Go Forth and Multiply
Stem cell funding reignites local research

Comstock's Magazine – by Christine Stanley
June 2009

Stem cell research has been taking place in the Capital Region for more than 20 years, but the scope of that research and the capabilities of scientists in the field of regenerative medicine are about to go through a substantial expansion, the likes of which, researchers say, could yield groundbreaking treatments for some of humanity's most damaging diseases.

Stem cells are cells with the ability to divide and develop into different cell types. In many tissues they can serve as a sort of internal repair system, dividing to replenish other cells. When a stem cell divides, each new cell has the potential to become another type of cell with a more specialized function, such as a muscle cell, a red blood cell or a brain cell.

President Obama issued an executive order this spring that eliminated barriers former President George W. Bush put in place to limit the extent of federally funded stem cell research — including the funding of embryonic stem cell research. As a result of Obama's order, scientific funding will now be available for broader use.

"Currently there is no impact because there has not been a directive from the [National Institutes of Health], which will not happen before the fall," says Gerhard Bauer, adjunct assistant professor in the UC Davis' Stem Cell Program. "I hope that the funding is going to be as broad as possible for all kinds of applications and will augment the research that has already been started here. It is encouraging because now science is not being stifled anymore. We lost a whole generation of young scientists because of a lack of funding." NIH funding dropped to just 2 to 3 percent of what was requested in the past eight years, he adds.

In a serendipitous stroke of action, UC Davis began construction on its $62 million Institute for Regenerative Cures last fall. Now, when that 90,000-square-foot laboratory opens, dozens of disease teams will have the space and tools to collaborate on the cures for Huntington's, Alzheimer's and Parkinson's diseases, among others.

"It's going to be more centralized, and everyone can come together and use common equipment. We're being very resourceful in the amount of money we're using. We're trying to spend the best that we can, so we can train as many people as we can," says Matt Lindsey, a Sacramento State biology student working in the UC Davis Stem Cell Program. "There will be different phases and trials. We go into animal models and small models to show that these cells are doing what they're supposed to be doing. Once we do those small models, then it can move into clinical trials."

The institute's basic research will soon advance far enough to make clinical research applicable, Bauer says. After these discoveries have been determined fit for clinical use, scientists can then make clinical-grade products in the institute. The new Good Manufacturing Practice laboratory

at UC Davis, which is headed by Bauer, will be a six-suite manufacturing facility designed for the production of cellular and biological products.

Many of the discoveries made at UC Davis and beyond have come as a result of studying and manipulating embryonic stem cells. Under the Bush policy, scientists were allowed to work on human embryonic stem cell lines so long as their time, facilities and supplies weren't paid for with federal dollars. That rule was a cause for strife among major laboratories and research centers such as UC Davis, but under the Obama administration, all stem cells derived from excess fertility clinic embryos would be eligible for federal funding.

"Because the federal funding paid for things like electricity and air conditioning, it required all separate facilities and equipment for embryonic research."
— Dr. Jan Nolta, director, UC Davis Stem Cell Program

"The thing that had been really tough with the restrictions that the Bush administration put on stem cell research, was that we couldn't even have the (different stem cell) lines in the same building," says Dr. Jan Nolta, UC Davis' stem cell program director. "Because the federal funding paid for things like electricity and air conditioning, it required all separate facilities and equipment for embryonic research." UC Davis simply didn't have the money to purchase duplicative laboratory equipment, so progress was often stifled.

In the years since 2001, when Bush created his order that only the 21 stem cell lines created to that point could be used for research, as many as 800 other stem cell lines have been created with private money through institutions, such as the California Institute for Regenerative Medicine and the Howard Hughes Medical Institute, and international governments, including England's. Many lines were discovered with research using human embryos.

Embryonic stem cells, as their name suggests, are derived from embryos, most of which are fertilized in vitro at fertility clinics and then donated for research purposes with informed consent of the donor. These stem cells are of great interest to researchers because they not only have the capacity to replenish damaged cells as adult stem cells do but also to develop into entire organisms such as hearts and kidneys.

Experts say conditions such as Parkinson's, cancer, diabetes, traumatic spinal cord injury, muscular dystrophy and hearing loss might be treated by transplanting cells generated from human embryonic stem cells.

"Adult stem cells (which come from bone marrow) are very useful for certain things, but they will not recreate a whole organ. The adult stem cells can heal disease and revascularize, but they don't actually divide and differentiate into a liver tissue, for example," Nolta says. "We can build bone and regenerate muscle, but you can't rebuild a whole heart."

For now, public support of federally funded embryonic stem cell research is moderate and

predicated on hopes that the research yields cures for diseases. According to a February Gallup Poll, 52 percent of Americans want fewer or no restrictions on federally funded embryonic stem cell research.

---

52 percent of Americans want fewer or no restrictions on federally funded embryonic stem cell research. — Gallup Poll

---

While the California Institute for Regenerative Medicine, or CIRM, and the recipients of its grants have been celebrating the new federal support of their mission and the additional money provided by the stimulus package, getting that money into the hands of scientists has been tremulous.

Proposition 71, which was passed by California voters in 2004, made clear the Legislature's view that science works best with sustainable, predictable funding. That sustainability, however, has been compromised by the state's tenuous budget.

"Because the state was shut out of the bond market for so long, we have made a number of contingency plans," says Don Gibbons, CIRM's chief communications officer. "We had a significant amount of bond money in the bank — about $160 million — but looking at our obligations, which are two-, three- and four-year obligations, we were going to run out of money around September if the state couldn't issue more bonds. So we started scaling back."

With its most recent bond sale, CIRM is now hopeful that it will soon return to a more robust plan. Until that time, the institute has awarded training grants with a one-year delay in funding to buy time and ensure bonds are sold.

That delay has fallen on grants headed to UC Davis, Sacramento State and American River College, to name a few.

CIRM's Bridge to Stem Cell Research program would provide $8 million for Sacramento State student advancement programs in collaboration with community colleges and research institutes throughout the state.

"They are planning to bring students in from the community colleges to make sure they have the basic skills with biology, and then move them into labs at [Sacramento State]," says Jeffery O'Neal, the state director of biotechnology for California Community College Economic and Workforce Development. "Part of the problem is that people are trying to get foreign students in with research skills, and the point is to train Californians. It's important to fund this, so you don't have to go out of the state and out of the country to find the right people."

CIRM approved this program more than a year ago but had to rethink funding because of the state's faltering economy. In the end CIRM decided to move forward.

While community college students are honing skills at Sacramento State, CSUS graduate students will head to laboratories at UC Davis where more than two dozen mentors will expose them to stem cell programming at the new institute.

A $1.3 million grant, also from CIRM's Bridge to Stem Cell Research program, would provide two semesters of coursework at Sacramento State and UC Davis, followed by two semesters of a full-time internship at the UC Davis Institute for Regenerative Cures and a 40-hour stem cell techniques training course at the Buck Institute for Age Research in Novato. Students will learn specialized techniques such as good manufacturing practices, adult and embryonic stem cell culture, and production of cellular therapies.

Over the past decade, UC Davis has become the center for stem cell-related treatments for cardiovascular disease, liver conditions, retinal disease and Huntington's disease, Bauer says. That list is only likely to expand now that construction of the UC Davis Institute for Regenerative Cures is under way and federal funding is set to expand.

"A lot of people don't know how [stem cell research] affects them until it actually impacts them," says Lindsey, a sophomore who hoped to take part in the Bridges program. "People have so much appreciation for the science when their loved one is battling something, and that keeps us motivated to find a cure, but it's frustrating when you don't have the funds to back that up."