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U-M to begin accepting donated embryos for stem cell research

ANN ARBOR, Mich.—University of Michigan researchers have received approval to begin accepting donated embryos that will be used to derive the university's first human embryonic stem cell lines. The cell lines will be used to study the causes and progression of inherited diseases, to test potential treatments and to seek cures.

The announcement was made Tuesday afternoon by Dr. Eva Feldman, director of U-M's A. Alfred Taubman Medical Research Institute, during a speech at the Detroit Economic Club.

The embryo-donation and cell-line derivation program is the first U-M project made possible by Proposal 2, the state constitutional amendment that eased restrictions on human embryonic stem cell research in Michigan.

Approved by voters in November 2008, the law allows Michigan researchers to derive new embryonic stem cell lines from donated embryos that would otherwise be discarded. Since the approval of Proposal 2, the university has worked to ensure that the research will comply with federal law and the Michigan Constitution, as well as extensive new regulations established last summer by the National Institutes of Health.

To ensure full compliance, the project had to be approved by U-M's Human Pluripotent Stem Cell Research Oversight Committee and the Medical School's Institutional Review Board. Both committees are composed of physicians, scientists, ethicists, attorneys and community members who evaluated whether the project would be conducted ethically, legally and to the benefit of patients. The project was approved Nov. 11.

The cell-line derivation work will be conducted by the U-M's Consortium for Stem Cell Therapies. Launched in March with funding commitments of about $2 million, the consortium involves researchers from across the U-M campus, as well as collaborators at Michigan State University and Wayne State University.

"During last year's Proposal 2 campaign, opponents of human embryonic stem cell research claimed the constitutional amendment would lead to unregulated science," said Gary Smith, co-director of the U-M consortium. "But the fact that it has taken many months to clear all the regulatory steps required to start this project demonstrates that human embryonic stem cell science is among the most highly regulated areas of research.

"At long last, University of Michigan researchers will join colleagues around the world in pursuing the full promise of embryonic stem cell research," said Smith, an associate professor of obstetrics and gynecology.

U-M scientists expect to achieve their first embryonic stem-cell-line derivation by mid-2010, Smith said. Lab space totaling 1,254 square feet has been secured for the work, and the labs have been outfitted with state-of-the-art equipment. Three new research associates have been hired for the project, and a fourth will be hired soon.

The consortium has secured all necessary approvals to begin accepting embryos that were created for reproductive purposes but are either no longer needed or are unsuitable for clinical use. In accordance with federal and state law, these gifts require the voluntary and informed consent of the donor, documented in writing.

"Because this represented the first project at the University of Michigan in which embryos were to be used for the derivation of embryonic stem cells, the committee worked exhaustively to ensure that the proposed research complies with all relevant state and federal regulations," said James Shayman, co-chair of the university's Human Pluripotent Stem Cell Research Oversight Committee.

"While this review took several months to complete, we believe that the committee, working in concert with the Medical School's Institutional Review Board, was duly diligent in this process," said Shayman, U-M's associate vice president for research, health affairs. "We believe that the proposed research meets or exceeds state and federal regulatory standards presently in place."

In addition to deriving new embryonic stem cell lines, consortium researchers will refine recently developed techniques to convert adult skin cells into induced pluripotent stem cells, known as iPS cells. These reprogrammed cells display the most scientifically valuable properties of embryonic stem cells, while enabling researchers to bypass embryos altogether.

"We will pursue all forms of stem cell research so that we can achieve scientific and medical breakthroughs, no matter where they come from," said Sean Morrison, director of the U-M's Center for Stem Cell Biology.

Early next year, the consortium will issue a call for proposals from U-M researchers seeking funding to derive new iPS cell lines, said Sue O'Shea, consortium co-director and professor of cell and developmental biology.

A top priority of the U-M-led consortium is to derive new lines of human embryonic stem cells and iPS cells that carry the genes responsible for inherited diseases.

"There are very few university programs in the United States deriving disease-affected embryonic stem cell lines," O'Shea said. "Our special niche will be creating, studying and understanding normal and abnormal development of disease-affected stem cell lines – both embryonic and iPS cell lines."

Early disease targets will likely include neurological disorders such as amyotrophic lateral sclerosis (Lou Gehrig's disease), Huntington's and Alzheimer's.

"Stem cell research has special application to neurological diseases," said Feldman, a professor of neurology. "Providing stem cell lines containing the genes that lead to specific diseases will be an incredible boon to medical scientists.

"It will help us understand the origin and progression of many diseases, allow us to test out new medications and therapies with an efficiency we could never have dreamed of, and ultimately find treatments for disease where none now exist," Feldman said. "This is a major step forward."

Smith said the new stem cell initiative will leverage one of the U-M's core strengths: interdisciplinary collaborative research. The stem cell consortium will build on existing collaborations between researchers at the Medical School, the School of Dentistry, the Life Sciences Institute and the College of Engineering, he said.

"These stem cell lines will yield new insights into the causes and progression of inherited diseases," Smith said. "Our cross-campus partnerships will enable us to integrate novel stem cell biological findings with recent advancements in engineering and material sciences to develop new disease treatments that will benefit patients."

Embryonic stem cells are the body's master cells; they replicate endlessly and form the more than 200 cell types in the human body. Scientists hope these remarkably versatile cells—and the iPS cells that mimic them—can someday replace faulty cells or diseased tissues in failing organs. This fledgling field is known as regenerative medicine, and the new Consortium for Stem Cell Therapies positions the University of Michigan to play a leadership role in this research.

"This initiative will help move the University of Michigan to the forefront of every aspect of stem cell biology," said Doug Engel, chair of the cell and developmental biology department and chair of the consortium's scientific advisory board. "In addition to enabling important new science and clinical work, it puts us in an incredibly strong position to pursue any new federal funds that become available for embryonic stem cell research, and to recruit the brightest young scientists in the field."

To create an embryonic cell line, researchers remove a cluster of cells from a five-day-old embryo roughly the size of a period at the end of a sentence. At this stage of development, there is no tissue specialization. The embryonic stem cells are extracted from the embryos and placed in a culture dish containing nutrients that nourish them while preventing them from differentiating into specialized cell types.

The cells divide and spread over the surface of the dish. When they begin to crowd the dish, the cells are gently removed and placed into several fresh culture dishes, a process called re-plating. If the cells can be successfully re-plated many times over several months, a new embryonic stem cell line—consisting of millions of genetically identical cells—has been established.

"We have been proceeding carefully in order to consider ethical, legal and human-research issues, but we are now prepared to move forward," said Dr. Timothy Johnson, chair of the U-M Department of Obstetrics and Gynecology. "Stem cell technology has exciting potential to save lives and improve health, and it is important that all avenues of research are followed to make sure that cures happen as soon as possible."

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