

Stem Cell Research: The Debate that Has Divided America

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A scenario:

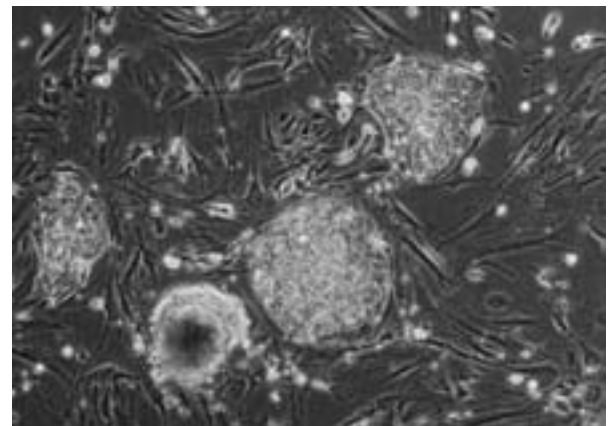
You have severe congestive heart failure. You need a heart transplant, but your doctor tells you that due to the scarcity of replacement hearts, you might have to wait a year or more. After the transplant, your body's immune system might still reject the new heart. Even if the transplant is a success, you will have to endure the effects of immunosuppressive drugs for the rest of your life.

Another scenario, this one for the future:

*You have severe congestive heart failure. Your doctor admits you to the hospital. During an operation later that day, she injects some heart cells into your heart, and after an integration period of a few days, your heart is healed substantially. You go home and lead a healthy life.**

Doesn't the second scenario sound better? What if you knew that the heart cells were generated from human stem cells, taken from human embryos? Depending on your belief about when life begins, this might bother you a great deal or it might not bother you at all.

Stem cells are the ordinary undeveloped cells of very early-stage (no more than 64-celled) embryos.¹ To put this in perspective, a newborn baby is composed of billions of cells. Many of these embryos have been grown in a laboratory from fertilized eggs; they were produced for in-vitro fertilization but were later discarded or donated specifically for research purposes. Embryonic stem cells are pluripotent—unlike more mature cells, they hold the possibility of developing into any organ of the body. Scientists experimenting with mice have introduced pluripotent mouse embryo stem cells into diseased organs. These stem cells then begin to take on certain characteristics and functions of the organ cells. The stem cells don't actually develop into organs, but they do begin to resemble the organ cells; stem cells introduced into a diseased kidney, for example, mime ordinary kidney cells. The other kidney cells integrate the new cells until the organ is effectively regenerated.²



Microscopic 10x view of a colony of undifferentiated human embryonic stem cells being studied in developmental biologist James Thomson's research lab. The embryonic stem cell colonies are the rounded, dense masses of cells. The flat, elongated cells in between the embryonic stem cell colonies are fibroblasts that are used as a "feeder layer" on which the embryonic stem cells are grown. (Source: University of Wisconsin-Madison.)

* Scenarios have been adapted from Horvath, 2003.



Culture trays containing human embryonic stem cells being viewed under a microscope and studied by developmental biologist James Thomson's research lab.
Photo by: Jeff Miller

The second of the given scenarios is what researchers hope will become an everyday reality early in the 21st century, not only to treat diseased hearts but also to treat damaged livers, kidneys, and lungs as well as neurological diseases. By the very nature of the research, however, scientists have found themselves entangled in a moral and ethical debate that has divided America: Should stem cells from embryos that could potentially develop into living beings be used to treat a wide array of diseases? The answer is contingent two main parts: When does a fertilized human egg become a living person? and Do the benefits of the therapy warrant the controversial use of stem cells?

Stem cells currently being used for research purposes and experimental studies are usually derived from aborted fetuses or embryos that have grown in a laboratory from fertilized eggs. The eggs used are normally produced for in-vitro fertilization, a process that helps many women to conceive children. When doctors match sperm and egg to create embryos outside the womb, they usually produce more embryos than are planted in the mother. These embryos are later discarded or donated specifically for research purposes. Some Pro-Life activists argue that an egg becomes a living person the instant it is fertilized; some scientists argue the opposite, using the following

logic: The fertilized eggs used for research purposes sit in vats of liquid nitrogen at subzero temperatures until they are otherwise thrown out. The eggs have the *potential* to become living beings, but they will never be implanted inside a woman's uterus to undergo the process of developing into a living, breathing human being. How, then, can these be called "human beings"? The same holds true for aborted fetuses: The decision to prevent the fertilized egg from becoming a living being has already been made.

Others argue that the question boils down to one of intent: What was intended to become of the eggs? If the egg in question were in fact implanted inside a woman, then it would have the opportunity to undergo the process of development into a human being. However, if the egg in question is one of the 30,000 leftover eggs*¹ which couples don't need after they've had their child and which are set aside to be discarded every year, then the intended path is *not* one of life. For such an egg, the decision regarding the potential to become a living being has already been made. Why, then, scientists argue, should such an egg be prevented from aiding researchers to find potentially life-saving treatments using stem cell technology? The same holds true for eggs donated for research, as well as aborted fetuses from which stem cells can be harvested.

The end results of utilizing embryonic stem cell research are numerous and highly promising: They could lead to life-saving therapies for Alzheimer's disease and diabetes as well as to ways to prevent birth defects and rebuild damaged organs. For example, in the 30 July 1999 edition of *Science* magazine, scientists reported how they were able to manipulate stem cells into neural cells and inject them into fetal or newborn rats who have a disease in which the myelin coating around nerve fibers is missing.³ The cells had been developed into key cells of the nervous system that were able to promote the growth of myelin covering to help nerves function normally. These tests show promise for a viable treat-

* Figure represents numbers in the United States alone.

ment for multiple sclerosis (MS), a disease in humans that parallels this demyelination in rats, for which there is currently no cure.

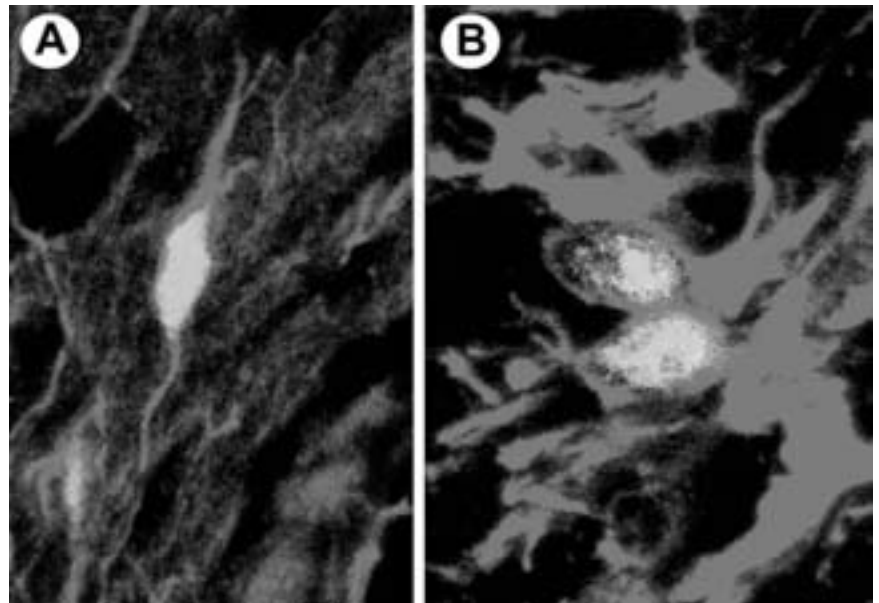
Geron, a small biotech firm in California, is working on a project that could profoundly change medical treatment by offering patients customized parts to repair damaged organs. The Geron Corporation has developed a technology called “telomerase expression,” which it says allows cells to keep replicating. With this technology, in conjunction with stem cell technology, Geron researchers would be able to grow new human tissue capable of repairing heart muscle, bones, nerves, skin, and eyes.⁴

Though mainstream media sometimes gives the impression that the public will have to wait years before revolutionary treatments involving stem cell technology for human diseases become a reality, this is not the case. This past July marked the twenty-first month of “complete clinical remission of [lupus]” in an 18-year-old woman who was so near death from the disease that she needed life support because her lungs and kidneys were failing. Now—about two years later—she is in good health and showing no signs of the disease. The young woman became one of a handful of lupus patients to undergo a stem cell treatment that may cure the disease.⁵

What if the government had decided to halt stem cell research before this revolutionary treatment for lupus had come to fruition? Can one justify depriving an individual who has a life-threatening illness of a potentially health-restoring treatment by utilizing an embryo that was set aside to be discarded anyway? Again the question is, When does a fertilized egg become a human being? Even if this line is unclear, can one justify preventing scientists from conducting research that could lead to and has already shown promise in treatments that can save thousands, if not millions of lives with cells derived from these same eggs? No one knows exactly how many lives could be saved, but if one examines the number of people afflicted with diseases for which stem cell therapy could potentially be a cure, the numbers are staggering: 1.4 million people

with lupus,⁵ about 1 million people* with Parkinson’s disease,⁶ and approximately 220,000 people with spinal injuries, with about 10,000 new injuries per year.⁷ These figures represent the number of people afflicted in the United States alone, and do not even include the countless other people with disorders that could be cured or improved with a regenerated body part or organ.

One of the most promising frontiers of science has rocked America with one of the greatest moral dilemmas: Should these “master cells” that are present only in early-stage human embryos be used for eventual life-saving therapies for Alzheimer’s disease, Parkinson’s disease, multiple sclerosis, and other neurological and physiological disorders, as well as to prevent birth defects and rebuild damaged organs? Some people may have difficulty with weighing life-saving medical benefits against moral costs, but some argue that there does not need to be any moral cost. Advocates of this argument posit that the much-debated “line” between when a fertilized egg becomes a living being does not need to be delimited. Again, they say the question boils down to one of intent. The implications of stem cell technology are very real and have already saved several

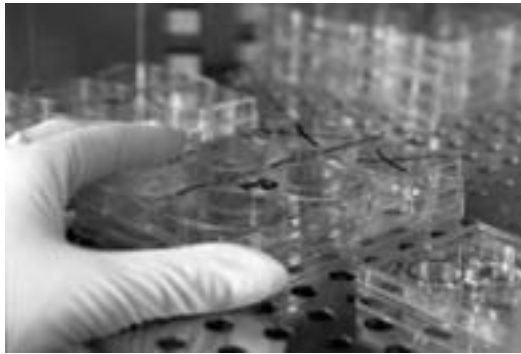


After transplantation into the brains of young mice, the neural precursor cells give rise to functioning neurons (A) and astrocytes (B), a star-shaped cell of the brain and spinal cord. Photo courtesy of Su-Chun Zhang

* The number is approximate because many people, perhaps half of those affected, are thought to be undiagnosed.

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Culture trays containing human embryonic stems cells being stored in heat-controlled storage and studied by developmental biologist James Thomson's research lab. Photo by: Jeff Miller

human lives as well as shown promise in animal models. Halting stem cell research could potentially destroy the light of hope for the millions of people in the United

States whose lives could one day be improved or even saved through the use of stem cell technology. Many agree that it is wrong to create human embryos in test tubes solely to experiment on them, but if the remaining eggs from an in-vitro fertilization are to be discarded regardless, they could be used instead to cure a child with diabetes, a 65-year-old with Alzheimer's disease, or a young father with a paralyzing injury. An embryo has the potential for life at one point, but if this route is no longer the intended one, stem cell technology gives an embryo the potential to *save a life*. Perhaps, then, we as a society must decide the point at which the *potential* for life can be outweighed by our need to survive. Then, if we found ourselves facing the opening scenario, would we change our minds? ☒