



Stem Cells and the University of Michigan

As public dialogue about stem cell research increases, UM President Mary Sue Coleman explains the science and its importance to both UM and human health.

Can you briefly explain stem cells and their research potential?

To put it simply, stem cells are the source of replacements for most or all of the cells in the human body. They exist throughout the body at all stages of development, including adulthood. By studying how stem cells work, we may learn how to replace cells and tissues lost to injury or disease.

To give you a couple of examples, we may someday be able to treat juvenile diabetes by replacing the insulin-secreting cells of the pancreas with new cells grown from stem cells. It's also possible that we could create a stem cell line that forms human brain cells that mimic Alzheimer's disease. We could use these cells in a culture dish to better understand the disease, how it leads to the derangement of brain

cells, and to test potential new medications.

But there are many years of very demanding basic research ahead of us before we reach these kinds of goals.

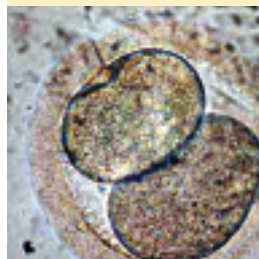
What about embryonic stem cells?

Embryonic stem cells are one type of stem cell that only exists early in the development of a fertilized human egg. We're very excited about these cells, because we know they go on to form more than 200 different kinds of human tissue, and because they appear to live forever in a lab dish. These cells can be recovered from early-stage embryos that have been discarded by the in vitro fertilization (IVF) process, including those embryos that were not considered healthy enough for implantation. Our hope is that through studying these tremendously promising embryonic stem cells, we can increase our understanding of devastating diseases like diabetes, cancer, Parkinson's disease, and other neurodegenerative diseases.

But embryonic stem cells are controversial because of where they come from. What about them is unique, and why not just use adult stem cells?

TERMS AND DEFINITIONS

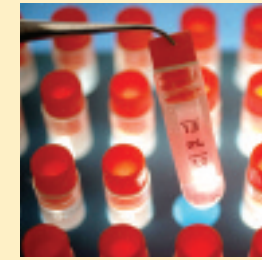
Adult stem cell: Found in newborns, children, and adults, these cells supply replacements for just one or two different cell types, depending on where they are found.



Differentiation: The process in which an unspecialized cell selectively turns off some of its genes and acquires specialized features like those found in a heart, liver, or muscle cell.

Embryo: In humans, the developing organism from the time of fertilization until the end of the eighth week of gestation, when it becomes known as a fetus.

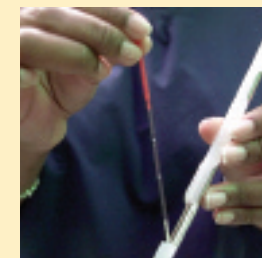
Embryonic stem cells: Primitive (unspecialized) cells from the embryo that have the potential to become every one of more than 200 types of specialized cells.



Embryonic stem cell line: Embryonic stem cells growing and dividing in a lab dish without specializing for months or even years.

In vitro: Literally, "in glass"; in a laboratory dish or test tube; an artificial environment.

In vitro fertilization (IVF): An assisted reproduction technique in which sperm and eggs are mixed in a lab dish.



Proliferation: Expansion of a population of cells by continuous replication and division.

Stem cells: The living body's source of replacement cells for those lost to injury, age, and disease.

Adult stem cell research is certainly important. The director of our Center for Stem Cell Biology, Sean Morrison, has done some very significant work with adult stem cells. But these cells have limits. For example, adult stem cells cannot become any type of human cell or tissue, and they don't appear to survive indefinitely in a laboratory dish. Umbilical cord stem cells are also promising for recreating the blood and immune system, but they are already somewhat specialized and cannot grow neurons, bones, and muscle the way we believe embryonic stem cells can. Embryonic stem cells are the most versatile, most long-lived stem cells we know of. To have the best hope of understanding how stem cells work and using that knowledge to develop treatments for serious diseases, we should study all types of stem cells.

What stem cell research is currently being conducted at UM?

As a world scientific leader, UM is vigorously pursuing almost all areas of stem cell research. Our Michigan Center for Human Embryonic Stem Cell Research has federal funding to maintain human embryonic stem cells for use by our scientific community. Under Michigan law, we cannot create embryonic stem cell lines of our own, but we are doing cutting-edge research on cell lines that were developed elsewhere to understand how these cells can differentiate into a variety of tissues including bone, heart muscle cells, neurons, and blood cells.

Our Center for Stem Cell Biology, housed in the Life Sciences Institute, seeks to answer fundamental questions about all types of stem cells in humans and animals. The answers to these basic biological questions will provide insights and medical breakthroughs creating new opportunities to treat disease.

How do you respond to ethical objections to this research?

There is broad consensus among mainstream research organizations, scientists, physicians, and patient advocacy groups that this research can and should go forward within ethical boundaries that balance the dignity of the human embryo with the potential medical value of embryonic stem cells.

I understand and respect the views of those who believe human life is sacred at the moment of conception, but I and most Americans nonetheless believe that this research can be conducted ethically.

It should rely only on embryos from IVF that have been created for the purpose of fertility treatments, but which are no longer needed for that purpose and which are destined to be destroyed, and that are being specifically donated for research by the parents after informed consent.

The simple fact is that there are an estimated 300,000 to 400,000 embryos currently in storage at IVF clinics in the United States, and many thousands of them are discarded each year for a variety of reasons. Using early-stage embryos that will otherwise be destroyed to create cell lines that could potentially help patients with debilitating and deadly diseases is a very humane course of action. Many people believe that it would be immoral not to pursue medical research that has the potential to cure disease and end suffering.

What is UM's code of ethics relating to embryonic stem cell research?

In addition to what I've already mentioned, we will never purchase embryos or pay a donor for an embryo. We will never create IVF embryos solely for research. We will never perform so-called "reproductive cloning" to produce a new human. Informed consent of the donor parents is absolutely crucial as well.

I not only want UM to lead the way in scientific research, I want us to be a model for conducting research in a highly ethical manner. We are one of the greatest research institutions in the world because we do adhere to very strict ethical standards.

Why is stem cell research a priority?

Stem cell biology is a new field and we understand very little about it, but it appears to hold tremendous promise for developing new cures. We like to say we 'follow the science wherever it leads,' and stem cells are a very exciting new frontier for us to explore. Our Cancer Center was the first to establish a connection between stem cells and breast cancer, for example, and a new cancer therapy already is being developed based on that work.

Stem cells have rapidly become a research and educational priority — not only for UM, but for federal funding agencies, the general scientific community, and the corporate sector. Our involvement with stem cell research epitomizes our desire to stay at the forefront of scientific research.

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