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Health

Embryonic stem cell research: Questions for Americans

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October 16, 2004—One of the questions asked during the second presidential debate was loaded in the sense that it could not possibly be answered in the allocated two minutes and it was presented in the framework of destruction of an embryo.

The question . . .

> Thousands of people have already been cured or treated by adult stem cells or umbilical-cord stem cells. However, no one has been cured by using embryonic stem cells. Wouldn't it be wise to use stem cells obtained without the destruction of an embryo? [1]

Americans need to decipher that question, or as teenagers often say, "Huh! Unpack that for me."

Stem cells are master cells that can develop into a variety of tissues. Adult stem cells are found in specific types of tissue and seem to be limited to regeneration of that particular type of tissue. For example, newly formed umbilical-cord blood stem cells may be used to treat leukemia (a blood disease) if ones parents had the resources and foresight to place umbilical cord blood into a special blood bank at the time of birth. In other cases leukemia has responded to stem cells derived from a patient's own bone marrow or from donor marrow. Potential rejection of donor grafts is an unsolved medical problem that carries a significant risk. [2]

By contrast, embryonic stem cells,(ESC)are derived from unused blastocysts (immature embryos) that fertility clinics will eventually destroy. Fertility Clinics store 100-cell blastocysts that have been grown on a petri dish and frozen in nitrogen. These cells have never been implanted into a prospective mother's uterus. Their fate is to remain frozen in nitrogen waiting to be implanted or destroyed when donors no longer pay maintenance and storage fees.

Unlike adult or umbilical cord blood stem cells which are tissue specific, embryonic stem cells have the unique ability to make any kind of cell in the body. This means that potentially, if the research is allowed to continue, 10 years from now children with diabetes can be cured or severed spinal cords can be repaired. This research holds the possibility that the next Christopher Reeve would be able to walk again after a devastating, life threatening accident.

The entire topic of embryonic stem cell research is rife with terms that hold emotional dual meanings. One example, therapeutic cloning, is a misnomer because it is often misunderstood to mean replicating or creating a new organism rather than replicating only specific cells. Therapeutic specific cell replication is a term more easily understood by nonscientists. That term simply means that specific types of cells generated in a medical laboratory, can be transplanted into a living person and function as they were intended. The goal and hope for the research is that children with juvenile diabetes and adults suffering from Parkinson's disease can be successfully healed.

Some researchers use the term Nuclear Transfer to indicate Therapeutic Specific Cell Replication. [3] The terms have exactly the same meaning and are used interchangeably.

Other than the United States, most of the world differentiates between Specific Cell Replication (SCR) and Reproductive Cloning (RC). In the United States opponents of Embryonic Stem Cell(ESC)research have fought against such a differentiation ruling because to do so would eliminate the most compelling argument against it. Senator Arlen Spector (R-PA) says that "the science is being held hostage by those who want to ban Nuclear Transfer" (Specific Cell Replication). [4]

Americans must ask why their legislators wish to ban Specific Cell Replication research. For example, Senator Brownback (R-Kan) has gone so far as to propose a bill that would fine scientists $10 million and imprison them for 10 years for developing new embryonic stem cell lines. [5]

The human body has a natural tendency and capacity for certain specific cell replication. Under most cases it can regenerate epithelial (skin) cells in the event of burns or other skin damage. Muscle tissue will regenerate after trauma or surgery so long as the nerve supply is intact. Broken bones heal. But, unlike the young tadpole frog that can regenerate its hind limb, the human body is limited in its ability to regenerate certain tissues. Specifically, humans can not regenerate pancreatic beta cells that produce insulin or damaged motor neurons that result in ALS (Lou Gehrig's disease) and muscular dystrophy. Neither the damaged brain nuclei that results in Parkinson's disease or severed nerve tracks in the spinal cord are capable of spontaneously regenerating. [6]

In the United States the ethical question, should scientists stand aside, suspended in a time warp, rather than move forward looking for ways to cure human suffering and disease has yet to be answered.

Questions about embryonic stem cell research should be based on ethical and scientific principles rather than politics. But in 2001 a line was drawn in the sand that precluded the full development of the science and tossed the question into the political arena.

Immediately after taking office George W. Bush froze all funding for ESC research. In August 2001 he announced that no new lines could be developed but that the 60 existing stem cell lines from around the world could be used for federally funded research. [7] The most recent reports claim there are 78 cell lines. What the president and his advisors failed to consider is that rather than 60 to 78 cell lines, there are actually only 12 available for research. Unfortunately, all of these 12 lines were grown on mouse cell cultures and carry a high probability of being infected with mouse viruses. [8] This is a risk that no medical researcher is willing to take; therefore, the cell lines are not suitable for human transplantation research.

Cultures were grown on mouse cells because that was the state of the research in 2001. It is now possible to grow the cells on different culture media. But because of the no new embryonic cell lines dictum, this newer technology may not be used by federally funded researchers. This is the Catch 22 for scientists who need federal funding to support their research. It is also the ultimate Catch 22 for the American public. [9]

How has this ruling impacted American scientists?

Since the 2001 restrictions were placed on limiting ESC research, prominent researchers, including Professor Roger Pederson, one of the world's leading experts on stem cell research, have left the United States for Cambridge and other European universities. [10]

Professor Douglas Melton of Harvard has gone outside the federal system to develop 17 ESC lines isolated from embryos that, with the consent of donors, were donated by fertility clinics. Melton's current goal is to share the cell lines with other scientists and to continue his work on insulin-producing beta cells for transplantation into the pancreas of diabetic patients; thereby curing their disease. While the end goal is not yet in sight, his progress, as well as by making the cell lines available to other researchers, provides the potential for success.

Professor James A. Thompson of the University of Wisconsin developed the research that allows human embryonic stem cells to grow in the laboratory. Until his discovery only mouse embryonic stem cell lines

had been developed. With the cut-off of federal funds for ESC research, Professor Thompson was invited to continue his work outside the United States. The Board of Regents responded by finding private funding to keep him at the University of Wisconsin.

Scientists in the United States are either scrambling for private funds or are leaving the country. Americans must ask themselves whether they can afford this brain drain and if the ban is working.

There is evidence that the ban is not working, but is merely sending federal research monies outside American universities. To cite just one example, the Department of Defense (DoD) is now supporting embryonic stem cell research on neurotoxins and dopamine receptors at Sweden's Lund University. [11] Americans must ask why this tax-supported research is not being conducted through an American university in the United States. The DoD's explanation is that it seeks "the best of the best" scientists to explore crucial problems. This statement implies that federally funded scientists in American Universities are losing the cutting-edge in embryonic stem cell research.

Most importantly, Americans must ask why embryonic stem cell research is being held hostage by some politicians as Senator Specter noted. [12] Why has the Congress and the president avoided banning reproductive cloning? If we had a law banning reproductive cloning, but allowed therapeutic specific cell replication research, the emotional value-laden concerns about cloning a human could be avoided.

Americans must ask hard questions and demand that ethical, moral, and sound scientific reasoning be used to reach decisions that affect our health and the health of future generations. In the current political atmosphere, we are not getting straight answers. We are not getting sound ethical or scientifically-based decisions from Congress and the president about matters that affect the treatment of serious illness and the health of our nation. [13]

We deserve better public health policy for ourselves and our children.

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