve in the lab, it piqued her interest.

"I brought it in to his cardiologist, and I said, 'I want one of those,'" she recalls.

More than a decade later, that science hasn't yet been perfected for humans. But University of Minnesota investigator Doris Taylor, Ph.D., is getting close.

In January 2008, she and her colleagues revealed that they had created a beating rat heart in the lab. Using a process known as decellularization, the team removed all of the cells from a cadaver rat heart, leaving only the organ's basic structural scaffolding. When the researchers populated the scaffolding with newborn rat heart cells, the organ came back to life.

Taylor, who directs the University's Center for Cardiovascular Repair, and her team also have transplanted the recellularized heart into a live rat to prove that it could survive. And it has.

Taylor believes that this process could work for virtually any organ. And she says it's years—not decades—away from being ready for clinical trials in humans.

That's what really excites the Turrittins. Jeff has already had one heart valve replacement surgery and will likely have another in his lifetime. Plus, John Turrittin adds, there are many potential complications of these procedures—which, besides risks associated with the surgery itself, include rejection and blood clotting—that need to be managed with daily medications and monthly blood tests. What if scientists instead could create a new valve or organ for a person using his or her own cells, basically eliminating the risk of those complications?

"There's almost an impatience about this kind of research because you can see the potential," John Turrittin says.

To help speed it along, the Turrittins gave $2,500 to support Taylor's work last year. And since they observed the research in action on a tour earlier this year, they have made two additional $5,000 gifts.

"We know that someday [Jeff] will have a valve that is essentially his own, and we will have people like Doris Taylor to thank," Sally Turrittin says.

To learn how your gift to heart research at the University of Minnesota can make a difference, contact Krista Mathews Dean at 612-626-6506 or k.dean@mmf.umn.edu, or visit ***www.mmf.umn.edu/heart/.***

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Alan T. Hirsch, M.D.

PAD costs increase substantially as condition worsens

Hospitalizations and costs associated with peripheral artery disease (PAD) increase substantially as the condition progresses, according to a study by University of Minnesota researchers.

PAD is a condition in which blood flow to leg arteries is obstructed as a result of the hardening and narrowing of artery walls. It also is associated with an elevated risk of heart attack and stroke.

The condition affects an estimated 8 million Americans—a number researchers expect will increase.

Alan T. Hirsch, M.D., a professor in both the Medical School and School of Public Health, helped to lead this international study on behalf of the Reduction of Atherothrombosis for Continued Health (REACH) Registry, which supplied the data for the research.

About 23 percent of asymptomatic and 31 percent symptomatic PAD patients in the two-year study experienced at least one vascular-related hospitalization. Average cumulative two-year hospitalization costs per patient were $7,000 for patients with a history of leg pain; $7,445 for those without symptoms; $10,430 for those with lower limb amputation; and $11,693 for those with a history of revascularization procedures.

"These ongoing high costs mean that we can never be complacent in merely measuring the adverse outcomes associated with any particular disease," says Hirsch. "We clearly have to be committed to devising new treatments where none exist and in assuring that current treatments are being used for both maximum clinical benefit and best cost-effectiveness."

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