most researchers in the field believed that so-called human embryonic stem cells (hESCs) have the most promise for the three goals of stem cell research: (1) understanding how degenerative diseases develop and progress, (2) creating large numbers of disease-specific cells to test potential pharmaceuticals more efficiently, and (3) ultimately creating stem-cell based treatments that could be used to replace dead or damaged cells and tissues.[2]

Adult stem cells, which exist inside all our bodies to generate replacements for the cells that routinely die every day, already have some clinical uses—a particular type, hematopoietic stem cells, are what make bone marrow transplants an effective treatment for leukemias—but they are thought by most scientists to have far less potential for a number of reasons.[3] Most importantly, adult stem cells do not live as long and replicate in culture as well as embryonic stem cells.[4] With only a few outliers, the scientific community was unified in the belief that embryonic stem cell research offered unique promise for finding cures to a range of degenerative diseases that affect, or one day will affect, nearly every family in America—from cancer, to heart disease, to Alzheimer's, to diabetes.

Notwithstanding the views of the scientific community, on August 9, 2001, President Bush ordered federal agencies to refuse to fund research on stem cell lines created through a process that entailed embryo destruction.[5] This policy implicitly rests on two assumptions, one of which finds broad support amongst the American public and the other of which is far more controversial. The first assumption is that no person's life should be intentionally sacrificed for medical research, no matter how much benefit the research may have for other members of society.[6] Although some dedicated utilitarian philosophers argue that we should be willing to intentionally sacrifice the lives of a small number of people for medical research that would cure a larger number,[7] the contrary

2. RUSSELL KOROBKIN WITH STEPHEN R. MUNZER, STEM CELL CENTURY: LAW AND POLICY FOR A BREAKTHROUGH TECHNOLOGY 18–20 (2007).

3. *Id.* at 22–23.

4. *Id.* at 23.

5. *See* President George W. Bush, Address to the Nation on Stem Cell Research from Crawford, Texas (Aug. 9, 2001), *in* 37 WKLY COMP. OF PRESIDENTIAL DOC. 1149, *available at* http://www.gpoaccess.gov/wcomp/v37no32.html [hereinafter Address to the Nation].

6. *See* Julian Savulescu, *The Embryonic Stem Cell Lottery and the Cannibalization of Human Beings*, 16 BIOETHICS 508, 512 (2002).

7. *E.g.*, *id.*

of equivalent moral worth between blastocysts and persons. Most people in this group reason that, since people are more important than blastocysts, medical research that has unique potential to save and improve the lives of people must take precedence over the well-being of blastocysts.

II. THE iPSC BREAKTHROUGH

chair of the President's Council on Bioethics, Leon Kass, wrote: "Why work to derive new stem cell lines from frozen embryos . . . when one can work with iPSCs . . . ?"[16] This reasoning jumps ahead of the science, and cannot be supported in its strong form—at least at the moment.

It is important to recognize that the new iPSCs are not identical to embryonic stem cells. Here, there are two important points. First, the process used, at least to this point, to reprogram ordinary cells into iPSCs employs retroviruses to insert the required genes—a process which can cause cancer.[17] Scientists agree that this makes the current iPSCs unsuitable to ever use as the basis for stem cell treatments. Researchers hope to create alternative techniques to engineer iPSCs without retroviruses. Many think that this is a hurdle that can be overcome quickly, and perhaps it can. In February 2008, a private company claimed to have done so, but it has declined to demonstrate it in a peer reviewed publication, thus producing a skeptical response from the research community.[18] In June 2008, a group of researchers using a type of adult stem cell from mice demonstrated success in using a synthetic molecule to activate the genes necessary for pluripotency, avoiding the need to use retroviruses to insert copies of the genes.[19]

More importantly, because iPSCs are not in fact embryonic stem cells—they merely behave in much the same way as embryonic stem cells—scientists just don't know whether they have properties that will make them an adequate substitute for all the purposes to which hESCs might be put.[20] Early results have been promising: MIT scientists recently succeeded in using iPSCs differentiated into dopamine neurons to reduce symptoms of Parkinson's disease in

Breakthrough Could Benefit GOP, MSNBC, Nov. 21, 2007, http://www.msnbc.msn.com/id/21914276/.

16. Leon R. Kass, *Defending Life and Dignity: How, Finally, to Ban Human Cloning*, WKLY STANDARD, Feb. 25, 2008, at 30.

17. *See* Gina Kolata, *Scientists Bypass Need for Embryo to Get Stem Cells*, N.Y. TIMES, Nov. 21, 2007, at A1.

18. Marie McCullough, *PrimeGen Biotech: Stem-Cell Progress*, PHIL. INQUIRER, Feb. 28, 2008, at A1.

19. *See generally* Yan Shi et al., Correspondence, *A Combined Chemical and Genetic Approach for the Generation of Induced Pluripotent Stem Cells*, 2 CELL STEM CELL 525 (2008).

20. *Accord* Insoo Hyun, *Stem Cells from Skin Cells: The Ethical Questions*, 38 HASTINGS CTR. REP., Jan.–Feb. 2008, at 20.

rats.[21] Still, it will probably take years of study before scientists fully understand the potential and limitations of these cells.

Ultimately, iPSCs might prove to be perfect substitutes for hESCs, or they might even prove to be better than hESCs because

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whether or not particular research requires the destruction of blastocysts, and no consideration given to how or for what purpose the blastocysts were brought into being. It is important to emphasize, however, that my conclusion relies on the premise that there is no logically defensible basis for viewing human embryos as possessing any moral value similar to that of people. Blastocysts have none of the attributes that give persons unique moral worth. They lack even the most rudimentary neurological function; they lack sentience, the ability to feel pain, consciousness, and the ability to imagine the future. Blastocysts are certainly human, in the sense that they possess an entire complement of human DNA, but this is true of every type of cell, and no one opposes research on ordinary adult tissues (assuming informed consent is obtained) or grieves at the millions of cells we shed naturally every day.[27]

It is sometimes argued that it is their *potential*

worth themselves.[29] Using blastocysts in medical research to try to find cures for disease shows deep respect for people, not disrespect, so the endeavor is morally appropriate, whether or not other avenues for progress in medical research also exist.

29. *Cf.* John A. Robertson, *Symbolic Issues in Embryo Research*, 25 HASTINGS CTR. REP., Jan.–Feb. 1995, at 37–38.