



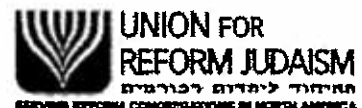


Department of Jewish Family Concerns
Bio-Ethics Program/ Case Study Guide XIV
Jewish Approaches to Stem Cell Research

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Department of Jewish Family Concerns
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JEWISH APPROACHES TO STEM CELL RESEARCH (FALL 2006)

TABLE OF CONTENTS

1. Introduction to Congregation Program-Study Guide #14 p. 1-6
 - a. Introduction by Director of Jewish Family Concerns
 - b. Introduction by Chair of Jewish Family Concerns Bio-Ethics Committee
 - c. Introduction: What are Stem Cells?
2. Stem Cells: A Status Report: Hastings Center Report January-February 2006. Volume 36. No. 1 p. 7-14
3. Overview on New Research on Stem Cells: Ethical and Moral Debates: Science and Theology News. June 2006 p. 15-22
4. Stem Cell Research in Jewish Law: Daniel Eisenberg, M.D.: Jewish Law. (jlaw.com) June, 2005 p. 23-36
5. United States Department of Health and Human Services "Fact Sheet" on Embryonic Stem Cell Research. July, 2004 p. 37-40
6. Press Release: Reform Jewish Leaders Urge President Bush to Promote Embryonic Stem Cell Research. July, 2001 p. 41-42
7. Rabbinic Council of America Statement on Stem Cell: October, 2004 p. 43-44
8. Central Conference of American Rabbis Responsa: p. 45-66
 - a. In Vitro Fertilization and the Statues of the Embryo
 - b. Human Stem Cell Research
9. Union for Reform Judaism Biennial Resolution on Stem Cell Research. November, 2003 p. 67-72
Fetal Tissue: October 1993
10. "Stem Cell Research": Rabbi Elliot N. Dorff p. 73-92
Committee on Jewish Law and Standards—
Rabbinic Assembly
11. "Stem Cell Research": Rabbi J. David Bleich p. 93-106
Tradition: Journal of Orthodox Jewish Thought
Vol.36. No. 2 . Summer 2002
12. Thought Piece: "Science Anxiety: Toward a Less Fearful Future". Arthur L. Caplan, Ph.D. p. 107-108
Philadelphia Inquirer. May 7, 2006
13. Thought Piece: A last word from The New Yorker p. 109
August 7-14, 2006. p. 6



Department of Jewish Family Concerns
Committee on Bio-Ethics

UNION FOR REFORM JUDAISM

DEPARTMENT OF JEWISH FAMILY CONCERNS: BIO-ETHICS
PROGRAM-STUDY GUIDE # 14
JEWISH APPROACHES TO STEM CELL RESEARCH
INTRODUCTION

In recent years the ethical issues surrounding the use of human stem cells for medical research has sparked passionate and determined conversation and debate. The potential for life saving and life enhancing results from this frontier technology has quickened the hopes of individuals and families who see in this technology potential salvation from life altering and life threatening illness. As you know, the issue has become a matter of political debate which, at times, threatens to subvert the potential benefit of this research. Likewise, this science is not the province of just one country. Across the globe, countries with less restrictive rules are pursuing the promise of human stem cell research. To add to the muddle, in the United States, various states are choosing to work around federal limitations and pursue this research. As with many aspects of frontier medical technology, altruism is also tinged with promise of commercial reward.

How does contemporary Judaism approach this powerful issue? We have assembled a variety of points of view that have been published in recent years. Using the rubric of "*p'kuach nefesh*", Judaism, across the denominational lines, is quite open to the potential for blessing inherent in this research. The statements by the Union for Reform Judaism, United Synagogue and modern Orthodox Judaism present an interesting approach. We have included representative Responsa, Resolutions and articles that trace the issue from a wide variety of textual angles.

The study guide begins with some overviews from current scientific and bio-ethics journals. These are a snapshot of some of the issues as they appear in 2006. Keep in mind, as you develop your adult-ed program, that this technology does change rapidly and that it may be useful to include in your program some representative of the scientific community who can "update" current progress.

We encourage you to make use of the material in Program-study Guide #14 to raise the issues of Jewish texts and approaches to stem cell research within your congregational adult-ed, Confirmation and continuing education programs. This guide may be used along with #s 10 (Cloning) and 11 (Infertility and Assisted Reproduction) to form a more complete course of study. Additional study guide are always available through the Department of Jewish Family Concerns office at the Union for Reform Judaism.

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Introduction

There has been a lot of ballyhoo regarding stem cell research, even having become a subject of controversy in the latest presidential election. Unfortunately, that discussion has often generated more heat than light. At the URJ 2005 Biennial there was a workshop asking, with tongue in cheek, whether stem cell research might represent the new messiah. As is often the case, expectations soar before the facts are in. While stem cells undoubtedly have great potential for medical applications, there should be little expectation that they represent a cure-all. Much research must be done before that potential may be realized and become factual. Philosophers have long made a distinction between potential and reality. Where stem cells are concerned, we are definitely at the potential stage. This study guide attempts to bring some reasonable perspective to the issues involved. It is apparent that it is the embryonic stem cell that has the greatest potential and elicits the greatest excitement amongst supporting scientists. It is also the embryonic stem cell that presents that greatest dilemma because an embryo must be destroyed in order to collect the cells. Therein lays the greatest ethical concern: the embryo and its status as human. The U.S. Government will offer no financial support for studies in which human embryos are destroyed, and this has placed the President at odds with some leaders in Congress, including a significant number of his own party. This study guide addresses the political and moral issues, and provides the opinions of a number of Jewish scholars who examine Jewish tradition for guides on modern Judaism's stance on the current concerns. You will discover how scholars have gleaned from ancient texts, insights into problems that did not exist nor were they imagined at the time the texts were written. The essays presented here demonstrate how the wisdom of the sages that produced Jewish tradition can be brought to bear on this most modern of dilemmas.

Dr. Morton Prager
Dallas, Texas
Chair: Jewish Family Concerns Bio-Ethics Committee

Throughout this study guide you will come across several serious examinations of the ethical validity of stem cell research. Do you know that there are different types of stem cells? This document attempts to clarify the basic differences between the two main types of stem cells and provide you with the means to gather additional information should you desire to do so. Addressed in this article are embryonic stem cells and adult stem cells. Stem cells, embryonic and adult, are cells capable of making identical copies of themselves and of making progenitor cells (Fig. 1). These progenitor cells are the cells that then go on to form various types of cells, such as blood cells, brain cells, skin cells etc. These cells make up the tissues and organs with which you are familiar (Fig. 1). The major difference between the stem cells are where they come from and what type of cells they can then go on to form because this influences their potential for medical application.

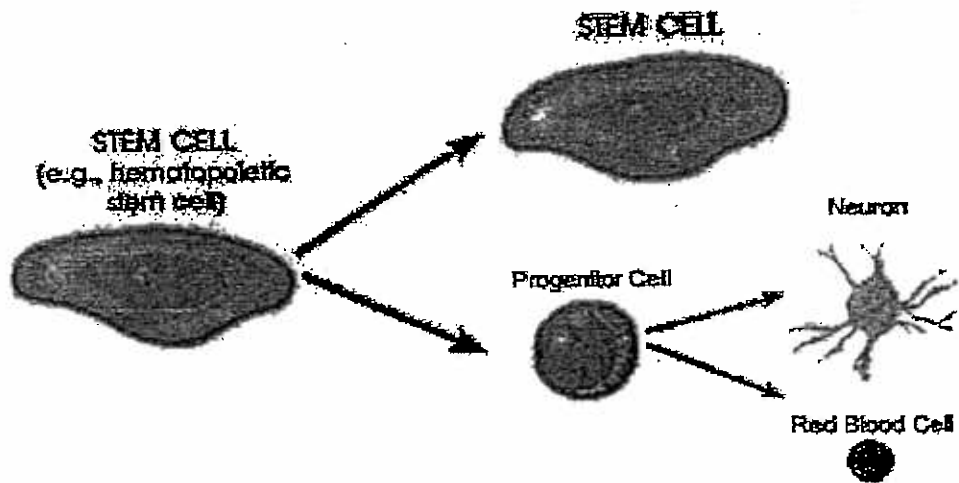


Fig.1

Embryonic stem cells are derived from the inside of an embryo no more than 8 days old. The 8-day embryo is also called a blastocyst. The blastocyst is a sphere made up of an outer layer of cells (the trophoblast), a fluid-filled cavity (the blastocoel), and a cluster of cells on the interior (the inner cell mass). It is this inner cell mass that are the embryonic stem cells. These cells have the capability of forming any type of cell that makes up the entire body. For this reason they are termed totipotent or having the highest potential. Their potential for medical applications appears boundless. However, this potential has not been realized to date. (See Fig. 2)

Embryonic Stem Cells

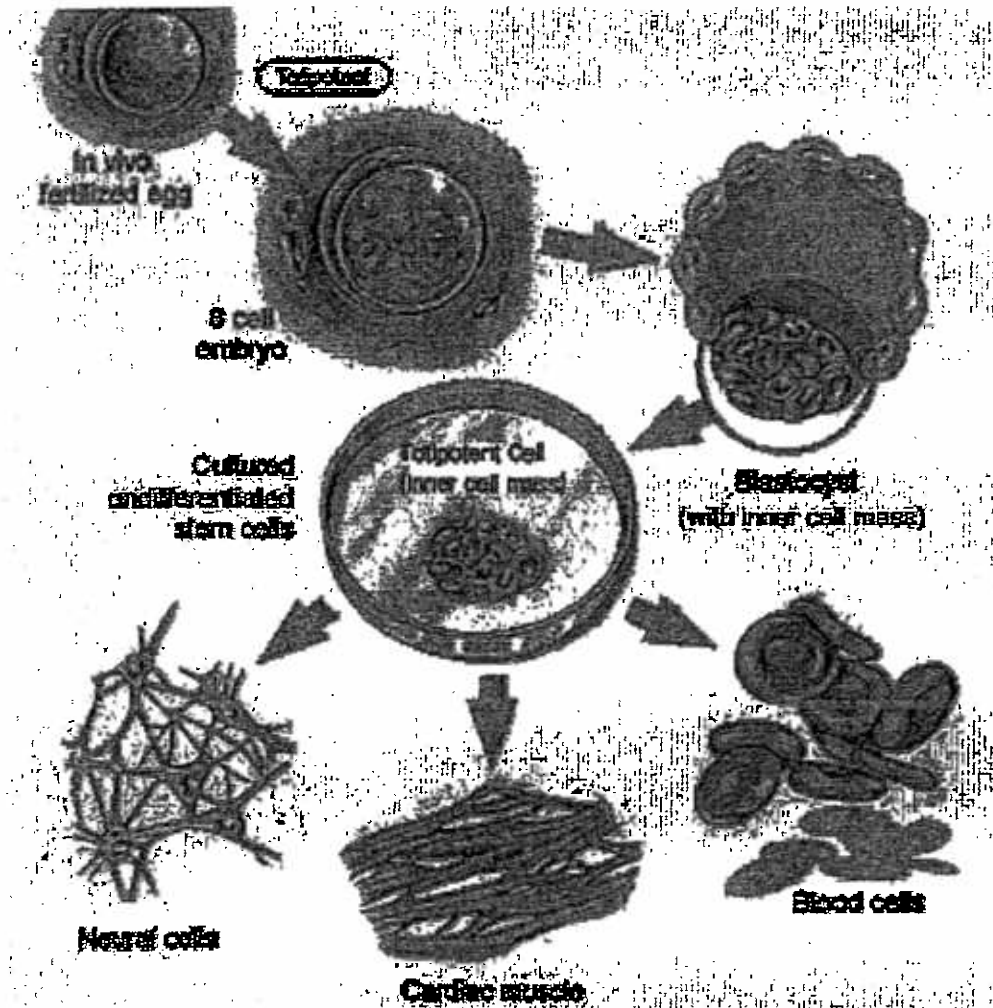


Fig. 2

Adult stem cells are derived from various organs within a child or adult donor without any loss of life. The list of organs where stem cells have been found include, but are not limited to, the umbilical cord, bone marrow, peripheral blood, brain, spinal cord, dental pulp, blood vessels, skeletal muscle, epithelia of the skin and digestive system, cornea, retina, liver, and the pancreas. The various types of adult stem cells have shown that in many cases, they are capable of forming multiple types of cells, although not all the cell types in the body. Stem cells derived from bone (bone stromal cell) can form cardiac (heart) muscle cells, skeletal muscle cells, neurons, and epithelial (skin) cells (Fig.3). Adult stems cell have been used repeatedly with great success in therapy. In fact, all of the successful stem cell therapies have utilized adult stem cells. According to the NIH, "Adult stem cells, such as blood-forming stem cells in bone marrow (called hematopoietic stem cells, or HSCs), are currently the only type of stem cell commonly used to treat human diseases. Doctors have been transferring HSCs in bone marrow transplants for over 40 years. More advanced techniques of collecting, or "harvesting," HSCs are now used in order

to treat leukemia, lymphoma and several inherited blood disorders. The clinical potential of adult stem cells has also been demonstrated in the treatment of other human diseases that include diabetes and advanced kidney cancer." (2)

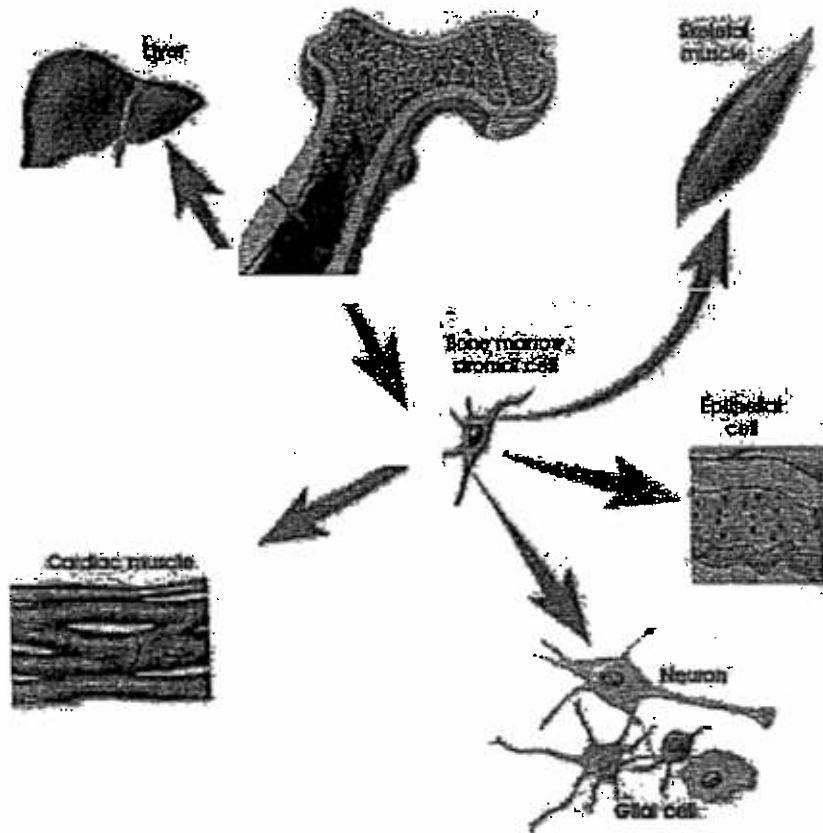


Fig. 3

Since the NIH published this statement adult stem cells have been used to:

- Restore sight to at the Centre for Sight, Queen Victoria Hospital in East Grinstead, West Sussex England. (Times Online UK) (5)
- improve the five year survival rate and quality of life for more than 200 women suffering from Ovarian cancer (4)
- Save as many as 80% of Severe Combined Immunodeficiency Disorder (SCID), a disease that is a defect in white blood cells that defend us from viruses (flu, cold, etc.), bacteria (pneumonia, etc.) and fungi. Those who suffer from this disease are not defended against these pathogens and can die within their 1st year of life. A childhood disease like chicken pox can be a death sentence. (6)
- Improve heart function in congestive heart failure patients in a South American Study. This study is was set to be repeated at the University of Pittsburgh Medical Center by Dr. Amit Patel as of May, 2005. (7)

- Produce disease free survival of 57% of adult leukemia patients in one study. For those who had the adult stem cell transplant while the cancer was in remission, the disease free survival rate was 72%. (3)
- Save the lives of 25 infants diagnosed with Krabbe's disease, a rare genetic disorder.(8)

Adult stem cells offer hope for cell therapy to continue to treat diseases such as Alzheimer's because the ethical issues applied to embryonic stem cells are not relevant in their case.(1) Additionally, if it is the patient's own cells that are utilized, then immunological compatibility is not an issue.

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ESSAYS

EDITOR'S NOTE

As stem cells move from basic science to clinical trials and eventually, perhaps, toward doctors' offices, questions about the moral status of the embryo give way to questions about the conduct of the research and the development of therapies. This special set of essays assesses the state of play in the science and in the new debates attending it.

Stem Cells: *A Status Report*

BY STEPHEN S. HALL

Last October, during one of those periodic flurries of news that push the Stem Cell Wars back onto the front pages for a day or two, the telephone in the Harvard Medical School office of Dr. George Q. Daley kept ringing off the hook.

On one occasion, it was a reporter seeking Daley's assessment of a new technique for creating embryonic stem cells that had just been reported in the online edition of the journal *Nature*. Researchers in the laboratory of Rudolf Jaenisch at the Whitehead Institute in Cambridge, Massachusetts, had managed to clone a deliberately crippled mouse embryo, with the idea that if a genetically manipulated embryo lacked the ability to form a placenta and attach to the uterus, it would therefore lack the biological potential to become a mature creature. If the same trick worked with human embryos, Daley was asked, would this solve the ethical dilemma? He wasn't so sure. "The embryo that is established in the first few days," he pointed out, "is substantially normal."

Another reporter wanted to know what Daley thought about a second technique, also published in *Nature*, that sought to answer the ethical objections of stem cell critics. A team of researchers at Advanced Cell Technology in Worcester, Massachusetts, led by Robert Lanza, had found that at a very early stage of embryonic

development, a single cell could be plucked away from an eight-cell embryo and used to derive mouse embryonic stem cells. Did this represent another alternative to the more "traditional" approaches to stem cell harvest, which require the destruction of human embryos and have thus aroused so much political and moral debate? Daley had his doubts about this one, too. The experiments, he said, "raise more questions than they answer."

And later that same week, researchers at Seoul National University in South Korea, led by Woo Suk Hwang, announced a plan to set up satellite labs in California and England to create, on order, cloned human embryos for the purpose of deriving customized stem cell lines. The Koreans, who had stunned the world in June 2005 with the report in *Science* that they had established eleven new human embryonic stem cell lines from cloned human embryos, now offered to franchise their expertise through a "World Stem Cell Hub." What did Daley think? "The details have yet to be divulged," he told the *Wall Street Journal*, "and the devil's in the details." (The details later became very devilish: soon thereafter Hwang withdrew from the initiative following reports of ethical improprieties in the group's egg harvesting program, and subsequently withdrew the *Science* paper amid allegations that some of the results were fraudulent.)

Having just set up a new stem cell laboratory at Children's Hospital in Boston, nothing would please Daley more than to devote all his time, energy, and expertise to

Stephen S. Hall, "Stem Cells: A Status Report," *Hastings Center Report* 36, no. 1 (2006): 16-22.

the biology of blood-forming stem cells. But the continuing ethical controversy, superimposed on the considerable scientific challenges of making advances in the basic research, has left Daley, like many stem cell researchers in the United States, caught in a pattern of occluded political weather that impedes their work. More than four years after President George W. Bush announced a policy that restricted federal funding for embryonic stem cell research, scientists like Daley have been forced to create new laboratories from scratch to pursue research with "nonpresidential" stem cell lines, tap private sources of financial support, provide a Greek chorus of commentary to journalists on every tangential new development, and routinely travel to Washington to testify before lawmakers who have annually threatened but to date failed to legislate any changes in national policy. It has all added up to distraction and, most important, delay.

In 2002, Daley and Jaenisch published a significant advance in which they used mouse embryonic stem cells, obtained by cloning—technically, "somatic cell nuclear transfer"—to partially restore immune function in immune-deficient mice. "It's now three years later," Daley lamented, "and I am still struggling to gain regulatory approval through our institution to be able to do those experiments with human material. And the increased sensitivity around doing these experiments has led to *countless* hours and months of work on the part of many, many people, countless committee meetings talking about whether we have the right mechanisms in place to insure no federal money is spent on any 'nonpresidential' research, time spent picking through the finer points of how protocols are written so that you don't run afoul of these highly sensitized issues around egg donation, embryo donation—I mean, I could go on for *hours* about how cumbersome and arduous this process has been. And we *still* haven't been able to do the research."

Delay, some scientists are now arguing, is an ethical issue in and of itself. Stanford University professor Irving Weissman, a longtime proponent of stem cell research (as well as strict ethical oversight of it), finds it troubling to ask biomedical scientists to put basic research on hold and concoct alternative, politically palatable solutions to appease critics of the technology. "You are taking somebody else's life in your hands—those people who could have been helped in that narrow window of opportunity that they have. That," he added, "is the part that's morally unacceptable."

A Long-Running Controversy

The continuing stalemate in embryonic stem cell research in the United States is tethered to two signal events. In November 1998, James A. Thomson and coworkers at the University of Wisconsin reported in the journal *Science* that they had isolated human embryonic stem (ES) cells from leftover embryos and created self-perpetuating colonies in culture. The news stirred enormous public excitement, given the cells' ability to "differentiate" into any of some two hundred distinct human tissues, from brains and brawn to skin and bones; that power, if harnessed, had the potential to revolutionize medicine and the understanding of disease.

The Thomson experiments simultaneously announced a scientific triumph and a bioethical dilemma, however, because human embryos (obtained, in this case, with the consent of donors from several in vitro fertilization clinics) had to be destroyed in order to start the ES cell cultures. To some people, the destruction of human embryos for research purposes was tantamount to murder; it also appeared to trespass upon legislation, inserted with minimal debate in a budget bill by Congressional Republicans in 1995, that banned federal funds for research in which a human embryo was damaged or destroyed. So the Thomson article in *Science* lit the fuse on an extraordinary

polarizing, three-year political debate in which social conservatives spoke of "embryo farms" for spare human body parts, while scientists and other proponents touted, perhaps too optimistically, the therapeutic promise of stem cells to treat dozens of diseases. That debate culminated in President George W. Bush's decision, announced on August 9, 2001, that the National Institutes of Health could issue federal research grants only for ES cell lines that had been created by that date.

According to many scientists, embryonic stem cell research has been held hostage—scientifically, bioethically, and financially—by the Bush policy. Although the president asserted that "more than sixty" ES cell lines existed, in truth less than a dozen were available to scientists for the first two years of the policy (the NIH Stem Cell Registry currently lists twenty-two lines). And with each passing year, the quality of many cell lines has deteriorated. Jaenisch echoed widespread scientific sentiment when he said, "They're *really* abnormal. Many people believe they have a lot of chromosomal rearrangements already, so it's sort of ludicrous to be con-

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stricted to their use." Moreover, scientists used mouse cells to nourish the initial growth of the NIH-approved cell lines, which probably renders their clinical use in humans problematic due to potential contamination.

But the impact of the Bush policy does not stop at the laboratory bench. Shortly after August 2001, a number of academic institutions, medical research organizations, and foundations took steps to create privately funded stem cell institutes.⁸ Stanford University and the University of California, San Francisco set up separate, multimillion dollar biomedical institutes devoted to ES cell research. In 2004, Harvard University launched the Harvard Stem Cell Institute with plans to raise \$100 million to support its research. At the same time, organizations like the Juvenile Diabetes Research Foundation and the Howard Hughes Medical Institute began to issue multimillion dollar grants to support research that went beyond the restrictions of the Bush policy. By contrast, in 2004, five years after *Science* magazine heralded embryonic stem cell research as the "breakthrough of the year," annual NIH funding for ES work amounted to \$24.3 million out of an overall budget of close to \$28 billion.

Recent polling data suggests that the current federal stem cell policy does not reflect public opinion. About 67 percent of Americans support embryonic stem cell research even though it requires the destruction of embryos, according to a survey reported last September by the Genetics and Public Policy Center at Johns Hopkins University. A breakdown of the survey results hint at the surprising breadth of that support. A majority of Republicans (55 percent) supported the research; 69 percent of Roman Catholics and 74 percent of Protestants did so as well. Even 50 percent of people who identified themselves as Fundamentalist or Evangelical approved of stem cell research. As authors Kathy L. Hudson, Joan Scott, and Ruth Faden noted, the survey "reveals a public opinion landscape that bears little resemblance to the polarized, deep moral divide expressed on the floor of the Congress and in the op-ed pages of American newspapers."

Indeed, the past calendar year passed without any substantive changes on the congressional front. Although the House of Representatives passed legislation (H.R. 841) in May 2005 allowing federal funds for research on new cell lines created from leftover IVF embryos, the Senate became bogged down in hurricane relief and other business and

never voted on its version of the measure. Senate majority leader Bill Frist has reportedly promised to allow a vote by next Easter. Even if the Senate bill passes, however, its future is uncertain; President Bush has already vowed to veto it.

The climate of continuing controversy and uncertainty has chased money away from the field, leading to what Peter Lomedico, head of strategic alliances and industry partnerships at the Juvenile Diabetes Research Foundation, calls a "funding gap" in the stem cell field—one that affects not just embryonic, but also adult stem cell research. "There's a *lot* happening on the academic side, and some of it is pretty exciting," he said. "But what's very clear is that there's precious little money for companies to exploit this work, and so in the field there's a crisis, and we're right in the middle of it. We want to see things move into the clinic and into the market. With the combination of Big Pharma not spending any money and venture capitalists not funding it, the [biotech] companies are struggling and the transfer of technology is grinding to a halt."

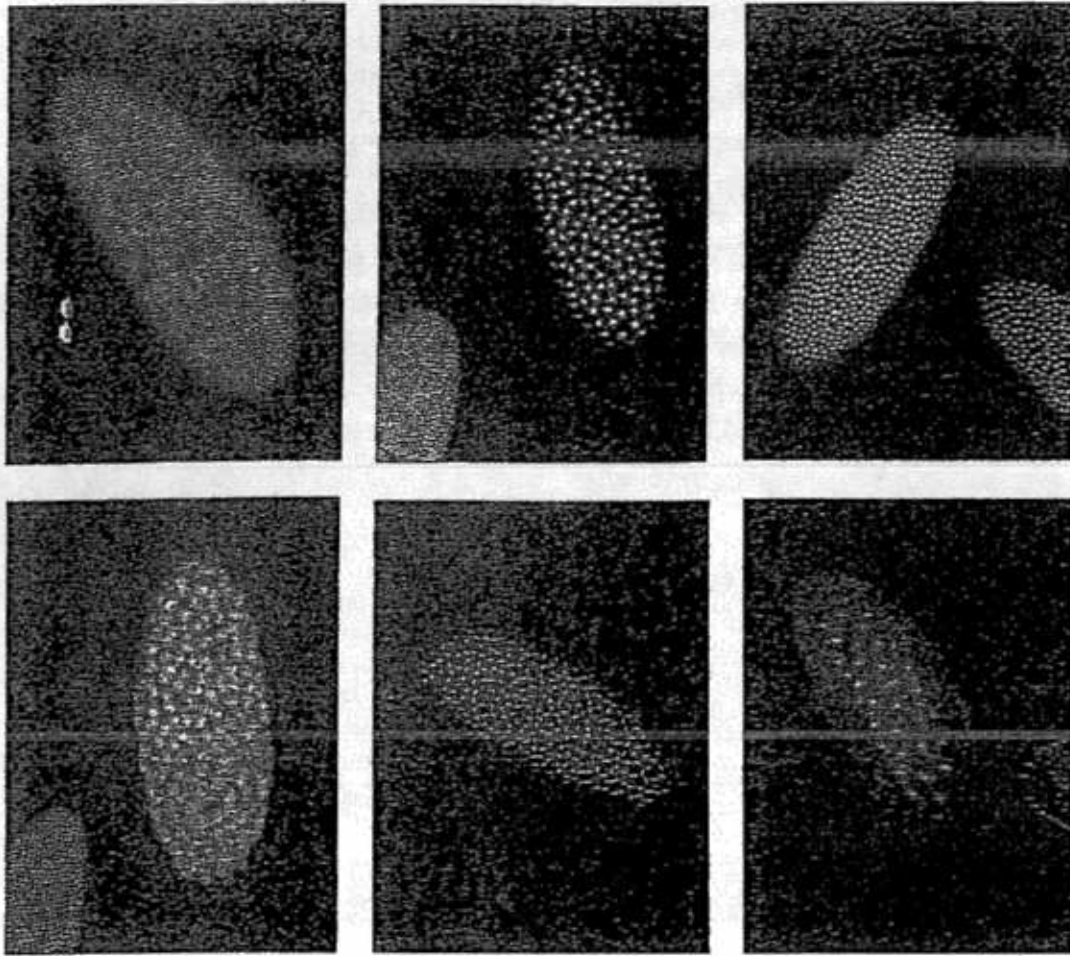
Stem Cells as a States Rights Issue

With only a trickle of federal money to support work on cells of limited quality, stem cell research has inspired an unusual version of states rights. Several states have passed legislation earmarking funds to support the kind of research proscribed by the Bush policy,

including the creation of new embryonic stem cell lines from leftover embryos destined to be destroyed by IVF clinics and the use of somatic cell nuclear transfer techniques, popularly known as therapeutic or research cloning, to create new stem cell lines. In January of 2005, the state of New Jersey announced plans to fund a \$150 million stem cell research institute, with future plans to raise an additional \$230 million. In May of 2005, Connecticut pledged \$100 million over ten years to support stem cell research in that state. Illinois, too, has committed \$10 million to support local stem cell research.

By far the most visible local uprising against federal policy occurred in California, however, where voters approved Proposition 71, a ballot initiative that created the California Institute for Regenerative Medicine and empowered the state to issue bonds equal to \$3 billion to fund stem cell research over the next decade. The initiative passed by a margin of 59-

A recent survey hints at a surprising breadth of support for stem cell research: a majority of Republicans, Roman Catholics, Protestants, and even half of those identifying themselves as Fundamentalist or Evangelical support it.



Cell Wall,
by Catherine Wagner,
1999-2000. 6 Iris prints,
46 x 34 inches each.
Courtesy of the artist.

to-41. So far, though, it too has become a monument to obstruction and delay.

More than a year after the passage of Proposition 71, the CIRM had yet to dispense a dollar in grant money. It has been hobbled on the one hand by lawsuits challenging the constitutionality of the ballot initiative, and bogged down on the other hand by a massive effort to reinvent the NIH's peer-review process, grant-making apparatus, and administrative structure at the local level.

The three lawsuits—filed by organizations that have ties to antiabortion or conservative tax groups—have had the practical effect of preventing the state of California from selling the bonds that would have funded the first year's round of grants. Robert Klein, leader of the Proposition 71 initiative and chairman of CIRM's governing Independent Citizens' Oversight Committee, has been forced to raise money through a separate strategy, the "Bond Anticipation Note." Klein hopes to raise \$50 million by early 2006; CIRM anticipates that legal appeals in the court case may affect the state's ability to issue bonds perhaps until early 2007, according to an organization spokesperson, and the Anticipation Notes would fund grants until then. A superior court trial on the initial legal challenge is scheduled to begin February 27, 2006.

From afar, the California initiative seems dogged by controversy and delay; one out-of-state observer privately described its status as "on life-support," and even Klein recently charged that Proposition 71 was "held hostage by a small group that is politically opposed to stem cell research." But Nobel laureate Paul Berg, professor emeritus of biochemistry at Stanford, expressed optimism that the California initiative may be in better shape than it appears to outsiders. "Bear in mind," he said, "nothing existed [before Proposition 71]. Suddenly, on November 3, 2004, everybody woke up and said, 'Wow, how do we do all this?' The NIH has been doing this for fifty years. So this really took a lot of brainstorming and organizing." CIRM has now established three review committees—on science proposals and training grants, building and infrastructure, and ethical standards—and has approved about \$12 million in training grants for postdoctoral fellows, graduate students, and trainees.

On November 29, 2005, a judge denied virtually all of the constitutional objections to Proposition 71, but the court case remained unresolved. If any legal challenges were to succeed, some observers fear that the language of the initiative might have to be reworded, which in turn might require voters to return to the polls to vote on the initiative all over again.

Politically Palatable Alternatives

In an attempt to break the fundamental bioethical logjam involving ES cell science, some recent research has attempted to devise technical solutions to the "embryo problem." But these efforts, to borrow a relevant term, may have arrived stillborn.

In 1998, Paul Berg and fellow biologist Maxine Singer, then president of the Carnegie Institute of Washington, had one of their informal annual meetings with clergy from the United States Conference of Catholic Bishops to discuss new developments in biology. This particular meeting came on the heels of the cloning of Dolly the sheep; nuclear transfer was a hot topic because cloned human embryos seemed possible. Way back then, Berg and Singer floated the theoretical possibility of genetically tinkering with a human embryo so that it would lack the biological ability to mature, thus allowing embryo research on an entity lacking any potential to become a human being. "In the end, the consensus was, you've just invented another way to murder," Berg recalled recently. "We had talked about that and we got shot down. They said that was not acceptable."

Nonetheless, the notion came back to life about a year ago, when University of Toronto researcher Janet Rossant identified an early developmental gene in mice, *Cdx2*, that controls the creation of the tissue known as the trophoblast; without this gene, an embryo can't make a placenta and can't implant in the uterus. This gave new life to the idea, known as altered nuclear transfer (or ANT), that scientists could create a crippled embryo that would produce harvestable embryonic stem cells, but would be unable to continue its development. When Irv Weissman first heard about the research, he suggested Rossant get in touch with William Hurlbut, a member of the President's Council on Bioethics, who had been searching for a scientific technique that might break the ethical impasse. Even as Hurlbut pushed the idea last year at meetings of the Bush bioethics council, however, critics from both the scientific and social sides expressed serious misgivings. George Daley and several colleagues wrote a commentary for the *New England Journal of Medicine* in December 2004 that questioned the value of these alternative approaches. From a different perspective, members of the Bush bioethics council raised serious ethical questions about the techniques. Even a stem cell proponent like Michael Sandel of Harvard called ANT "morally creepy."

Despite signs of widespread opposition, several scientific groups pursued ANT strategies. Alexander Meissner, a member of Jaenisch's group at the Whitehead, began experiments to accomplish this around the beginning of 2005. The technique involves a variation on somatic cell nuclear transfer. Researchers take an adult mouse cell and temporarily suppress the *Cdx2* gene, robbing it of the ability to form the trophoblast. Then these cells are inserted into mouse egg cells from which the DNA has been removed. The resulting embryo-like entities can't implant, but they can produce embryonic stem cells. Jaenisch calls these cloned embryos

"knockdowns" because the *Cdx2* gene, although initially turned off, can be turned back on, and indeed it needs to be on for normal ES cell development.

The second alternative approach, reported by Lanza and his colleagues, begins with a technique that is already in place at many fertility clinics: preimplantation genetic diagnosis, or PGD. Starting with an eight-cell preimplantation embryo, researchers delicately pry a single cell, or blastomere, away from the rest of the embryonic mass; in IVF clinics, this single cell can be analyzed for potential inherited diseases while the remaining seven-cell embryo can be implanted to produce a pregnancy. In a research setting, Lanza showed that the single blastomere, when fused with existing embryonic stem cells, can essentially "reformat" itself and go on to produce ES cells.

Each of these techniques, hailed as potential breakthroughs when initially reported in the press last fall, poses considerable technical and bioethical hurdles. Time—and therefore delay—is certainly one of them. How long before either of these approaches might be reduced to practice with human material? "Both of them are years away," Weissman predicted. Another problem, especially with the Jaenisch technique, is what Weissman calls the "egg problem." Because the technique would ultimately require the use of human oocytes, it immediately reignites well-known ethical concerns about women who donate their eggs for such experiments, including their recruitment, informed consent, the medical risks of egg harvesting, and possible remuneration.

But perhaps the most significant shortcoming of the new derivation techniques is that, despite all the time it may take to perfect them, they likely will not make a difference in the bioethical debate. While praising the elegance and ingenuity of the recent ANT experiments, Dr. Markus Grompe, a Roman Catholic who directs the Oregon Stem Cell Center at Oregon Health & Science University, said, "I don't think either method, as described, is a completely, across-the-board acceptable way of doing this." In terms of specific objections, he said a problem with the blastomere approach is that even at the eight-cell stage, removing a single cell might be creating two embryos (one of which would be destroyed), since eight-cell embryos can naturally divide to produce twins. Grompe believes the *Cdx2* approach has more potential, but noted that some people would still consider the entity created by the technique an embryo. "I would say it's chipped away at the ethical problems in that it's provided a solution for some," he said, "but not for everyone." Indeed, Richard M. Doerflinger of the United States Conference of Catholic Bishops said in an e-mail that neither of the techniques is acceptable, adding, "It's not clear that either of these approaches fills the bill."

Many scientists view the ANT work as a fruitless digression. As Davor Solter noted in the *New England Journal of Medicine* in December 2005, "Playing politics for the sake of science is probably necessary and sometimes noble; manipu-

lating science for the sake of politics is usually a waste of time."

Into the Clinic

If the impasse over stem cell research remains essentially political, since conservative objections are backed by a threatened presidential veto of any alteration of current policy, then many believe the strongest agency for change will be a dramatic clinical advance. "An advance could change the way the issue is seen," conceded Larry Soler, vice-president for government relations at the Juvenile Diabetes Research Foundation. "But then the question is: How much are the limitations currently in place keeping that from happening sooner? It's kind of a chicken-and-egg thing."

Public opinion polls suggest that successful ES cell treatment of a serious disease like diabetes would significantly shift public opinion in favor of more relaxed federal policies. But how close are stem cell researchers to delivering on the promise that has been dangled so attractively before the public?

To hear most scientific observers, not very close at all. But that doesn't mean they won't try soon, and a battle is already shaping up—pitting stem cell companies and patient advocates on the one side against some doctors and bioethicists on the other—over what promises to be a particularly thorny issue in the next few years: what kind of safety precautions need to be in place before the Food and Drug Administration, and local medical institutions, allow a human trial of ES-derived cells to proceed? And what sorts of patients should be eligible for these experimental, and potentially dangerous, treatments?

Many experts believe that a clinical success for *embryonic* stem cell therapies is still a long shot. "With embryonic stem cells, it looks like we're a ways off from being ready for prime time in man," said the Juvenile Diabetes Research Foundation's Lomedico. Added Grompe, "Long-term, I think there will be some therapeutic benefit, but I mean *really* long-term. I think Proposition 71 is going to be old news by the time we have a success. I'm thinking ten years before we have an actual cure or benefit that's really tangible, and I'm being optimistic."

Nonetheless, several therapeutic situations appear likely to test the promise of stem cell therapies sooner rather than later. George Daley's group at Children's Hospital in Boston

has been working on the idea of using ES cells derived from cloned embryos to create an entire new blood system from scratch, which could be used to treat classic childhood hematopoietic disorders, including immune deficiencies, Fanconi's anemia, sickle cell anemia, and thalassemia. This therapeutic reconstitution of the blood and immune system would essentially mirror the same effect achieved by the adult stem cells currently used in bone marrow transplants, but with a significant potential advantage—deriving ES cells from a cloned embryo, as Daley hopes to do, could provide immunologically compatible blood cells. Moreover, this approach has the added benefit of

an enormous medical, scientific, and regulatory infrastructure that already exists around this form of therapy, since bone marrow transplants have been routine hospital procedures for decades—an advantage, Daley conceded, "that we are not unaware of."

Another promising area for ES cells is the treatment of spinal cord injury. Hans R. Keirstead, a researcher at the University of California, Irvine, has been testing the ability of ES cells to repair spinal cord injuries in rats. In 2005, his group, working in conjunction with the biotechnology company Geron, reported that neural progenitor cells derived from human ES cells allowed paralyzed rats to partially regain the ability to walk after their spinal

cords had been damaged. Keirstead said "everything is on track" in terms of preclinical safety studies, and Geron has announced its intention to begin clinical trials in 2006.

But this promising clinical intervention has also served as an advertisement for the bioethical rows to come. Last November, Geron confirmed plans to seek FDA approval to test neural derivatives of its embryonic stem cells in humans with spinal cord injuries. News accounts reporting this development quoted patient advocates who, not surprisingly, applauded this impending step toward clinical testing. But some doctors and bioethicists have expressed reservations about going directly from rodents to humans without testing the cells in nonhuman primates first—an expensive, time-consuming bit of preclinical research that could easily take two or more years. Arnold Kriegstein, director of the University of California, San Francisco's Institute for Stem Cell and Tissue Biology, told reporters, "There is a great potential for harm."

A somewhat different but related bioethical quandary seems to confront a proposed clinical test of fetal stem cells.

Many experts believe that a clinical success for embryonic stem cells is still a long shot.

Nonetheless, several therapeutic situations appear likely to test the promise of stem cell therapies sooner rather than later.

In October 2005, StemCells, Inc., of Palo Alto, California, announced that the FDA would allow the company to proceed on a phase I clinical trial to test the safety of its neural stem cells in children with Batten disease, an enzyme deficiency in neural cells that is invariably fatal. As of this writing, the protocol for the trial had not yet been approved by the institutional review board at Stanford University, one of the potential sites, and university officials were unusually tight-lipped about the pending trial.

The Batten disease trial raises a particularly sensitive ethical issue: testing the safety of a highly experimental stem cell treatment in children. While he said he was "not at liberty to discuss" particulars of the Batten disease protocol, University of Stanford bioethicist David Magnus argued that in general, if the research poses more than incremental risk to a patient, there had to be a legitimate prospect of therapeutic benefit before children could be treated. "My view is, for almost all these techniques, that they would not meet that standard for a prospect of benefit. . . . When you have front-line, cutting-edge research, I'm very concerned that we are seeing a repeat of gene therapy—very thin, 'just-so' stories told about clinical benefit, but with very little chance of things happening to benefit patients."

The short-term prospects for success may be better with adult stem cells, although success there could have ethical and political implications for ES cell research. Dr. Joshua M. Hare, a cardiologist at Johns Hopkins Medical School, is heading a six-center, placebo-controlled clinical trial, in conjunction with the Maryland biotech company Osiris Therapeutics, Inc., testing the safety of stem cell therapy for heart attack victims. In the study, begun last March, adult mesenchymal stem cells isolated from human bone marrow donors are given intravenously. Experiments in pigs have demonstrated that these cells home in on damaged tissue and affect "profound reduction" of scar formation and "near-normalization" of cardiac function following a heart attack. In a surprising scientific twist that has implications for the debate over therapeutic cloning, animal experiments have suggested that the infused adult stem cells do not provoke an immunological response, even though they come from an unmatched donor. Although the human trial is still in progress, Osiris recently reported that safety monitors reviewing the first group of cardiac patients approved the use of a higher dosage of cells, suggesting that immunological reactions have not to date produced serious side effects.

Anthony Atala, Mark Furth, and their colleagues at the Wake Forest Institute for Regenerative Medicine in Winston-Salem, North Carolina, are testing the potential of nonembryonic but developmentally early stem cells to differentiate into functional cells. Although the work is still confined to animals at this point, they are exploring the ability of fetal stem cells isolated from the amniotic fluid and placenta to mature into cells that might serve as replacement tissues in the treatment of disease.

Successful adult stem cell therapies will no doubt bolster the argument of those who maintain that there's no need to

destroy embryos for ES cells because adult stem cells are sufficient (Hare, like many researchers, insists both approaches must be pursued). Further, some of these early clinical trials are proceeding at great speed and have the potential to create high-profile mistakes that may cast a cloud over the entire stem cell field. Hare noted, for example, that American patients and doctors are currently traveling outside the U.S. to test experimental stem cell treatments. "In Ecuador," he said, "fetal stem cells, obtained in the Ukraine, are being used to treat patients from the U.S. There are cowboys who want to do this, and are going to do it."

"There's a bit of a Wild West mentality out there," agreed Lomedico. "A lot of clinicians, and mostly surgeons, are driving the work into man, and it's just wild."

Five Years and Counting

When *Nature* published the two new stem cell derivation techniques last October, William Hurlbut told the *Washington Post*, "This is just the beginning of the conversation. It's time for everyone to humbly enter a constructive dialogue and listen deeply here."

In truth, doctors, scientists, patients, and indeed many bioethicists are growing weary of all the talk. There is evidence that neither the public nor the scientific community has an infinite appetite for delay. One of the surprising findings in the Hopkins opinion poll is that the clock on public patience is ticking on how long people are willing to delay progress in medical research to find sources for stem cells that circumvent the destruction of embryos: nearly half (48 percent) wanted no delay, while 9 percent were willing to wait one year, and 12 percent were willing to wait five years. But to hear some tell it, the research has already been held up that long.

It was five years ago that George Daley and Rudy Jaenisch completed the experiments demonstrating the proof of principle of therapeutic cloning in mice. "To think that five years later we're not yet able to even get started in the human," Daley said, "is pretty much a testimony to the effectiveness of the Bush policy in delaying what clearly the international research community considers vital research."

Research probes middle ground in fierce stem cell debate

Multiple approaches show issue not so black-and-white

By Zachary Janowski

Stem cell research simultaneously evokes hope in human progress and fear of the moral hazards of science. The following seven pages of stem cell information suggest that if new lines of research are successful, this dilemma may be bridged by science itself.

Embryonic stem cells are important to researchers because they are "pluripotent," which means they can differentiate into any kind of cell in the human body. Currently, pluripotent stem cells are derived from embryos left over after *in vitro* fertilization. As of yet, no therapies are available using embryonic stem cells. However, researchers are hopeful that stem cells can provide cures or treatments for many serious medical conditions ranging from paralysis to Alzheimer's disease.

Many Americans, however, believe that these hopes come at a high ethical cost. Some — mostly traditional Catholics and evangelical Christians — oppose the destruction of embryos for use in stem cell research. Others have raised ethical questions about procedures that are used in stem cell research including cloning and the collection of human egg cells.

Fears of the "unintended consequences" of the use of embryonic stem cells have also been raised. Historian Kenneth Hendrickson, in a companion article, shares some examples of how "notions of progress can lead to a redefinition of the human person, a change that can have profound and unforeseen consequences," in "Truth and unintended consequences," page 25.

A scientific solution

Scientists caught in the middle have proposed ways to navigate this ethical landmine. These alternatives are not new ideas. The President's Council on Bioethics has been discussing them since 2004. Dr. William Hurlbut, a Stanford Medical School professor with a background in theology, has theorized that pluripotent stem cells can be derived from a procedure similar to cloning without destroying embryos. Last June, 35 concerned scientists and ethicists signed a joint statement supporting research to test Hurlbut's theory by experimenting with a technique related to the methods used to produce Dolly, the cloned sheep: a technique known as ANT-OAR.

In altered nuclear transfer-oocyte assisted reprogramming (ANT-OAR), scientists create an embryo by inserting the nucleus of an adult cell into an egg cell (oocyte) from which the nucleus has been removed. The egg cell is, in effect, "fertilized" by the adult nucleus. The resulting cell, a single-celled embryo, or totipotent cell, has the potential to develop into an individual human being. After dividing, totipotent cells become pluripotent and can become any kind of cell except totipotent ones.

Unlike normal cloning, scientists will attempt to activate certain genes in the adult nucleus, before it is transferred, that will make the end product a pluripotent cell instead of a cloned, totipotent embryo. In addition to the potential to create numerous stem cell lines without destroying any embryos, ANT-OAR has the additional promise of creating "customized" stem cell lines. By using the patient's exact genetic code to produce treatments, doctors can reduce the risk of immune rejection. Moral theologian E. Christian Brugger makes a strong case for ANT-OAR as a scientific solution to current the impasse in his article "New research could resolve embryonic stem cell debate" (page 22).

Such applications of ANT-OAR are a long way from fruition. Only recently has there been animal research showing that ANT-OAR is feasible. Rudolf Jaenisch, founding member of the Whitehead Institute for Biomedical Research at Massachusetts Institute of Technology in Cambridge, Mass., successfully completed "proof-of-concept" research using mice cells just last year. Ethical questions have not been completely left behind, either. Before ANT-OAR is accepted as an alternative to embryo-destructive sources of stem cells, animal models must be used to prove that ANT-OAR is not simply creating "maimed embryos" for the sake of destroying them. Some scientists and theologians are skeptical that this hurdle can ever be overcome. Biochemist W. Malcolm Byrnes and theologian José Granados take this point of view in their article "ANT-OAR fails on all counts" (page 23).

Possibilities and hope

Dr. Donald W. Landry and Dr. Howard A. Zucker, professors at Columbia University Medical School in New York, suggest another alternative in their article "Organ donation from a test tube" (page 20). By developing a criterion for embryo death, Landry and Zucker hope to create a compromise on the use of embryos created for, and discarded during, the *in vitro* fertilization process. If embryos intended for implantation are not implanted because they are "pronounced dead," they can be used for research without crossing moral or ethical lines, Landry and Zucker argue. Other proposed sources of pluripotent cells include non-destructive embryonic biopsy, adult cell reprogramming, and parthenogenesis. (See "Proposed alternative sources for embryonic stem cells," pages 20, 22 and 23.)

Proponents of these solutions are motivated by the desire to alleviate human suffering while preserving the dignity that they attribute to embryos. They hope that an alternative source of embryonic stem cells, one that does not involve the morally questionable act of destroying embryos, will be a democratically viable, middle-ground solution to the controversy surrounding embryonic stem cell research. Other scientists have participated in this preliminary research because they believe in the therapeutic promise of embryonic stem cell research and that all avenues of research should be pursued.

ANT-OAR and similar proposals are significant because, if successful and deemed morally acceptable, they could produce unlimited embryonic stem cell lines without the further destruction of embryos. These sources of stem cells would be less politically divisive and potentially eligible for federal funding. Representing a middle ground, they would allow research to proceed more rapidly. These sources would complement research conducted with existing stem cell lines and adult stem cells, while some embryo-destructive research supported by private funding would probably continue.

The debate over embryonic stem cell research is not easily reducible to polar-opposite positions, although it is often portrayed as such. The issue need not be a political light switch that is either turned on or off. The articles on these pages demonstrate the possibility of rising above acrimony to reach a compromise or even mutual agreement. ■

Zachary Janowski is an editorial intern at Science & Theology News.

Organ donations from a test tube

Harvesting stem cells from dead embryos may answer moral questions

By Dr. Donald Landry and Dr. Howard Zucker

The ongoing and thus far unique, success of therapeutics based on adult stem cells does not diminish the clinical promise of embryonic stem cells. However, current practices that require the destruction of human embryos to create human embryonic stem cell lines have hindered biomedical research.

The ethical controversy surrounding embryo-destroying research has resulted in the well-known ban on U.S. federal funding. Local governments and, to a lesser extent, private industry are investing in this area, but neither are likely to provide wholly adequate funding and oversight.

Going beyond the funding issue, some researchers restrict their work to nonhuman species simply to avoid the ethical controversy. But work in mice — the most common substitute — is not easily carried over to human embryos, further supporting the need for active research with human embryonic cells. However, those who would, out of respect for human dignity, spare human embryos, and those who would destroy them to advance biomedical science, remain locked in stalemate.

Matters of life and death

The life of an organism is more than the sum of the lives of its constituent cells, and thus death does not entail the necrosis of every cell. The continued failure of persuasion and coercion and the apparent futility of compromise — both sides seem frankly repulsed at splitting the difference on ethics and morals — leave only a search for common ground. In this context, we have proposed that death could provide this common ground. Regardless of whether all of the rights and privileges of personhood are to be conferred upon a human being at the embryonic stage of development, all would agree that if that embryonic being has died, then the person has died as well. By direct analogy to the well-accepted practice of donation and harvesting of living organs from deceased patients for transplantation, we proposed in a 2004 article in the *Journal of Clinical Investigation* the possibility of obtaining living cells from deceased embryos for the creation of stem cell lines.

The concept of death for all complex organisms, whether developed or embryonic, is based on the irreversible loss of

integrated organic function. Brain death is the diagnostic category for developed humans that signifies this irreversible loss of integrated function. In brain death, the organism has died even as the majority of cells — even whole organs — are alive, healthy and suitable for transplantation. But what of death for the nascent life at a stage prior to development of the brain?

Even the eight-celled embryo is a complex organism integrated by cellular functions. The integrated function of the cells of an embryonic organism is best demonstrated by continued growth and development. Consider the class of the more than 50 percent of embryos created through in vitro fertilization, or IVF, that are designated nonviable, incapable of development to live births. Nonviability is assessed by the arrest of further cell division.

Nonviable does not mean dead, but the functional criterion likely correlates with death. The vast majority of nonviable embryos are genetically abnormal due to abnormal numbers of specific chromosomes or chromosome segments exist within the nucleus. Arrested embryos frequently contain normal cells, or blastomeres, in a milieu of abnormal cells.

The remarkable finding is that normal cells in an abnormal environment undergo cleavage arrest and stop developing, but if these arrested cells are transplanted to a normal embryo they will resume growth and development to yield a normal blastocyst and normally differentiated tissues. Thus, the arrest of growth of normal blastomeres in a mosaic embryo indicates a collapse of integrated organic function.

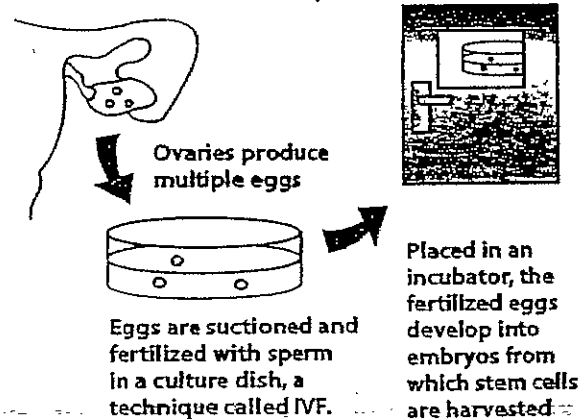
We proposed that through observation of nonviable IVF embryos it would be possible to define a time beyond which an embryo, having failed to divide, never divides again and eventually dies. Such a time would define an irreversible arrest of growth and hence an irreversible loss of integrated organic function — the definition of death.

Stem cells from "dead" embryos

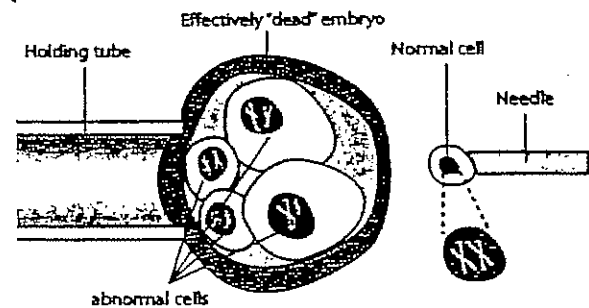
We have just completed such a natural history study of non-viable IVF embryos, to be published in *Regenerative Medicine*, that has yielded unambiguous criteria for embryonic death. We reviewed the records of nonviable embryos created by IVF. Out of 698 embryos, about 60 percent were designated nonviable on the fifth day of embryonic development. We found these embryos had ten-or-fewer cells, rather than the 60-to-80-celled blastocyst

Proposed alternative sources for embryonic stem cells

1 "Dead" embryos intended for in vitro fertilization, or IVF



2 Nondestructive embryonic biopsy



The same procedure regularly used to collect cells for disease testing could be used to collect "normal" stem cells from a cluster of abnormal, or nonviable stem cells.

PHILIP M. DAVIS

this stage in development. We concluded that these embryos are beset with irreversible collapse of integrated function, and thus are, in fact, dead. Embryos declared dead in this condition would be suitable for donation and harvesting of live cells for stem cell creation.

The fact that living cells can be found in dead embryos leads some to argue that the embryos are not truly dead. This opinion does not adequately recognize that billions of living cells reside in brain-dead patients. Not merely cells, but the tissues they form and the whole organs formed from many tissues are alive and well in deceased patients. Thus, the distinction between the lives of individual cells and the life of an organism cannot be overemphasized.

GLOSSARY

ANT (Altered Nuclear Transfer) – a proposed technological method to acquire human pluripotent stem cells without creating or destroying human embryos

Blastomere – a type of cell produced by division of the egg after fertilization

Blastocyst – a hollow structure that contains a cluster of cells that will develop into an embryo

Epigenetics – the study of heritable changes in gene function that occur as a result of gene packaging rather than a change in the DNA sequence itself

Morula – an embryo at an early stage of development, consisting of numerous blastomeres (an early "ball of cells")

OAR (Oocyte Assisted Reprogramming) – a variant of ANT in which modified genetic material is injected into an egg so that a pluripotent stem cell is produced rather than an embryo

More glossary terms on page 22

incorporate to yield normal tissue and cells from embryos rejected due to genetic defects on pre-implementation genetic diagnosis can contain genetically normal blastomeres. These findings argue that the subgroup of nonviable IVF embryos meeting the criteria for death will also yield normal cells — but this is a speculation that can only be tested empirically.

What death really means

The criteria for determining death must be unambiguous, objective, clear and convincing.

Finally, The Dickey Amendment prohibits the use of funds appropriated to the U.S. Department of Health and Human Services to support the creation of human embryonic stem cells *only if* that creation results in harm, destruction, or risk of injury or death. Clearly, an embryo that has died despite best efforts is no longer subject to risk, injury or death. U.S. courts treat the determination of human death as a specific question of fact to be decided case by case rather than a general question of law. Thus, implementing criteria for death is not contingent upon statutory enactment.

We are pursuing Institutional Review Board approval for application of our definition of death for early embryonic life. With the board's approval of these criteria, we would seek National Institutes of Health funding for the creation of human embryonic stem cells from cells harvested from dead embryos.

Application of our criteria for embryonic death in the effort to create human embryonic stem cell lines can begin now. No preliminary studies in animal models are required because no organism is destroyed or comes into existence for the purpose of destruction. ■

Dr. Donald Landry is a professor of medicine and director of the division of experimental therapeutics in the department of medicine at the Columbia University College of Physicians & Surgeons. Dr. Howard Zucker is an associate professor of clinical pediatrics and clinical anesthesiology at the Columbia University College of Physicians & Surgeons.

Similarly, the observation that human blastomeres harvested from multiple nonviable morulas can, if collected and clumped together in groups of seven or so cells, reorganize into chimeric embryos leads some to argue that the individual blastomere retains its "embryohood" and thus should retain the inviolable status of a human. But an individual blastomere is no organism and, by itself, it does not grow and develop — it is potentially pluripotent, not totipotent. If an organism arises by placing individual blastomeres together, then this event is analogous to the creation of an organism by placing sperm and egg together. The status of an individual blastomere is comparable, at best, to the status of an individual egg or sperm and not that of the organism that could arise were these constituents brought together.

Concerns have been raised about whether cells from dead embryos would be truly normal and able to yield normal stem cells. The experience to date is encouraging: Cells harvested from arrested embryos

New research would resolve stem cell debate

ANT-OAR technique addresses rights of the human embryo

By E. Christian Brugger

The rolling conflict over embryonic stem cell research has one root cause: Current methods for deriving these stem cells require the destruction of human embryos. Thus the debate focuses on one overriding question: What is the moral status of a human embryo?

To the untutored eye, the embryo looks like no more than a clump of cells. It doesn't look like the rest of us, or act like the rest of us, or think, or feel or sense like the rest of us — it mustn't then *be* like the rest of us. Opponents of embryo-destructive experimentation claim that the embryo is one of us, if "us" means fully living members of the species *Homo sapiens*. They also maintain that the embryo does in fact look like us and act like us — all of us, that is — when we were embryos.

GLOSSARY

Continued from previous page

Oocyte — egg cell

Ooplast — enucleated egg cell

Pluripotent — able to produce most kinds of cells in an organism. A pluripotent human cell can give rise to most human cell types but cannot by itself form a human being

Totipotent — able to produce any kind of cell found in an organism. A single human totipotent cell can give rise to a human being

Zygote — the original cell formed when sperm fertilizes an egg

Since it is reasonable to say, "I exist," as well as "Yesterday, I existed," and, "Ten years ago I existed," and that "I was a newborn" and "I was a fetus," it is also reasonable to say, "I was an embryo." If the stage of my development is irrelevant to the reality of whether the entity is me, and it is wrong to lethally experiment upon me, then it is wrong to lethally experiment upon me at any stage of my development. It seems that if we believe in

human equality, then embryos cannot be excluded from the fairness calculation. We must ask ourselves the question: Would I want to be lethally experimented upon when I was an embryo?

I know that not all thinkers agree that "me now," and "me then," are essentially the same. And in one sense I concur with them. Developmentally I am very different today from the way I was as an embryo. But I am also different today from the way I was when I was 20 years ago, and a newborn, and an 8-month-old fetus. Nonetheless, I do insist it is reasonable to refer to the embryo that I once was — at that stage of human development — as fully me. I am no more me today than I was me as an embryo. To be sure, there is more of me today, but no more me-ness in me than when I was an embryo.

Similar arguments have been made many times over the past 30 years, and the debate still goes on. It indicates that the current conflict over the nature and status of the human embryo is unlikely to be resolved through deliberation and discussion. Moreover, as biotechnology advances, the moral controversy is likely to get stronger. Does this mean that any resolution to the socially divisive question of embryo-destructive experimentation must be addressed by a purely political solution? I hope not.

Can science resolve the dilemma?

What if we could produce pluripotent stem cells, or stem cells that can differentiate into any type of cell, functionally identical to embryonic stem cells, without ever needing to create, experiment upon or destroy human embryos? Conscientious people on both sides of the ethical debate could then stand together in supporting the funding and use of pluripotent cells. The most promising scientific procedure in this area, endorsed by a wide range of opponents of embryo experimentation, is

called altered nuclear transfer—oocyte assisted reprogramming, or ANT-OAR.

ANT-OAR begins from the premise that the function and identity of human body cells are determined not by their genetics, but rather by what scientists call "epigenetics" (see "Glossary," page 21). It is not the sequence of the more than 30,000 genes in the genome that determines whether the cell is a liver, cardiac or immune cell, since gene sequence is identical in nearly every cell in the human body — it is rather the programming of the gene sequence, or the cell's epigenetic state.

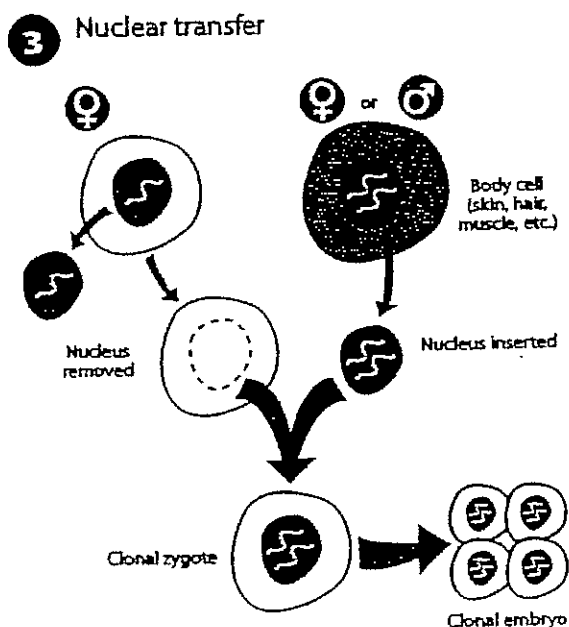
The epigenetic state of pluripotent stem cells is pluripotency, or the capacity of a cell to develop into nearly all the tissue types found in the human body. The epigenetic state of single-celled embryos is totipotency, or the capacity of a cell to develop all the tissues necessary for full human development in an organized and self-directed manner.

Using a procedure called somatic cell nuclear transfer, defenders of ANT-OAR propose extracting the nucleus of an adult body cell with its highly specified epigenetic state of the cell type from which it was extracted, such as a skin cell. This stem cell is then transferred into an egg cell whose nucleus has been removed. Without a nucleus, the egg cell is no longer an oocyte, or an egg cell, but rather an ooplast, an organic sac of oocyte cytoplasm.

Now — and this is crucial for the ANT-OAR proposal — before we transfer the somatic cell nucleus into the ooplast, we pre-emptively alter its epigenetic state so that the genes expressed in the nuclear genome are consistent with pluripotent stem cells and incompatible with a state of totipotency, and hence the existence of a human zygote.

"NEW RESEARCH" continues on page 24

Proposed alternative sources for embryonic stem cells



Cloned embryos would be a source of donor-specific stem cells for use in individualized treatment.

Let's call this altered gene expression X. X refers to precise epigenetic conditions expressive of a state of pluripotency. The expression of X in a cell is an indicator that the cell's epigenetic state is pluripotent. Even more significant for the ANT-OAR proposal, X expression in a cell is a sure biological indicator that the cell is *not* totipotent and therefore couldn't develop from this embryonic stage.

Biologically, the cell cannot both express X and be totipotent, since totipotency would be associated with another state of gene expression. In examining any particular cell, we can say: If X, then not a totipotent cell, therefore not a one-celled embryo. Thus, if the somatic cell nucleus expresses X before the nucleus is transferred into the enucleated oocyte, then the resulting cell, the product of the fusion of the nucleus with the ooplasm, is from the beginning an X-expressing cell and never was a zygote.

There are, however, other considerations. At the time of nuclear transfer, the new cell is X-expressing, but the newly transferred nucleus retains epigenetic properties similar to the somatic cell type from which it was extracted. This is where the biochemical properties of the oocyte cytoplasm become very important. The science of cloning has discovered that the biochemical constituents of oocyte cytoplasm have the remarkable capacity to reprogram the epigenetic state of a transferred nucleus

back to a state of totipotency.

If this is the case, then why won't the cytoplasm of the ooplasm reprogram the ANT-OAR nucleus back to the state of totipotency, and hence bring into existence a human embryo? This is where altered nuclear transfer (ANT) comes in. Before the transfer, the genetic material in the nucleus is altered in such a way that X-expression is deliberately forced, and forced to such an extent that it will not be affected by the reprogramming of the oocyte cytoplasm. The cell is X-expressing at the time of transfer, remains as such during the reprogramming, and ends as an X-expressing cell. The forced expression of X prevents the reprogramming from ever taking the nuclear genome to a state of totipotency. The result, therefore, of the oocyte assisted reprogramming (OAR) is to create a pluripotent stem cell, from which, if all goes well, stem cell lines can be derived.

ANT-OAR defenders currently propose initial research using only nonhuman animal cells. If this research establishes beyond reasonable doubt that ANT-OAR can reliably be used to create pluripotent stem cells without creating embryos, they would support research on human cells.

Fairness for embryos

Current methods for deriving embryonic stem cells are unacceptable to many because the methods are unfair to the embryos. To the embryos, the so-called therapeutic research is manifestly un-therapeutic because it promises them no benefits. Perhaps a

deeper exploration of technical solutions like ANT-OAR will allow a means for the generation of pluripotent stem cells that overcomes this ethical objection.

Rudolf Jaenisch, a professor of biology at the Massachusetts Institute of Technology and a member of MIT's Whitehead Institute, is an international leader in the fields of transgenic science and therapeutic cloning who himself has no ethical objections to research that destroys embryos. He has demonstrated that the biological artifact brought into existence through ANT is able to efficiently generate pluripotent, embryonic-like stem cells. Jaenisch was quoted in MIT's newsletter *TechTalk* as saying, "The purpose of our study was to provide a scientific basis for the ethical debate." This illustrates that concerned people on all sides of the debate are eager to overcome the social and political impasse that has arisen over this ethically loaded and socially divisive experimentation.

Finding such a solution would keep with the constructive and creative spirit of the American people and, at this crucial moment in the advance of science, would be not only a social, but also a scientific triumph. It would be a solution that sustains the important human values being promoted by both sides of this difficult debate. The debate over embryonic stem cell research can be resolved in a way in which everyone wins. ■

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The world of embryonic stem cell research

While the United States squishes, other countries move ahead

Many scientists, pressed by the desire to alleviate human suffering, support research using stem cells derived from embryos discarded during *in vitro* fertilization. In 2001, President George W. Bush limited the use of federal funds to research using the 64 existing embryonic stem cell lines. Scientists had already destroyed embryos to create each of these lines.

However, the use of cells derived from them requires no further destruction of embryos. Some contend President Bush's decision will delay treatment for suffering people, inhibit the progress of science and allow other countries to outperform the United States in biotechnology research. Restrictions on the number of federally funded stem cell lines limit the genetic diversity of the stem cells available for developing treatments. Furthermore, some lines have been corrupted by the animal cell culture in which they were grown, damaging their usefulness.

Meanwhile, the development of cell research with new embryonic stem cells by contrast, with private funding. In May 2005, the U.S. House of Representatives passed a bill that would expand federal funding for research using embryonic stem cells. The bill remains

in the U.S. Senate, where it will be considered with several competing proposals.

Other countries are moving into the stem cell research field, trying to attract scientists and their laboratories by offering financial support and legal permission to derive stem cells from embryos fertilized *in vitro*, donated embryos and even aborted fetuses in some cases.

Singapore has attracted embryonic stem cell researchers from all over the world with its permissive regulatory policies and extensive investment, including a research campus called Biopolis. South Korea is also in the vanguard of stem cell research, although recent scandals, namely that involving biomedical scientist Woo Suk Hwang, have discredited some of the pioneering work allegedly being done there.

England stands out within Europe, where many countries have restrictive policies on embryonic stem cell research. With strong support from Prime Minister Tony Blair, stem cell research has flourished. Governmental stimulation and institutional cooperation have led to the establishment of a national stem cell bank that provides researchers with stem cells from a legally acceptable source.

—Anthony Brown

NT-OAR fails on all counts

Method of harvesting stem cells riddled with scientific and ethical flaws

Malcolm Byrnes and José Granados

The altered nuclear transfer-oocyte assisted reprogramming (ANT-OAR) proposal to eliminate moral ambiguities associated with stem cell research has serious scientific and philosophical flaws, and it is not a morally acceptable means of obtaining embryonic stem cells.

Origin in ANT

In the spring of 2005, a statement supporting OAR — or simply OAR — was adopted by a group of 35 primarily Christian scientists, bioethicists and theologians as a way around an ethical problem associated with the original ANT proposal. The original ANT procedure was proposed by John Hurlbut, a physician and a consulting scientist in the program in neuroscience at Stanford University. ANT involves disabling a gene that encodes a developmentally important protein that normally represses the expression of genes in the nucleus of a cell. An embryo that is created develops normally until the blastocyst stage, which forms four to six days after the nuclear transfer event.

At the blastocyst stage, however, the blastocyst becomes disorganized in its outer layer of cells. The inner cell mass, which contains embryonic stem cells, remains intact. These stem cells can be removed and used for medical research. The reasoning used to support ANT is ethically problematic. First, its proponents have pointed out that a respect for life recognizes the special status of the embryo from the moment of fertilization onward. With fertilization, a new process is directed by an intrinsic telomeric process toward the formation of an adult. This process of formation is a continuum: at some moment can be found in which a substantial change occurs, a change that allows us to identify a human being only after this moment, and before.

NT proponents argue, since the final product of the process will not be a human being but a disorganized clump of cells, the entire teleological process is different. From this, they conclude that the entity is not human.

But, however, an important objection to this is that before the blastocyst stage, the ANT procedure goes through developmental stages that are indistinguishable from those of a normal embryo. We do not say, then, that we have created an embryo that is from the outset prevented from developing fully.

But what would happen if a different modification were introduced, one that allowed an entity to develop for, say, a little more time before its development became chaotic and ended? When would this "little more time" be "no much time" for the procedure to be acceptable?

The problem here is that one ends up trying to determine the exact "enough" point, whether temporal or spatial, beyond which the entity would have a level of organization that characterizes it as human.

But this goes precisely against the main assumption of the position that respects human life from its beginning, that the process of development is a continuum. It is therefore impossible to find such a point.

Scientific problems with ANT-OAR

OAR was put forth in an attempt to overcome the ethical problem associated with the time-delay inherent in ANT. This would be achieved by engineering an entity that would be defective from the very beginning. As with ANT, OAR would involve the transfer of a genetically altered adult body cell nucleus into an egg, or oocyte from which the nucleus has been removed.

However, OAR would be different in the sense that the created embryo's genetic material would be reprogrammed to overexpress the protein NANOG, which has been shown in mice to maintain pluripotency and prevent differentiation into different cell types.

The result of the OAR procedure, say supporters, would be a cell that, once created, moves backward from the differentiated state of a adult body cell to a multipotent state and finally to a pluripotent state. It never reaches the totipotent state of an embryo because the presence of NANOG and reprogramming factors in the oocyte cytoplasm prevent it from doing so. Thus, the cell that is created would be a pluripotent stem cell and never be an embryo at all. Or so the thinking goes.

But this thinking is scientifically incorrect. It is naive to assume that overexpression of NANOG in a cloned one-celled embryo would reprogram it to the pluripotent state. Why would one *a priori* think that NANOG overexpression would have exactly the desired result — creation of a pluripotent stem cell? There is no evidence that it would.

Indeed, the opposite seems to be true. As more

and more is being learned about pre-implantation mouse embryos, the particular role of NANOG in development is becoming clearer. Collectively, what these studies are showing is that NANOG functions within a certain developmental context.

Scientific intuition tells us that expression of NANOG outside this context in the newly cloned embryo will not lead to a stem cell, but will lead to either an entity that is so grossly defective that it dies early on or, due to the robust reprogramming ability of the oocyte cytoplasm, an embryo that is unaffected by the presence of NANOG and therefore develops essentially normally.

Ethical problems with ANT-OAR

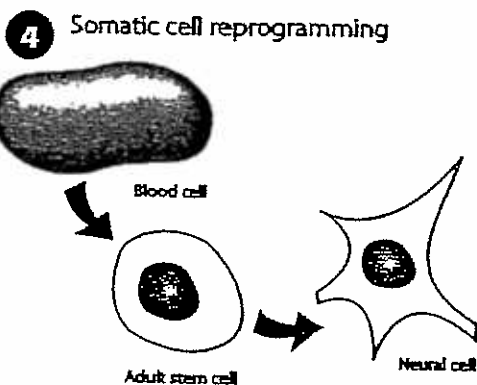
But let us put aside our scientific concerns with OAR for the moment, and assume that OAR actually could work to produce stem cells. The question then becomes whether OAR overcomes the ethical problem raised by the time-delay inherent in ANT, whether the procedure avoids the creation of an embryo or simply makes a defective one.

At first glance, the former seems to be the case, because the OAR-derived entity appears to share no developmental stage in common with a normal human being. Ostensibly, the genetic and biochemical modifications that are introduced prevent the formation of an embryo even at its earliest stage (that of a totipotent cell).

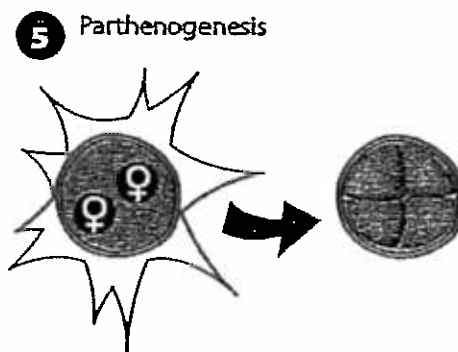
OAR's ethical problems come into view, however, when we compare OAR with cloning. When do we start to have a human being in cloning? Cloning differs from normal fertilization because there is a period of nuclear reprogramming — unique to cloning — that occurs after the adult body cell nucleus has been introduced into the oocyte lacking a nucleus.

"ANT-OAR FAILS" continues on page 25

Proposed alternative sources for embryonic stem cells



One dream of researchers is to be able to return mature cell samples to a pluripotent state, allowing them to be reprogrammed as other cell types.



An egg can be made to develop as if it had been fertilized by chemical or electric shock and maintain both sets of its chromosomes.

Stem cells can then be extracted from the briefly stable embryo.

NELLIE N. DAVIS

Now, if we use the teleological argument of the position that respects life, then the introduction of the nucleus is the initial event from which we have a unified teleological process. This means, in turn, that the reprogramming process that occurs during cloning is part of the process of development of a human being, albeit a cloned one. Thus, the OAR entity does share the initial stages of its formation (the first steps of the process of reprogramming) with another entity (the cloned product) that has to be considered human.

From a philosophical standpoint, then, what we have with OAR is the creation of an entity that starts off just like any cloned embryo. From this starting point, it undergoes at least the initial stage of a reprogramming process that is part and parcel of cloning.

If we assume that NANOG can successfully change the cloned cell into a pluripotent cell, then this process must take some time. During this time, the OAR-derived entity is as human as a cloned embryo. Furthermore, even if NANOG succeeds in diverting the developmental trajectory of the newly cloned entity toward formation of a pluripotent stem cell, the subject upon which NANOG acts will be an embryo that is trying to put itself through the paces of normal human development.

What all this means is that OAR is equivalent to ANT. In both ANT and OAR we have altered or introduced a factor that has its transforming effect some time later in the development of the entity. The only difference is the amount of time that has elapsed: In OAR, the time is shorter in the case of NANOG, which hypothetically changes the endpoint of an early reprogramming process; as opposed to ANT and the disabling of important developmental proteins, whose absence is felt later at the blastocyst stage. The ethical objection that applies to ANT also applies to OAR.

Back to square one

From these arguments, we can draw at least two conclusions about OAR. First, it is unlikely to work from a scientific point of view. But second, even if it could work, it would be unethical because the entity created would share in its initial stages of development those of a cloned human embryo, which is a human being. ■

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Truth and unintended consequences

History suggests stem cell research will have unexpected results

By Kenneth Hendrickson

As Americans confront the monumental possibilities suggested by current scientific breakthroughs, we should reflect on common assumptions about "progress." The development of stem cell therapies may well lead to a therapeutic revolution of greater significance than antibiotics, and stem cell research enjoys widespread public support. But popularity and tremendous potential do not protect us from folly.

Historically, moments of apparently unmitigated progress have often later proved to have complicated, even harmful, consequences that observers could not easily have predicted. The French Revolution — a passionate rebellion against tyranny, corrupt government and religious repression — ultimately bequeathed Europe ideological political terror, persecution and 25 years of war. The breathtaking scientific epiphany of Darwinian evolution unleashed a new brand of racism. The consequences of women's sexual and social equality now threaten the application of equal protection under the law, thus threatening the liberty of all. None of these outcomes resulted from intention, nor do the unexpected consequences justify a reactionary glorification of the past. Yet each example stands as a warning to society on the brink of the stem cell revolution.

The French, Darwinian and sexual revolutions all have at least one thing in common with the stem cell quandary. In all these cases society faced a devil's bargain of progress at the price of revisiting basic assumptions about the human person. It is not necessary to accept current conservative critiques of embryonic stem cell research to have serious qualms about it. We are proposing to commercialize the elemental substance of human life. The vision of radical medical progress beckons, but remembering histories of other revolutions might temper our enthusiasm.

Liberty, equality and fratricide: the French Revolution

In the summer of 1789, French King Louis XVI, bowing to an intractable financial crisis, convened the Estates-General. The ancient deliberative council had not met for decades. Louis hoped to create support for sweeping fiscal reforms by allowing more people a role in government affairs. After initial deadlock, the famed Third Estate, made up of non-noble, propertied laymen, withdrew from the proceedings and demanded a formal, written constitution.

The development thrilled many in America and even Britain, who believed that the middle classes of France would destroy tyrannical absolutism. In Britain, the Whig political faction, having earlier opposed its own king's arbitrary war in America, now celebrated the apparent march of constitutional principles back across the Atlantic. The one notable exception was the parliamentarian Edmund Burke.

At first blush, nothing in Burke's career suggested he would become the champion of traditional government in France. A leading Whig, Burke had duly defended the American cause from the 1760s. A serious Anglican, however, he had no time for radical philosophy. Burke simply argued that abrasive British tax policies in America went against common sense. Given Burke's resulting reputation as a reasoned patriot, a friend of liberty and a critic of arbitrary monarchy, political allies assumed he would support the events in France in 1789. In fact, despite the harsh criticism of former friends, he reacted with immediate horror. Burke, who knew many of the leading minds of French radical politics, understood what escaped a casual glance.

Burke saw the French Revolution as an attempt to invent a government, even to create a new society. He feared the new French regime intended to force through its vision of state, society and church, regardless of resulting violence or social dislocation. But Burke knew that particular forms of liberty, grow organically through practice. They are long-term, historical realities. Imposed theoretical forms will not work, he argued, because people shape their behavior by experience.

Burke suspected, as the philosopher Jean Jacques Rousseau had once taught, that radical changes demanded collective coercion of recalcitrant individuals through the imposition of the general will. This could actually worsen the problem of tyranny by expanding traditional powers of the state. Even Thomas Jefferson had sought to place the basis of human rights safely beyond the vicissitudes of politics by invoking God. Compare his language "endowed by their Creator" with Article Three of the French *Declaration of the Rights of Man and Citizen*. "The principle of all sovereignty resides essentially in the nation. No body or individual may exercise any authority which does not proceed directly from the nation." To Burke, "all sovereignty" was dangerous language. Nothing lay beyond the compass of the state. Unlike Burke's history or the deists' God, governments so inclined could legislatively revoke what they had once legislatively granted. Burke believed that no state should possess the explicit power to define human rights.

By the early 1790s, the radical Jacobin party dominated France's government. The Jacobins recognized no legitimate opposition to their "rule of reason." Historians attribute more than 30,000 political executions to Jacobin rule. Concepts like "counter-revolutionary thought," "enemy of the people" and "class enemy" all spring from 1790s France. Karl Marx and Vladimir Lenin thought the infamous Jacobin leader Maximilien Robespierre the worthy prototype of a modern revolutionary. They admired his willingness to employ state terror for "higher" ideological purposes. Robespierre was executed and in 1804, Napoleon Bonaparte seized control of destabilized France. In addition to his reliance on secret police and political repression, he launched nearly 15 year aggressive warfare justified as "revolutionary necessity."

The radical turn against tyranny of the French Revolution redefined the source of human freedom. Changing assumptions about the basis of individual freedom made these freedoms more vulnerable to political reinterpretation. In this way, a progressive move toward freedom resulted in a new incarnation of the original tyranny. But realized early on that the radical politics of the French revolutionaries could regress into an exponentially more dangerous form of the original oppression. Experience through 1815 vindicated him.

Darwinism's new species of inhumanity

When finally published in 1859, Charles Darwin's *The Origin of Species* was a capstone work. Though instantly controversial, *Origin* was not the first that literate Britons heard of evolution. Earlier scholars, including Darwin's grandfather Erasmus Darwin, published evolutionary theories of life, Earth and the universe. Despite these prelude Darwin's *Origin* was different. Darwin took vague assertions and muted implications and recast them into rigorous scientific theory that provided a sound mechanism of natural selection to explain what others had observed. C

therefore galvanized and modernized biology.

Yet, like the French revolutionaries, Darwin set loose dark forces that he had not foreseen. Social Darwinism was the crude application of Darwinian concepts to human communities. Stemming from the sensational debates surrounding *Origin*, social Darwinism rapidly moved from a fringe idea to a mainstream consensus. Although usually associated with the racial policies of Nazi Germany, Social Darwinism had an astounding impact in the liberal West. Millions of would-be immigrants were denied entrance to England and the United States because of racial quotas. State governments in America, with the ultimate blessing of the Supreme Court, enacted racial hygiene laws that permitted forced sterilizations. The devaluation and exploitation of the handicapped was rationalized as being in the best interest of the human species. Few understand today how pervasive racism based on social Darwinism really was or how many Western intellectuals embraced it.

Social Darwinian theories posed very real and more imminent dangers. In the United States, copying an "anthropology" exhibit at the World's Fair of 1904, the Bronx Zoo exhibited a pygmy man named Ota Benga in a cage with "other primates." Zoo officials wished to create a popular illustration of the evolutionary connections between apes and "lower men." Zoo director William Hornaday proudly reported that "the little fellow" had "one of the best rooms in the primate house." Despite some protests from African-American clergy, no one intervened. Benga later committed suicide.

Even top scientists embraced social Darwinism. As late as 1930, the great British evolutionary theorist R.A. Fisher dedicated fully a third of his masterpiece, *The Genetical Theory of Natural Selection*, to strategies for promoting "desirable traits" in human society.

It may have been pseudoscience, but social Darwinism had implications in the United States and beyond. Some Japanese nationalists argued for introducing "white genes" in their population to help Japan with the West. In Soviet Russia, Josef Stalin once ordered a program to cross-breed humans and chimps to make stronger, more obedient soldiers. Some Nazi leaders thought Darwin a better ideological basis than Hitler's racist idealism.

Darwin never intended to propagate such nightmares. They were the unforeseen consequences of the re-evaluation of the human person according to materialistic, evolutionary criteria.

The confusing freedom of the sexual revolution

In the first decades of the 20th century, the diminutive but decisively powerful Margaret Sanger electrified the fight over women's roles by shifting the debate from legal issues such as voting to foundational arguments about sex roles and gender. She campaigned relentlessly to legalize contraceptives and thereby launched one of the

world's greatest social revolutions.

As a result, women constitute 60 percent of today's college students and, although poor women have always worked, relatively affluent women work now too. Working women in marriages and relationships keep those households safely middle class because a single income can no longer do that. Though other factors apply, none of this would be possible without the widespread distribution of effective birth control and its ultimate stay: abortion.

In her day, cultural taboos against open discussion of abortion forced Sanger to concentrate her public campaigns on "family planning." Her private records make clear, however, that despite a personal ambivalence toward abortion, she heartily endorsed the use of contraceptives not just to plan pregnancies but also to redefine sexuality, family and therefore women's place in society. As time has shown, she understood well the revolutionary implications of her work. Contraceptives severed the link between procreation and intercourse. Consequently, sexual practices, sexual taboos and public discourse about sex have all drastically changed. Biology is no longer destiny.

The new sexual realities have come with complicated side effects. Many economic disparities plaguing women persist and may be exacerbated by sexual practices that downplay personal commitment to partners. The rate of single motherhood is up. Women having children early in life or outside of stable and economically functional households face grossly diminished life prospects. Their children are more likely to struggle in school and subsequently in their working lives.

Contraception is not foolproof. The consequences of unplanned pregnancies are drastic. Therefore the cultural consensus on sexual self-expression and free association depends upon the ready access to abortion. Certainly since the 1960s, and particularly since the 1973 U.S. Supreme Court decision *Roe v. Wade*, advocates of the right to choose abortion have made this case repeatedly. The majority of Americans seem to agree, including practicing Christians who abort at rates similar to society at large. Americans seem convinced of the necessity of reproductive choice.

Yet Americans pay a serious price for this exercise of self-determination. Under current U.S. abortion law, there is an ambiguity about the key concept of personhood. The 14th Amendment to the U.S. Constitution obliges the federal government to extend equal protections and enjoyment of rights to all persons. Because of the difficulties inherent in deciding when the fetus becomes a legally recognized person, personhood now has variable meaning depending on the circumstance and intent of the actors. One woman's premature infant is another's late-term abortion.

Because a rigid definition of person could endanger access to abortion, the courts are moving toward a logical but frightening resolution: revisiting the unvarying interest of the state to protect life. Most Americans have no problem with early-term abortions, when fetal

life displays little apparent personhood. But the issue is no longer early-term abortion. In reviewing euthanasia laws, U.S. District Court judges have for years invoked abortion law to justify variable degrees of state interest in preserving adult lives. Writing for the majority of the Ninth Circuit Court of Appeals in 1996, Judge Stephen Reinhardt argued that the state's interest in equal protection varied with relevant circumstances. Reinhardt cited *Roe v. Wade*. The case had, he said, enshrined the doctrine of variable state interest. Just as opinions about the value of a fetus could differ relative to the development of the fetus, so opinions about the worth of an adult could differ relative to the health, mental status or even self-opinion of the adult. Recently, in *Gonzales v. Oregon*, the U.S. Supreme Court upheld the right to physician-assisted suicide.

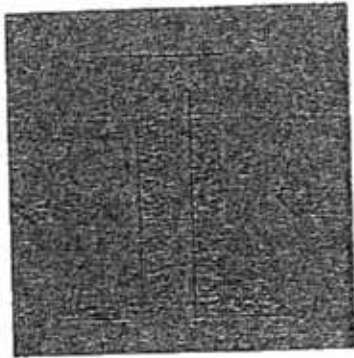
The quandary is clear: In pursuit of the equality of women, we have created a social and economic revolution that Americans are not willing to forgo. That revolution led, through the sexual and reproductive self-determination of women, to the logical concluding point of a right to choose abortion. But, because there is no consensus on what constitutes a person, this liberty has become a threat to the equally fundamental guarantee of equal protection before the law. The legal framework of sexual equality, resting heavily on the 14th Amendment, has evolved into a threat to its own source.

The fragile foundation

The case of stem cells is closer to these other historical episodes than it may be comfortable to admit. French revolutionaries sought to break traditional power structures by redefining the person in terms of the secular state. Social Darwinism aimed at liberating science from traditional mysticism instead threatened to bind all people with the constraints of mere animal necessity. Sexual revolutionaries redefined the role of women by changing the meaning of sex, which eventually contributed to the blurring of the very concept of personhood.

In the case of stem cells, it will likely be necessary to reconstruct our image of humanity, especially if the best method of stem cell acquisition involves the use of embryonic cells, albeit with procedures such as altered nuclear transfer-oocyte assisted reprogramming, which are described in the accompanying articles. With the very stuff of human life subjected to the pressures of the marketplace, there is extra need for reflection and wisdom. We cannot now confidently say that we foresee the consequence of an unbridled exploration of the possibilities. With some historical reflection, we can at least admit to ourselves that an uncritical faith in our own notions of progress can be just as dangerous as the failures we fear to face from no progress at all. ■

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Stem Cell Research
in Jewish Law
Daniel Eisenberg, MD

Stem Cell Research in Jewish Law

by Daniel Eisenberg, MD*

Introduction

Stem cell research is among the most promising and controversial technological breakthroughs of our time. Most cells in the human body are differentiated and, if they maintain the ability to divide at all, have the ability to form only cells similar to themselves. Stem cells have the unique property of being able to divide, while maintaining their totipotent or pluripotent characteristics. Early in mammalian development, stem cells (under the proper conditions) have the ability to differentiate into every cell of the human body (totipotent), potentially forming an entire fetus. Stem cells derived from later stages of mammalian development have the ability to differentiate into multiple cell types, but not into an entire organism. If we were able to manipulate the conditions controlling cellular differentiation, we might be able to create replacement cells and organs, potentially curing illnesses such as diabetes, Alzheimer's disease, and Parkinson's disease.

The ultimate promise of stem cell technology would be to combine it with cloning. Imagine a man dying of liver failure. If we could take a somatic cell from his skin and place the nuclear DNA into a denucleated egg cell, we would have created an almost exact copy^[1] of that sick man's cell, capable of differentiating into his clone. Instead of allowing the cloned cell to develop into a fetus, we might place it (or its stem cells alone) into the appropriate environment that would cause it to differentiate into a liver that would be virtually genetically identical to the sick man. If we could "grow" this liver to maturity, we could offer the sick man a liver transplant without the risk of rejection and without the need for anti-rejection drugs.

This sounds like a virtual panacea for many of man's ills. Yet we still do not know if we are able to successfully clone a human, nor are we sure what practical value can be derived from stem cells. We are

currently in the realm of fascinating speculation. It will require years of very expensive, labor intensive research to determine the potential that stem cells hold for the treatment, palliation, and cure of human illness. While stem cells have been isolated from adults and aborted fetuses, the best source is the "pre-embryo," the small clump of cells that compose the early zygote only a few days following conception. Therefore, to best investigate the latent possibilities inherent in stem cells, scientists wish to use the approximately 100,000 "excess" frozen pre-embryos that are "left over" from earlier IVF attempts.

What is the *halachic* perspective on such research and what could the possible objections to such research be? There is little argument that the use of stem cells derived from adult somatic tissue pose few ethical problems. The issues raised by stem cell research involve the use of in vitro fertilized eggs which have not yet been implanted in a woman and the use of tissue from aborted fetuses.

The issues raised by stem cell research may be divided into several questions:

1. Is in vitro fertilization permitted to begin with?
2. What is the Jewish approach to abortion?
3. Are pre-embryos included in the prohibition of abortion?
4. May a very early embryo be sacrificed for stem cells that could save lives or at least cure disease?
5. May we fertilize ova specifically to create an embryo to be sacrificed for stem cells?
6. Need we make "fences" in the form of protective laws to protect fetuses from wanton destruction? May tissue from aborted fetuses be used for research or medical treatment?

In Vitro Fertilization

Artificial insemination has been dealt with a length by a spectrum of *poskim* (rabbis qualified to decide matters of Jewish law). While artificial insemination by a donor is generally strongly condemned, the use of a husband's sperm for artificial insemination in cases of necessity was accepted by most Rabbinical authorities.^[2] The question of in vitro fertilization was dealt with later. A significant majority of authorities accepted in vitro fertilization under the same rubric and limitations as artificial insemination,^[3] including the fulfillment of the mitzvah of procreation.^[4] However, a fundamentally new question arose. What is the status of the "spare" embryos that are not implanted as part of the first cycle of IVF?^[5] Must they be implanted in the mother as part of another attempt at pregnancy. May/must they be donated to another women to allow the pre-embryo its chance at life? May they remain frozen indefinitely?^[6]

24

Most importantly to our topic, the question arose - may pre-embryos be destroyed? To answer this question, we must first generally examine the Jewish approach to abortion.

Abortion in Jewish Law

The traditional Jewish view of abortion does not fit conveniently into either of the major "camps" in the current American abortion debate. We neither ban abortion completely, nor do we allow indiscriminate abortion "on demand." To gain a clear understanding of when abortion is sanctioned, or even required, and when it is forbidden, requires an appreciation of certain nuances of *halacha* (Jewish law) which govern the status of the fetus.

The easiest way to conceptualize a fetus in *halacha* is to imagine it as a full-fledged human being - but not quite. In most circumstances, the fetus is treated like any other "person." Generally, one may not deliberately harm a fetus, and sanctions are placed upon those who purposefully cause a woman to miscarry. However, when its life comes into direct conflict with an already born person, the autonomous person's life takes precedence.

It follows from this simple approach that, as a general rule, abortion in Judaism is permitted only if there is a direct threat to the life of the mother by carrying the fetus to term or through the act of childbirth. In such a circumstance, the baby is considered tantamount to a *rodef*, a pursuer after the mother with the intent to kill her. Nevertheless, as explained in the Mishna (Oholos 7:6), if it would be possible to save the mother by maiming the fetus, such as by amputating a limb, abortion would be forbidden. Despite the classification of the fetus as a pursuer, once the baby's head has been delivered, the baby's life is considered equal to the mother's, and we may not choose one life over another, because it is considered as though they are each pursuing the other.

Judaism recognizes psychiatric as well as physical factors in evaluating the potential threat that the fetus poses to the mother. However, the danger posed by the fetus (whether physical or emotional) must be both probable and substantial to justify abortion. The degree of mental illness which must be present to justify termination of a pregnancy is not well established and therefore criteria for permitting abortion in such instances remain controversial.

As a rule, *halacha* does not assign relative values to different lives. Therefore, almost all major *poskim* forbid abortion in cases of abnormalities or deformities found in a fetus. Rabbi Moshe Feinstein, one the greatest *poskim* in this century, rules that even amniocentesis is forbidden if it is performed only to evaluate for birth defects for which the parents might request an abortion. Nevertheless, a test may

be performed if a permitted action may result, such as performance of amniocentesis or drawing alpha-fetoprotein levels for improved peripartum or postpartum medical management. While most *poskim* forbid abortion for "defective" fetuses, Rabbi Eliezar Waldenberg (in his "*Tzitz Eliezer*," vol. 9, chapter 51:3) is a notable exception. Rabbi Waldenberg allows first trimester abortion of a fetus which would be born with a deformity that would cause it to suffer, and termination of a fetus with a lethal fetal defect such as Tay Sachs up to the end of the second trimester of gestation.

The question of abortion in cases of rape, incest, and adultery is a complex one, with various legal justifications propounded on both sides. In cases of rape and incest, a key issue would be the emotional toll exacted from the mother in carrying the fetus to term. The same analysis used in other cases of emotional harm might be applied here. Cases of adultery interject additional considerations into the debate which are beyond the scope of this short article.

In sum, the parameters determining the permissibility of abortion within *halacha* are subtle and complex.

Are Pre-Embryos Included in The Prohibition of Abortion?

While the practical aspects of the Jewish approach to abortion are relatively agreed upon, the exact source and nature of the prohibition is not. Depending on the origin of the prohibition, the application to the pre-embryo will differ. For instance, while most *halachic* authorities consider the prohibition of abortion to be from the Torah, a few consider it to be Rabbinic in nature. It is interesting to note that both the person who performs the abortion as well as the woman who voluntarily allows it to be done are culpable.^[7]

The most obvious place to look for the Biblical prohibition would be from the *aseret ha'dibrot* (Ten Commandments), "Thou shalt not murder"^[8]. This prohibition, called *retzicha*, usually carries a death penalty for transgression. Nevertheless, it appears the Torah itself teaches that killing a fetus is not equivalent to killing an adult. The Torah specifically states^[9] that if in the course of an altercation with a third party, a person causes a woman to miscarry, he pays only monetary damages, while if the woman herself were to die of her injuries, the aggressor would receive a death sentence. Rabbi Yehuda Ashkenazi, in his commentary on the Code of Jewish Law,^[10] reasons from here that a fetus is not a full-fledged person, since regarding the one who hits the woman, causing her to miscarry, "... he pays the value of the child and we do not label him a murderer, nor do we execute him. . . ."

Notwithstanding the statement of Rabbi Ashkenazi, several *poskim* rule that abortion does represent murder, but without the punishment

of death.^[11] This law is similar to the law of one who kills a *treife*^[12] (a specific type of terminally ill person), for whom there is a prohibition of murder, but no death penalty.^[13] If the pre-embryo is included in this prohibition, then very little short of the pre-embryo posing a threat to someone's life could justify its destruction. An independent threat to the life of a third party would not suffice to allow destroying the pre-embryo.

The argument regarding whether a fetus is included in the prohibition of murder is complicated and fascinating.^[14] Both positions garner support from two sides of the same page of the Talmud. *Arachin 7a* states that the court should strike the abdomen of a pregnant woman to cause a miscarriage prior to her execution.^[15] The life of the fetus seems inconsequential in that discussion. On the other hand, *Arachin 7b* states that the Sabbath may be desecrated for the life of a fetus, something which may only be done to save a life, for *pikuach nefesh*. This apparent contradiction is dealt with at length in the responsic literature.

But is the pre-embryo included in this prohibition? That question is best answered by evaluating the next possible Biblical source for abortion. When Noah and his family exited the ark, G-d commanded them seven laws, which apply to all of humanity. The usual translation of one of these laws is: "Whoever sheds the blood of man, by man shall his blood be shed."^[16] The Torah clearly demands capital punishment for murder. While this prohibition appears straightforward, there is a fascinating twist.

The Talmud^[17] attempts to prove that non-Jews, who are not obligated by most of the Torah's commandments given at Mount Sinai, are forbidden to perform abortions.^[18] The Talmud brings the literal translation of the previously mentioned passage (with slightly altered punctuation), which is: "Whoever sheds the blood of man, within man, his blood shall be shed." It then asks: "What is the meaning of 'man within man'?" This can be said to refer to a fetus in its mother's womb." This prohibition, as part of the Noachide laws, would apply to all people, Jew and non-Jew alike, although for technical reasons, the degree of severity would differ.^[19]

Once the "standard" prohibition of *retzicha* (murder) is separated from that of killing a fetus, we may investigate how this difference might affect the status of the pre-embryo. From the Talmudic discussion of abortion, we might expect that pre-embryos are not covered by the prohibition of abortion, because they have never been implanted. The rationale for such a decision is based on the concept that a pre-embryo left in its petri dish will die. It is not even potential life until it is implanted in an environment in which it can mature.

27

Others derive the prohibition of abortion from the Torah's proscription of inflicting damage to one's self or others (*chavala*)^[20] — One may not wound one's self without a valid reason (such a medical necessity as in surgery). Obviously, one may not damage someone else.^[21] As a result, some claim that the prohibition of abortion arises from the prohibition of the woman wounding herself^[22], while others feel that the derivation is from the prohibition of wounding the fetus.^[23] Unlike murder, for which only a threat to the mother's life^[24] could justify killing the fetus, the rationale of *chavala* allows greater leeway in allowing its abrogation. Particularly, if the wounding of the mother is the prohibition, her consent to being wounded might be considered a determining factor. Whether this prohibition applies to a pre-embryo is open to debate (albeit my personal opinion is that the prohibition of *chavala* does not apply at this level).

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Use ? and

The last possible prohibition to consider is the Torah's forbidding of "wasting seed" (*hashchatat zera*).^[25] This is the main prohibition involved in questions of male contraception (for example, condoms) as well as the laws governing gathering of sperm for analysis, IVF, or artificial insemination. The prohibition forbids the "useless" emission or destruction of sperm that could create life. Some *halachic* authorities have ruled that excess sperm from fertility treatments may be destroyed. Further, the emission of semen for analysis has been permitted as part of the process of procreation in those suffering from infertility.^[26] (Nevertheless, according to most *poskim*, this prohibition does not apply once fertilization has occurred.) Since this ban may be waived for the sake of saving a life,^[27] it is conceivable that destroying a pre-embryo to save someone's life (or potentially treat severe illness; this would bring us into the complicated question of "*v'chi omrim lo l'adam chatei bishvil sheyizke chavirecha*" — do we allow one to sin in order to save his friend, — an issue beyond the scope of this article) would be permitted as part of the mitzvah of *pikuach nefesh*.

B. San 73a

Two positive Biblical commandments bear on the obligation to save life (the obligation of *hatzala*). The Torah requires that we "Do not stand idly by as your neighbor's blood is being shed."^[28] This mitzvah is interpreted by the Talmud^[29] to require one to expend positive effort and even money to protect an endangered person. Maimonides learns the whole commandment for a qualified individual to heal his neighbor from the obligation to return lost objects. Regarding a lost object, the Torah commands: ". . . and you should surely restore it to him."^[30] From an extra letter in the sentence, Maimonides^[31] derives that if one must return a lost object, he must certainly return someone's "lost" health.

Both of these positive commandments may apply regardless of

whether there may be any prohibition of abortion for a pre-embryo. But do these positive commandments apply to a pre-embryo? That is, do we have a positive obligation to protect the pre-embryo that is sitting in the freezer?

Forty days

In our analysis, we must also evaluate whether we are more lenient with the destruction of an embryo prior to forty days gestation. There is reason to argue that prior to forty days gestation, the fetus lacks "humanity." The Mishna^[32] states that a miscarriage prior to forty days does not cause *tumat leida*.^[33] The daughter of a *Cohen* (priest) whose non-Cohen husband has died may continue eating *trumah* (tithes) only if she has no children and is not pregnant. Rav Chisda^[34] states that in a case where her non-Cohen husband died soon after marriage, she may continue eating *trumah* for forty days. He reasons that if she is not pregnant, then there is no problem, and that if she is pregnant, that up to forty days the fetus is "*mayim b'alma* (mere water)."

These sources suggest that a fetus prior to forty days gestation is not considered to be an actual person and we might extrapolate that destruction of such a fetus is not forbidden by Jewish law. If we now apply this reasoning to the possible sources for abortion discussed above, we note consistency on the part of the *poskim*.

Rabbi Unterman, former Ashkenazi chief Rabbi of Israel, who ruled that a fetus is protected by the prohibition of murder (*retzicha*), rejects these sources as removing the early embryo from the prohibition of murder. He bolsters his opinion by quoting from Toras Ha'Adam^[35], a famous Jewish law book by Nachmanides (Ramban) that discusses medical issues. The Ramban quotes the Ba'al Halachot Gedolot, who asserts that one may desecrate the Sabbath for a fetus because, by desecrating one Sabbath, the fetus will be able to fulfill many Sabbaths in the future.^[36] Thus, the Ba'al Halachot Gedolot argues that saving the life a fetus before forty days overrides the Sabbath; therefore, argues Rabbi Unterman, feticide is murder.

Rabbi Yair Bachrach, author of Chayot Yair, does not accept the forty days distinction because he derives the prohibition of feticide from wasting male seed, which is prohibited even before conception.^[37]

Rabbi Yosef Trani (author of Responso Maharit), who argues that abortion is forbidden as *chavala* (wounding) of the mother, does not specifically mention the forty day cutoff. However, Rabbi Yechiel Weinberg (author of the Responso Seridei Aish), clearly held that there is no prohibition of abortion before forty days according to Rabbi Trani's opinion since there is no "limb" to injure prior to formation of a recognizable fetus at forty days.^[38] Rabbi Weinberg

himself at first permitted abortion prior to forty days, but later reconsidered his position.^[39]

All of the above approaches apply only to Jews who are bound by Torah law. The prohibition of abortion for non-Jews, as discussed above, devolves from the Noachide laws. Of course, non-Jews are forbidden to commit homicide. Yet, according to many commentators, non-Jews are not bound by the commandment in Leviticus 19:16 to protect the lives of their comrades, since it was not commanded to Noah. The scope of their prohibition includes murder and "shedding blood of man within man." These obligations include only actual lives, not potential lives. Therefore, according to Rabbi Unterman,^[40] there is no prohibition of abortion for a non-Jew, nor for a Jew to aid in such an abortion, before the fortieth day of gestation.^[41]

May a very early embryo be sacrificed for stem cells?

Now that we have analyzed the possible ethical issues in destroying pre-embryos, what is the final outcome? For non-Jews, the issue appears most direct. The combination of the pre-embryo never having existed within a uterus and the generally accepted leniency toward abortion within the first forty days, would strongly argue for a permissive ruling regarding the destruction of pre-embryos for stem cells.

Regarding Jews, the answer is more complicated. Since stem cell research is a new endeavor and cloning of humans has not yet occurred, there are no published responsa on the topic. We must, therefore, look to more practical cases that encompass our question to find an applicable ruling. We find such an issue with respect to the best course of action for couples who wish to avoid having children with Tay Sachs disease when both partners are carriers of the Tay Sachs gene. A similar problem arises in families where the wife carries a gene for a sex-linked disease, such as Fragile-X.^[42]

The most promising option for such couples is preimplantation diagnosis, in which a zygote conceived in vitro has a few cells removed to be tested for genetic defects before implantation. Only a zygote that is not homozygous for Tay Sachs or not a male carrier of Fragile-X would be implanted. Rabbi Yosef Shalom Eliyashuv, possibly the most influential *posek* in Israel today, has permitted preimplantation diagnosis and destruction of affected zygotes to prevent cases of Fragile-X and even in a case of a woman with neurofibromatosis who only had skin lesions.^[43] Rabbi Dovid Feinstein has taken a similar view as to the permissibility of discarding "extra" pre-embryos.^[44] Pre-implantation diagnosis, which is already accepted by some Rabbinic authorities, is likely to be acceptable to most Jewish legal experts when used to prevent serious

30

diseases in offspring.

Based on these rulings, it would seem that we now have a practical answer to our question of stem cell research. If the pre-embryo may be destroyed, it certainly may be used for research purpose and other life-saving work. In fact, Rabbi Moshe Dovid Tendler, in testimony for the National Bioethics Advisory Commission^[45], argued strongly in favor of the use of pre-embryos for stem cell research.^[46] Nevertheless, it is important to realize that this conclusion is not unanimous^[47] and that all of these rulings are predicated upon the understanding that the pre-embryo is not included in the prohibition of *retzicha* (murder).

May we fertilize ova specifically to create an embryo to be sacrificed for stem cells?

The creation of embryos for the purpose of taking their stem cells is a complex issue. While no responsa yet exist specifically dealing with this question, it is likely that Rabbinic authorities will not favor such a leniency. The mere existence of already created pre-embryos creates a need to decide the *halachic* ramifications of their destruction. We therefore may decide that such research is permitted *bedieved* (*ex post facto*), once the pre-embryos exist. However, since there are *poskim* who forbid abortion even within the first forty days,^[48] it is much harder to argue *lichatchila* (*a priori*) that creation of pre-embryos with the intention of destroying them is permitted.

There are additional questions that we as a society must ponder. May we *and should we* deliberately create pre-embryos in order to destroy them?

"Fences" around the law and the use of stem cells and aborted fetal tissue

The Rabbis often create protective edicts (*gezerot*) to prevent the desecration of Torah law. Additionally, the Rabbis may promulgate decrees intended to protect Torah values by preventing untoward behavior that is not already prohibited by the Torah itself. For example, more than 1000 years ago, Rabbenu Gershon enacted *gezerot* banning polygamy and opening the mail of others, despite the absence of actual Torah prohibitions for either of these two actions.

The protection of life is a strongly held Torah ideal. While the destruction of pre-embryos in the course of fertility treatments or to prevent disease may be permitted, this does not mean that pre-embryos may be destroyed without compunction. To avoid the proverbial "slippery slope," should we ban stem cell research on embryonic stem cells as a dangerous encroachment on the sanctity of life? That is, even if pre-embryos may be destroyed, should we enact

preventative laws barring stem cell research that requires the destruction of potential lives to avoid cheapening life by treating the process of creating humans as another scientific process, stripped of its miraculous underpinnings? In his testimony, Rabbi Tendler summed up the issue of protective enactments as follows:

Jewish law consists of biblical and rabbinic legislation. A good deal of rabbinic law consists of erecting fences to protect biblical law. Surely our tradition respects the effort of the Vatican and fundamentalist Christian faiths to erect fences that will protect the biblical prohibition against abortion. But a fence that prevents the cure of fatal diseases must not be erected, for then the loss is greater than the benefit. In the Judeo-biblical legislative tradition, a fence that causes pain and suffering is dismantled. Even biblical law is superseded by the duty to save lives, except for the three cardinal sins of adultery, idolatry, and murder. . . Life saving abortion is a categorical imperative in Jewish biblical law. Mastery of nature for the benefit of those suffering from vital organ failure is an obligation. Human embryonic stem cell research holds that promise. . .

Human embryonic germ cells may also be derived from gamete ridge tissue removed from first trimester abortuses (at approximately eight-weeks gestation). While abortion of fetuses is a grave offense, it is difficult to justify prohibiting the use of life-saving tissue from these aborted fetuses for fear of encouraging or condoning abortion. This is another case where the cost of a preventative enactment might be the avoidable death of human beings.^{[49] [50]}

Footnotes

[BACK]

* Dr. Eisenberg resides with his wife and children in Bala Cynwyd, Pa. This article was reviewed for *halachic* accuracy by Rabbi Sholom Kaminetsky of the Talmudical Yeshiva of Philadelphia.

If you have any comments or questions about this article or other medical / *halachic* issues, feel free to contact Dr. Eisenberg at eisenber@pol.net.

[BACK]

1. While the nuclear DNA would be identical to the donor skin cell, the mitochondrial DNA would be that of the donor egg.

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2. See "Artificial Insemination in Jewish Law," Maimonides: Health in the Jewish World, Vol 5, No. 1, Winter, 1999.

[BACK]

3. With the important exceptions of (1) Rabbi Ovadia Yosef, who forbids it and rules that it does not fulfill the obligation of fathering children, (2) Tzitz Eliezer XV, no. 45, and (3) Rabbi Moshe Sternbach who denies paternity to the sperm donor and forbids the procedure.

[BACK]

4. The use of sperm for IVF once the mitzvah of procreation has been fulfilled is more controversial.

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5. See the article by Rabbi Yitzchok Breitowitz, "The Preembryo in Halacha" posted on JLaw.com at <http://www.JLaw.com/Articles/preemb.htm>

[BACK]

6. The development of cryogenic techniques to freeze pre-embryos only pushed off the crucial question of whether pre-embryos could be destroyed. Prior to cryogenic techniques, several Rabbinic authorities ruled that all fertilized embryos must be implanted. This severely limited the availability of IVF to Torah observant Jews because of the great expense and low yields of each IVF attempt (necessitating fertilization of many ova), and the inherent risk of implanting many embryos. With the advent of cryogenic techniques, many ova could be fertilized with only a few implanted. Nevertheless, the question of disposition of these "frozen" pre-embryos which now number approximately 100,000 remains.

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7. Nishmat Avraham, Orach Chaim 656:1 (p. 92)

[BACK]

8. Exodus 20:13

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9. Exodus 21:22-23

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10. Be'er Hetiv, Choshen Mishpat 425:2

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11. See Rabbi I.Y. Unterman, Responsa Shevet M'Yehuda, Vol. I, p. 29 and Noam 6 (1963): 1-11.

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12. A treife is a person with an organic illness that is expected to be fatal within a year.

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13. See Igrot Moshe, Choshen Mishpat II, 69B

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14. For more extensive treatment of this debate, see Jewish Ethics and Halakhah For Our Time, Sources and Commentary, Vol. I, by Rabbi Basil F. Herring.

[BACK]

15. To spare her the embarrassment of bleeding during her execution.

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16. Genesis 9:6

[BACK]

17. Sanhedrin 67b: "In the name of Rabbi Yishmael they said: A ben Noach [is liable] even for killing a fetus. What is the reasoning of Rabbi Yishmael? Because it is written [in Genesis 9:6]: 'Whoever sheds the blood of man by man [literally "in man"], his blood shall be shed'. What is the meaning of 'man in man'? This can be said to refer to a fetus in its mother's womb."

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18. Since the Torah was given to the Jews at Mount Sinai, only they are bound by its commands. Nevertheless, all laws given to Noah, the father of all nations, are binding on non-Jews.

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19. Tosofot, Chullin 33a, (d.h. "Echad oveid kochavim"), Tosofot, Sanhedrin 59a (d.h. "Layka")

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— 20. Bava Kamma 90b based on Genesis 9:5 ("the blood of your lives I will surely require"). See Responsa Maharit 97 & 99. See also Responsa Seridej Aish, vol. 3, no. 127 (originally published in Noam 9: 193-215).

[BACK]

21. The laws of damage in *halacha* are extensively discussed in the Torah, Talmud, and codes of Jewish law.

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22. See Responsa Seridej Aish, vol. 3, no. 127 (p. 249)

[BACK]

23. Rabbi J. David Bleich, Contemporary Halakhic Problems, Vol. 1, p. 341

[BACK]

24. As noted above, the fetus would be classified a *rodef*

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25. See Nida 13b and Responsa Chavot Yair, no. 31. Responsa Sheilot Yaavetz, no. 43 argues that once the sperm has been deposited in the woman, the primary prohibition of *hashchata zera* no longer applies.

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26. Igrot Moshe Even HaEzer I:70, III:14

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27. Generally, all Torah prohibitions except for murder, idolatry, and forbidden sexual relationships are waived to save a human life.

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28. Leviticus 19:16

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29. Sanhedrin 73a

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30. Deuteronomy 22:1-2

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31. Maimonides, Commentary on the Mishnah, Nedarim 4:4

34

- [BACK]
32. Nidda 30a
- [BACK]
33. *Tumat leida* is the impurity that is created by the birth process, whether live or by miscarriage.
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34. Yevamot 69b
- [BACK]
35. Torat HaAdam (in Mosad HaRav Kook Kitvei Haramban, Vol. 2, p. 29)
- [BACK]
36. This line of reasoning is brought in Talmud Yoma 85b as one possible reason for why saving a life overrides the Sabbath.
- [BACK]
37. See Responsa She'ilot Yaavetz, no. 43, where Rabbi Yaakov Emden argues that "wasting seed" only bars preventing the semen from reaching the woman's uterus. He nevertheless forbids abortion prior to forty days for other reasons.
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38. Seridei Aish, vol. 3:350, n.7
- [BACK]
39. Seridei Aish, vol. 3, no. 127 (p. 249)
- [BACK]
40. Responsa Shevet M'Yehuda, Vol. I, 9 and Noam 6:4.
- [BACK]
41. Rabbi Chaim Ozer Grodzinski (Responsa Achiezer, III, 65:14) even entertains the possibility that there may be no Biblical prohibition of abortion before forty days. See also: Tzofnat Paneach 59; Responsa Bet Shlomo, Choshen Mishpat 162; Torat Chesed, Even Ha'ezer, 42:33 all of whom discuss the decreased stringency of abortion within the first forty days.
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42. Males with a single gene for a sex-linked disease will be affected by the disease.
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43. Personal correspondance with Dr. Avraham Steinberg.
- [BACK]
44. Personal correspondance with Rabbi Sholom Kamenetsky.
- [BACK]
45. *Stem Cell Research and Therapy: A Judeo-Biblical Perspective*, Ethical Issues in Human Stem Cell Research, Volume III: Religious Perspectives, September 1999, pp.H-3 to H-5. The full text may be downloaded from the National Bioethics Advisory Commission website at <http://bioethics.gov/pubs.html>.
- [BACK]
46. "The Judeo-biblical tradition does not grant moral status to an embryo before forty days of gestation. Such an embryo has the same moral status as

male and female gametes, and its destruction prior to implantation is of the same moral import as the 'wasting of human seed.' After forty days-the time of 'quickening' recognized in common law-the implanted embryo is considered to have humanhood, and its destruction is considered an act of homicide. Thus, there are two prerequisites for the moral status of the embryo as a human being: implantation and forty days of gestational development. The proposition that humanhood begins at zygote formation, even in vitro, is without basis in biblical moral theology." Testimony of Rabbi Moshe Dovid Tendler, Ph.D., *Stem Cell Research and Therapy: A Judeo-Biblical Perspective*, Ethical Issues in Human Stem Cell Research, Volume III: Religious Perspectives, September 1999, p.H-3.

[BACK]

47. E.g., Rabbi J. David Bleich has voiced opposition to the destruction of pre-embryos and their use in stem cell research.

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48. Responsa Seridei Aish, vol. 3:350, n.7, Responsa Shevet M'Yehuda, 1:50, Responsa Maharash Engel, 7:85, and Rabbi Moshe Yonah Zweig, Noam 7:48.

[BACK]

49. "In stem cell research and therapy, the moral obligation to save human life, the paramount ethical principle in biblical law, supersedes any concern for lowering the barrier to abortion by making the sin less heinous. Likewise, the expressed concern that this research facilitates human cloning is without merit. First, no reputable research facility is interested in cloning a human, which is not even a distant goal, despite the pluripotency of stem cells. Second, those on the leading edge of stem cell research know that the greater contribution to human welfare will come from replacement of damaged cells and organs by fresh stem cell products, not from cloning. Financial reward and acclaim from the scientific community will come from such therapeutic successes, not from cloning." Testimony of Rabbi Moshe Dovid Tendler, Ph.D., *Stem Cell Research and Therapy: A Judeo-Biblical Perspective* Ethical Issues in Human Stem Cell Research, Volume III: Religious Perspectives, September 1999, p.H-4.

[BACK]

50. Other issues applicable to stem cell research are generic and apply equally to all research. Full informed consent, careful risk-benefit analysis, allocation of scarce resources, and the role of financial gain and remuneration in research have all been dealt with in Jewish law, and are beyond the scope of this article.

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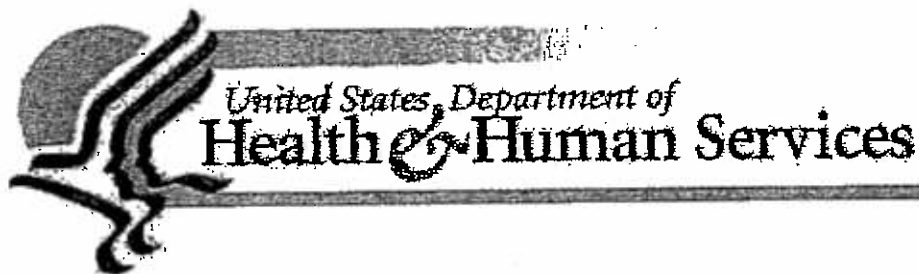
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Article Index

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36



Fact Sheet

FOR IMMEDIATE RELEASE
July 14, 2004

Contact: HHS Press Office
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Embryonic Stem Cell Research

"Stem cell research is still at an early, uncertain stage, but the hope it offers is amazing: Infinitely adaptable human cells to replace damaged or defective tissue and treat a wide variety of diseases. Yet the ethics of medicine are not infinitely adaptable. There is at least one bright line: We do not end some lives for the medical benefit of others. For me, this is a matter of conviction: a belief that life, including early life, is biologically human, genetically distinct and valuable." -- President George W. Bush; August 12, 2001

The President's Decision is Based on Ethical Principles

The President is committed to pursuing stem cell research without crossing a fundamental moral line by providing taxpayer funding that would sanction or encourage further destruction of human embryos.

- **Decision Based on Ethics:** "The President's policy rests on this significant principle -- no taxpayer funding for embryo destruction -- not an assumption regarding the number of stem cell lines. Even as the science develops, this principle does not change," as Secretary Thompson said at the time of the 2001 decision, "neither unexpected scientific breakthroughs nor unanticipated research problems would cause the President to reverse this policy."
- **Bipartisan Support for Ethical Treatment of Human Embryos:** The principle that human embryos merit respect as a form of human life -- and that the Federal government should not fund their destruction -- has been adopted by Congress on a bipartisan basis for a number of years. Annually, since 1996, Congress has adopted legislative language stating that HHS funds may not be used in research involving the destruction of human embryos.
- **Broad Support Internationally:** This principle is also shared by a number of other countries. In fact, some European countries including, Germany, Austria, and Ireland, ban altogether the destruction of human embryos to create stem cell lines.

The President Supports Exploring the Promise of Stem Cell Research

President Bush understands the pain of individuals and their families suffering through the illness of a loved one. The President remains committed to fully exploring the promise and potential of stem cell research without violating ethical principles and while maintaining respect for all human

life. The Bush Administration was the first to provide federal funding for embryonic stem cell research. In keeping with this commitment, the Administration:

- Provided FY 2003 funding of \$24.8 million for human embryonic stem cell research, an increase of 132 percent from FY 2002; in FY 2003 the Administration has strongly supported promising research using adult stem cells by providing \$190.7 million for human non-embryonic stem cells (adult stem cells, including those from cord blood, placenta, and bone marrow).
- Clarification of current NIH rules to enable researchers to participate in privately-funded stem cell research without compromising their ability to receive NIH funding for separate projects.
- NIH currently funds three Exploratory Centers of Excellence to promote basic research on embryonic stem cells.
- NIH is also engaged in a project on its Bethesda campus to comprehensively analyze the properties of the stem cell lines that are eligible for federal funding, which will provide researchers with valuable information.
- NIH developed five training courses to help American and foreign scientists acquire needed skills and techniques to culture human embryonic stem cell lines.
- NIH has funded an adult stem cell bank which provides mesenchymal stem cells to the research community. This type of adult stem cell is able to proliferate, which lends itself to the degree of expansion necessary for wide distribution; they have also been shown to have the capacity to differentiate into specialized cells. It is worth noting that Federal funds are available for the derivation of adult stem cells.

New Steps to Further Accelerate Stem Cell Research

In keeping with the President's commitment, the Administration is announcing:

- With the goal of exploiting new discoveries in basic embryonic and adult stem cell biology, NIH will also establish Centers of Excellence in Translational Stem Cell Research, where stem cell researchers will be working side by side with clinical researchers, transplant surgeons, and other medical researchers who are experts in diseases such as diabetes, Parkinson's disease and heart disease and other conditions that may benefit from this research.
- NIH will soon establish a new National Embryonic Stem Cell Bank, that will consolidate some of the human embryonic cell lines eligible for funding in one location, reduce the costs that researchers have to pay for the cells, and maintain uniform quality control over the cells. Research conducted at the Bank will provide important insights about which cells might be most useful for a specific basic or translational research activity by exploring the functional diversity of the cell lines.

The State of Embryonic Stem Cell Science

Under President Bush's policy, this science is advancing faster than it ever has in the past. As of February 2004, more than 400 shipments of eligible stem cell lines had been sent to researchers. Today, there are more than 3500 additional shipments are maintained by the owners and available to be shipped.

Number of Lines Available for Federal Funding

- 78 derivations of human embryonic stem cells meet the criteria established by the President and listed on the NIH Registry, although since the August 2001 announcement 16 of these derivations failed to grow into lines that would be usable for research.
- With assistance from NIH, the owners of 19 of the lines agreed to make their lines available for use by researchers in the U.S. and abroad. Four other derivations are being developed into lines today; two of them will be available in the near future for broad distribution, while two others are still under development. Still others are being preserved by their owners until the science develops further. No other country in the world has made as many stem cell lines widely available.
- Because stem cell lines divide continuously in culture, these lines can be used by hundreds of individual researchers. One line alone has already resulted in 136 shipments to researchers.
- These lines are being employed to study many unanswered questions that must be answered before the cells can be used in human therapies. For example, determined cell culture conditions that allowed one line to differentiate into neurons similar to the dopamine-producing neurons that degenerate in Parkinson's Disease. This advance is the first step towards generating neurons that may be useful in treating this disorder. Other scientists used an eligible line to form 3-dimensional structures with characteristics of developing liver tissue, cartilage, nerve, or blood vessels. This technique may permit scientists to generate tissue for use in skin grafts, wound treatment, or organ transplantation.

Private and State Funding for Embryonic Stem Cell Research is Available

The President's policy places no obstacles in the path of private or state funding for stem cell research – researchers are receiving support from both sources, in addition to support from the Federal Government.

- Based on 2002 data, one study reports that private sector research and development in stem cells was being conducted by approximately 1000 scientists in over 30 firms. Aggregate spending was estimated at \$208 million.¹ Geron Corporation alone reported that it spent more than \$70 million on stem cell research by September 2003.
- In the Stem Cell Business News Guide to Stem Cell Companies (Feb 2003), 61 U.S. and international companies are listed as pursuing some form of research or therapeutic product development involving stem cells. For example, Geron Corp. has announced plans to seek FDA approval to pursue human trials.
- Some states ban the destruction of human embryonic stem cells for research. Some permit it, but do not fund it (consistent with federal policy). And still other states provide funding.
- As with most medical research, the effort to explore the promise of this science and to develop treatments and cures will require the combined efforts of both the public and private sector.

1. Lysaght, J.J., and Hazlehurst, A.L., Private Sector Development of Stem Technology and Therapeutic Cloning, "Tissue Engineering 9(3): 555-561 (2003).

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40



PRESS RELEASES

REFORM JEWISH LEADERS URGE BUSH TO PROMOTE EMBRYONIC STEM CELL RESEARCH

"Cutting off funding for medical research that has such tremendous potential benefits - even where, as here, it raises complex and far-reaching issues - is both immoral and unethical according to our tradition."

WASHINGTON, July 16, 2001 -- In a letter today to President George W. Bush and Department of Health and Human Services Secretary Tommy Thompson, a group of Reform Jewish leaders voiced their support for carefully regulated federal funding of embryonic stem cell research. The letter recommends the Administration pursue an approach to the complex moral issue that will "promote and nurture the very real promise this potentially live-saving medical research offers us all." The complete letter follows:

On behalf of the Union of American Hebrew Congregations (UAHC), whose over 900 congregations across North America encompass 1.5 million Reform Jews, we write in support of the use of federal funds to conduct research involving stem cells derived from human embryos produced through the in vitro fertilization process.

Experimental data has shown embryonic stem cells have the ability to develop into brain, liver, nerve and heart muscle cells. Many scientists believe continuation of this research will play a key role in developing new and effective treatments for diseases such as Alzheimer's, diabetes, Parkinson's and certain types of cancers. An estimated 128 million Americans are afflicted with conditions that may benefit from embryonic stem cell research.

The proposed guidelines for federal funding of stem cell research currently under review by the Administration would impose ethical safeguards that private funding alone would not ensure. Scientists only would be permitted to use embryos already earmarked for destruction and which had been released with consent from donors who already had decided against their implantation. These clear guidelines give us reason to support a measured, cautious approach towards dealing with the complex moral issues associated with stem cell research.

Our Jewish tradition reminds us that while only God can create life, God has charged humans with doing everything possible to preserve it. "I have put before you this day life and death. Choose life, that you and your children may live" (Deuteronomy 30:20). As the UAHC noted in a 1993 resolution on fetal tissue research, Jewish authorities have used the concept of pikuach nefesh, or the primary responsibility to save human life, which overrides almost all other laws, to approve a broad range of medical experimentation. Cutting off funding for medical research that has such tremendous potential benefits - even where, as here, it raises complex and far-reaching issues - is both immoral and unethical according to our tradition.

We urge the Administration to implement the proposed guidelines allowing for carefully regulated federal funding of embryonic stem cell research, and in doing so, promote and nurture the very real promise this potentially live-saving medical research offers us all.

Sincerely,

Rabbi Richard F. Address, D. Min
Director,
UAHC Department of Jewish Family Concerns

Mark J. Pelavin
Associate Director,
Religious Action Center of Reform Judaism

Jean Abarbanel
Chair,
UAHC Department of Jewish Family Concerns

David S. Davidson
Chair,
Commission on Social Action of Reform Judaism

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The Religious Action Center of Reform Judaism is the Washington office of the Union of American Hebrew Congregations (UAHC), whose 900 congregations across North America encompass 1.5 million Reform Jews, and the Central Conference of American Rabbis (CCAR) whose membership includes over 1700 Reform rabbis.

return to
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42



Rabbinical Council of America

התאחדות הרבנים האמריקאי

RCA Reissues 2001 Statement of RCA/OU on the Important Topic of Stem Cell Research, as Formulated as a Letter to President Bush

Oct 22, 2004 -- Dear President Bush,

- Policies Headlines
- Text of Senate Testimony
- Condemning Destruction in Gaza
- Hurricane Katrina
- Nomination of Judge John Roberts
- Metzitza Be'Peh - Halachic Clarification

We write to you on behalf of this nation's largest Orthodox Jewish synagogue umbrella organization and Orthodox Jewish rabbinical organization with regard to a serious matter you are currently considering -- whether to permit federal funds to support embryonic stem cell research. On the basis of consultations with leading rabbinic authorities in our community as well as with scientists sensitive to traditional Jewish values, we write to express our support for federal funding for embryonic stem cell research to be conducted under carefully crafted and well-monitored guidelines.

As you no doubt appreciate, the decision you face is one with complex moral dimensions. On the one hand scientific research indicates that there is great life-saving potential in embryonic stem cell research, potential that warrants federal support. On the other hand, we must be vigilant against any erosion of the value that American society affords to human life, including potential human life.

Our Torah tradition places great value upon human life; we are taught in the opening chapters of Genesis that each human was created in G-d's very image. The potential to save and heal human lives is an integral part of valuing human life from the traditional Jewish perspective. Moreover, our rabbinic authorities inform us that an isolated fertilized egg does not enjoy the full status of person-hood and its attendant protections. Thus, if embryonic stem cell research can help us preserve and heal humans with greater success, and does not require or encourage the destruction of life in the process, it ought to be pursued.

Nevertheless, we must emphasize, that research on embryonic stem cells must be conducted under careful guidelines. Critical elements of these guidelines, from our perspective, relate to where the embryonic stem cells to be researched upon are taken from. We believe it is entirely appropriate to utilize for this research existing embryos, such as those created for IVF purposes that would otherwise be discarded but for this research. We think it another matter to create embryos ab initio for the sole purpose of conducting this form of research.

Because of the ethical concerns presented by embryonic stem cell research and the reports of potentially garnering similar benefits from research on adult stem cells, we would urge you to simultaneously increase funding for adult stem cell research.

Other elements of an ethically sensitive oversight regime would include a rigorous informed consent process from future IVF procedure participants, a fully funded and empowered oversight body comprised of scientists and bio-ethicists, and periodic reviews by relevant Executive branch agencies and congressional committees.

We hope these views are useful to you in your deliberations over this critical issue of public policy. We wish you the paramount blessing for political leaders that the Jewish tradition offers - wisdom.

Sincerely,
Harvey Blitz

43

President, UOJCA

Rabbi Herschel Billet
President, RCA

Nathan Diament
Director of Public Policy, UOJCA

Rabbi Steven Dworken
Exec. Vice President, RCA

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44



CCAR RESPONSA

In Vitro Fertilization and the Status of the Embryo

5757.2

She'elah

In the procedure known as in vitro fertilization (IVF; the "test tube baby"), human ova are removed from the womb and placed in a petri dish, where they are fertilized with sperm. The usual procedure is to choose the "best" of these embryos or zygotes for implantation into the womb (of either the ovum donor herself or of a "host mother") and to discard the rest.

What is the status of the zygote with respect to "humanhood"? May those zygotes not chosen for implantation be used for medical research? May they be offered to another couple, and if so, who are ultimately the parents of the child? Perhaps we should be guided by the ruling of Rav Hisda in *BT Yevamot* 69b that prior to forty days gestation the human fetus is but "mere water" (*maya be `alma*) and does not warrant independent status under *halakhah*. (Rabbi Thomas Louchheim, Tucson, AZ)

Teshuvah

The development of the procedure of in vitro fertilization, which creates and maintains a human embryo outside the womb, raises many difficult religious and moral questions, some of the most important of which are noted in our *she'elah*. In addressing them, we as rabbis must first of all be guided by the Jewish legal tradition, as we understand it from our own liberal Jewish perspective, although we recognize that our tradition may offer but limited practical guidance on issues of this sort.¹ And as liberal rabbis, we shall consider as well the findings of contemporary biological science, medicine and genetics.

I. In Vitro Fertilization as a Medical Procedure. We begin by considering briefly a basic issue implied by our *she'elah*: the permissibility or advisability of in vitro fertilization as a medical procedure.² To answer this question, we must address to IVF the same inquiry we apply to all medical issues: does the medical benefit which might accrue from the procedure justify its risks? Jewish tradition teaches us to regard our lives and our bodies as gifts from God and therefore prohibits us from placing them in needless danger³ or subjecting them to unnecessary physical damage.⁴ These concerns are set aside, of course, in the case of legitimate medical need,⁵ since medicine is a *mitzvah*.⁶ By "medicine" we mean the wide array of chemical, surgical, and other procedures aimed at the correction or control of disease. And by "disease" we mean a condition in which some aspect of our biological or psychological systems does not function properly.⁷ Accordingly, we may define human infertility as a disease and the procedures designed to correct it as medicine. We might add that since

Jewish tradition and Reform Jewish teaching see the birth of children as a blessing to their parents and to the entire community of Israel,⁸ the development of technologies which enable the infertile to bring children into the world should be similarly be welcomed as a blessing to humankind. Since current information indicates that IVF is not associated with unacceptable risks to either the health of the woman or of the child, we see no reason to oppose the procedure or to issue any warnings concerning it. On the other hand, those considering IVF must take into account the normal medical risks of any surgical procedure, as well as the psychological stress involved in fertility treatments, before they decide to use it.

2. *The Status of the Embryo at Less than Forty Days.* Our *sho'el* is correct that the sources regard a human embryo of less than forty days gestation as *maya be`alma*, "mere water", and therefore not a "fetus" (*ubar*) at all.⁹ On this basis, a number of authorities are willing to rule more leniently on the question of abortion: that is to say, if we presume a prima facie halakhic prohibition against abortion,¹⁰ that prohibition either does not apply or is much less stringent with regard to a fetus at less than forty days following conception.¹¹ By extension, we would expect an even more permissive attitude concerning an embryo which, because it exists outside the womb, is not defined as a "fetus." This is indeed the case. One leading contemporary halakhist rules that it is forbidden to set aside the laws of Shabbat in order to save the life of an embryo in a petri dish, even though we are permitted to violate Shabbat on behalf of a fetus.¹² In a ruling which touches directly upon our own *she'elah*, R. Chaim David Halevy permits a hospital or clinic to discard "excess" embryos created for purposes of IVF, explaining that the prohibition against abortion relates only to the *fetus* and not to an embryo maintained outside the womb.¹³ A similar decision is rendered by R. Mordekhai Eliyahu.¹⁴

3. *In Vitro Fertilization as Healing (Refu'ah).* We agree with these decisions, but we think it vital to expand their rationale. The absence of an explicit prohibition against destroying an embryo does not in and of itself justify the act of destruction, any more than the definition of an early-stage fetus as "mere water" automatically permits an abortion. Like the fetus, the zygote is not a legal person.¹⁵ Yet it most definitely is a person "in becoming," possessing all the necessary genetic information; it lacks only gestation, development *in utero*, to realize its biological potential. Rather, just as we require some warrant, however "slim,"¹⁶ to abort the fetus, so too we should seek some positive reason to argue on behalf of the destruction of this microcosm of the human being.

We find this reason in the nature of IVF as a form of *refu'ah*, of healing, a medical response to the disease of infertility. As we have already written, actions which might under other circumstances be forbidden may be undertaken if they constitute a proper element of a therapeutic regimen: in other words, if they are defined as *medicine* and contribute to the treatment of disease. Thus, although we would certainly oppose the wanton destruction of human embryos, we can permit the discarding of excess embryos as a necessary part of the IVF procedure. We say "necessary" because 1) multiple embryos must be created in order for the procedure to be feasible and effective; and 2) to require that each and every zygote be preserved would likely place a cumbersome burden upon hospitals and laboratories. Under such conditions, many of these institutions would likely refuse to perform IVF, thus rendering the procedure intolerably expensive or simply unavailable to many of those who seek it. Given that our tradition does not expressly forbid the destruction of the embryo, the positive value of IVF as a medical therapy clearly justifies the necessary discarding of excess zygotes.

Moreover, since IVF is a means by which Jews can fulfill the *mitzvah* of childbearing, for whose sake

a number of important ritual prohibitions can be waived,¹⁷ we think that our tradition would permit us to discard the excess embryos as a necessary means of enabling Jewish people to build families and bring children into the world.

4. *Medical Experimentation.* If in the name of "medicine" it is permitted to discard the excess embryos created during IVF, then it is certainly permitted to utilize these embryos for research intended to increase our life-saving scientific knowledge. We would add the proviso that whether it be discarded or used for research, the embryo be treated and handled with an attitude of respect and reverence that is befitting of that which, after all, a *potential* person, a *nefesh* in becoming.¹⁸

5. *Parenthood.* Who are "ultimately" the parents of a child created by IVF? This question has been considered by several Orthodox halakhists, whose arguments--and our difficulties with them--we summarize here.

R. Eliezer Yehudah Waldenberg rules that a child conceived outside the womb has no parents: it bears no halakhic relationship either to its biological parents or to the "host mother," the woman who carries the child to term.¹⁹ He cites as support a statement by Maimonides in the *Moreh Nevuchim* that "human organs cannot exist separately from the body and still be regarded as fully human."²⁰ Thus, an ovum detached from its "natural" place ceases to be a human ovum. He quotes as well the talmudic dictum that "a fetus in the womb of a Canaanite slave is like the fetus of a beast."²¹ He interprets this to mean that "no *yichus* (familial relationship) is possible outside the womb of a Jewish woman"; hence, the embryo created in a petri dish enjoys no *yichus* or familial relationship at all. Both of these proofs, however, are clearly flawed. In mentioning Maimonides' philosophical treatise, Waldenberg relies upon the latter's *scientific* judgment, the truth of which depends upon its accuracy as a description of physical reality. That judgment, while it may have corresponded to the best available scientific knowledge in the twelfth century, is now outdated; today, it is possible to establish that an organ is "human" by means of chemical and genetic testing. If we wish to base our religious decisions upon scientific information, it is incumbent upon us to use the best science available, as did Maimonides himself, rather than enslave our scientific judgments to standards which science itself has long since abandoned. Waldenberg's talmudic evidence, meanwhile, does not prove that *yichus* is created exclusively within a Jewish womb.²² The text speaks instead to the "matrilineal" principle of Jewish descent: traditional *halakhah* does not recognize the legal bond between a father and his child by a non-Jewish woman. This says nothing at all about the case in which the donors of the biological materials for IVF are both Jews.

Other authorities hold that a child created by IVF is the offspring of the woman who bears it, whether or not she conceived it.²³ They base this conclusion upon an analogy to the talmudic passage concerning a woman who converts to Judaism during pregnancy.²⁴ Since "one who converts is like a newborn child,"²⁵ these authors reason that both the woman and her fetus become "newborn": *i.e.*, all prior families ties (*yuchasin*) are cancelled, including the relationship between this mother and her fetus. Yet once the child is born the *halakhah*, for purposes of the law of incest, recognizes it as this woman's child. The authors infer therefore that it is *birth*, rather than conception, which in all cases establishes the mother-child bond, so that the child conceived by IVF is the legal offspring of the "host mother." While this conclusion is open to halakhic criticism (since the sources in question can be interpreted in several different ways),²⁶ we would question the aptness of the analogy itself. Jewish law defines the Jew-by-choice as a "newborn child" for *religious* rather than for biological reasons.

The *ger* or *giyoret* who enters our community and embarks upon a life of Torah and *mitzvot* most definitely becomes a "new person." In the eyes of the talmudic sages, conversion marked a sharp and irrevocable break with one's past and with one's connections to the non-Jewish world. However we understand this concept today, it has nothing to do with the case of an embryo conceived through IVF. This fetus may experience a change of place, but unlike the proselyte it undergoes no transformation of religious status.

We learn two things from these observations. First, rabbinic scholars ought to acknowledge that traditional techniques of halakhic analysis, in particular the case method of reasoning by analogy, are of limited usefulness in an area dominated by technological novelty and innovation. The tortuous logic of the arguments we have just cited demonstrates that there may simply be no precedents or source materials in talmudic literature that offer plausible guidance to us in making decisions about these contemporary scientific and medical issues.²⁷ Second, given our positive attitude as liberal Jews toward modernity in general, it is surely appropriate to rely upon the findings of modern science, rather than upon tenuous analogies from traditional sources, in order to render what we must consider to be *scientific* judgments. To ask "who are this person's biological parents?" is to ask a scientific question whose answer is determined according to accepted scientific indicators; *i.e.*, genetic testing. Hence, the biological parents of the child are those who donated the sperm and the egg from which he or she was fertilized.

In the event that a child is born to or raised by parents other than those who donated the sperm and the egg, he or she becomes the adoptive child of those parents. This does not present inordinate difficulties under Jewish law. As we have written elsewhere,²⁸ adoptive parents are a child's *ultimate* parents; those who raise, care for, educate and love the child during his or her life assume full parental status. It is to them that the child owes the duty of honor and reverence.²⁹ The child adopted by another couple has no legal or religious relationship to the donors of the egg and sperm, although for personal, medical, and genetic reasons the child or his/her guardian should be permitted to discover the identity of the biological parents at an appropriate time.

Conclusion. To summarize:

1. A human embryo or zygote is, like the fetus, a potential but not a legal person, and there is no explicit Jewish legal prohibition against its destruction.
2. In vitro fertilization is a legitimate medical therapy, offering realistic hope to many who seek to build families. Since the creation of multiple embryos is a necessary element of IVF, and since the preservation of "excess" embryos may constitute a serious impediment to the availability of this procedure, it is permissible to discard those embryos.
3. The embryo may be used for medical research, provided that it is handled with the proper respect and reverence.
4. The embryo may be offered to another couple. The child will be the biological offspring of the man and woman who donated the sperm and the egg. Those who raise the child are his or her "ultimate" and "real" parents.

NOTES

¹ See the article by our colleague David Ellenson, "Artificial Fertilization (*Hafrayyah Melakhotit*) and Procreative Autonomy," in W. Jacob and M. Zemer, eds., *The Fetus and Fertility in Jewish Law* (Pittsburgh and Tel Aviv: Freehof Institute of Progressive Halakhah, 1995), 19-38.

² This fundamental question has never been addressed to or by the Responsa Committee. Therefore, while our *she'elah* proceeds on the assumption that the answer is affirmative, we find it necessary to fill this lacuna in our existing literature.

³ See Deut. 4:15, Lev. 18:5 and *BT Yoma* 85b; Isserles, *YD* 116:5.

⁴ *M. Baba Kama* 8:8; *BT Baba Kama* 91a-b; *Yad Chovel* 5:11 *SA CM* 426:31. An instance of unnecessary physical damage would be purely surgery undertaken for purely cosmetic reasons; see *Teshuvot for the Nineties*, no. 5752.7.

⁵ See the following responsa in *Teshuvot for the Nineties*: treatment for severe pain in terminally-ill patients (responsum 5754.14); medical experimentation under carefully controlled conditions (5755.11); on cosmetic surgery (5752.7); and abortion performed for the mother's "healing" (*refu'at imo*; 5755.13).

⁶ The *mitzvah* is *pikuach nefesh*, the saving of human life. See Nachmanides, *Torat Ha'adam* (Chavel ed.), 41-42, and *SA YD* 336:1.

⁷ This suggests that the definition of "disease" is largely a matter of social construction: that part of our biological or psychological systems is functioning "improperly" is a judgment we make based upon a conception of what "proper" functioning is.

⁸ Gen. 1:28; *M. Yevamot* 6:6; *Yad, Ishut* 15:1, and *SA EHE* 1:1. For Reform Jewish teachings concerning the *mitzvah* of having children, see *Gates of Mitzvah*, 11, and *American Reform Responsa*, no. 132.

⁹ Rav Chisda's position in the Talmud is cited as *halakhah* in *Yad*, *Terumot* 8:3.

¹⁰ Most halakhic authorities hold that there exists a prohibition (*isur*) against destroying a human fetus without sufficient cause, although there is a good deal of dispute as to the precise definition and legal basis of this prohibition; see R. A.S. Avraham, *Nishmat Avraham*, CM 425:2, sec. 1, for discussion. As to the debate over what counts as "sufficient cause" or warrant for abortion, see our responsum 5755.13.

¹¹ R. Ya'akov Emden, *Resp. Chavat Ya'ir*, no. 31; R. Yechiel Ya'akov Weinberg, *Resp. Seridey Esh* 3:127 (p. 341); R. Eliezer Yehudah Waldenberg, *Resp. Tzitz Eliezer* 7:48, ch. 1 (pp. 190-191).

¹² R. Shmuel Halevy Wasner, *Resp. Shevet Halevy* 5:47. The permit to perform otherwise forbidden work (*melakhah*) on Shabbat or Yom Kippur in order to save a fetus is found in *Halakhot Gedolot* (Laws of Yom Kippur; Warsaw ed., 31c; ed. Hildesheimer pp. 319-320) and cited by Nachmanides

(*Torat Ha'adam*, ed. Chavel, pp. 28-29), who applies it even to a fetus less than forty days old. This would seem to be a contradiction: if it is not forbidden to destroy a fetus at this early stage, on the grounds that it is not a "fetus" at all, how can it be allowed to transgress the laws of Shabbat, an otherwise capital offense, in order to save it? Yet this problem can be resolved, for even at less than forty days the fetus is still a life in becoming, and we are taught that the duty of *pikuach nefesh*, the saving of life, applies even to cases of *safek*, when we are uncertain that "life" can be saved by our action (*BT Yoma* 85b; see *Resp. Seridey Esh loc. cit.*). Moreover, we might also remove the difficulty by saying that the permit to violate Shabbat and Yom Kippur applies in fact to saving the life of the mother, not that of the fetus (*Hil. Harosh*, Yoma 8:13; R. Nissim Gerondi to *Alfasi*, Yoma, fol. 3b).

¹³ See *Sefer Assia* 8 (1995), 3-4. Halevy, it should be noted, does not express a clear opinion as to whether the procedure of IVF is itself permitted; he explicitly notes that his ruling applies only to individuals or institutions who "adopt the opinion of those who permit (the procedure)."

¹⁴ *Techumin* 11 (1991), 272-273.

¹⁵ "The fetus is not a legal person" (*lav nefesh hu*); see Rashi, *BT Sanhedrin* 72b, *s. v. yatza rosho*, and *Sefer Me'irat Eynayim*, CM 425, no. 8.

¹⁶ The language is purposefully reminiscent of that utilized by R. Ben Zion Meir Hai Ouziel (*Resp. Mishpetey Ouziel* 3, Choshen Mishpat, no. 47), who permits abortion when there is a "slim pretext" (*sibah kelushah*) on which to argue that the procedure is necessary to safeguard the mother's health.

¹⁷ Although this remains somewhat controversial; see the discussion on artificial insemination in A.S. Avraham, *Nishmat Avraham*, EHE 1, pp. 5ff.

¹⁸ On medical experimentation in general, see our responsum 5755.11 and R. Walter Jacob, *Questions and Reform Jewish Answers*, no. 152.

¹⁹ *Resp. Tzitz Eliezer* 15:45.

²⁰ *Moreh Nevuchim* 1:72.

²¹ *BT Kiddushin* 69a.

²² The child of two gentiles is their legal offspring; see *Encyclopedia Talmudit* 5:289-295. Indeed, the passage in *BT Kiddushin* says only that the child is not related to the Jewish father (see Rashi, *s. v. kevelad bema'ey behemah damey*); this does not affect the existence of *yichus* between the mother and the child.

²³ See the articles by R. Zalman N. Goldberg and R. Avraham Kilav in *Techumin* 5 (1984), 248-267.

²⁴ *BT Yevamot* 97b.

²⁵ *BT Yevamot* 22a and parallels.

²⁶ See R. Yehoshua Ben-Meir in *Assia* 8 (1995), 73-81 and 153-168: the texts support various conclusions: the child is the offspring of the biological mother; the child is the offspring of the birth mother; the child is the offspring of both; the child is the offspring of neither. Not surprisingly, he concludes that "this question requires careful analysis and decision by the leading authorities" (81).

²⁷ See Ellenson (note 1, above).

²⁸ *Teshuvot for the Nineties*, no. 5753.12.

²⁹ See Ex. 20:12 and Lev. 19:3. A parent may waive the honor and reverence owed him or her by a child. The decision to allow one's biological child to be raised by others, though made for good and noble reasons, constitutes such a waiver.

If needed, please consult [Abbreviations used in CCAR Responsa](#).

[Back to Responsa Home Page](#)

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Central Conference of American Rabbis

CCAR RESPONSA

5761.7

Human Stem Cell Research

She'elah

Recently, scientists have reported some important findings from experiments conducted upon human stem cells. These results, we are told, signal the potential discovery of treatments for a number of dreaded diseases. Yet the stem cells used in these studies are usually taken from aborted fetuses or from embryos (zygotes) created in the laboratory. According to Jewish law and tradition, is it permissible to utilize human embryos and aborted fetuses in stem cell research?

Teshuvah

1. *The Scientific Background.*[1] Stem cells are a type of cell found in the human body at all stages of development: embryonic, fetal, and adult (in this context, an "adult" stem cell refers to a stem cell that occurs in the human organism after birth). While all other cell types, such as heart cells or skin cells, are specialized or committed to conducting specific biological functions, the stem cell is unique in that it is uncommitted to any specific function and remains so until it receives a signal to develop into a specialized cell. All stem cells are capable of renewing themselves and of becoming specialized or differentiated to yield the cell types of the particular tissues from which they originate; when the tissues become damaged or destroyed, the stem cells enable the body to restore them. Yet there are some important differences among these stem cells. Some stem cells are "pluripotent": *i.e.*, they have the capacity to develop into almost all of the more than 200 different known cell types. Stem cells that display this characteristic come from embryonic or fetal tissue.[2] Adult stem cells do not have this capacity. Adult stem cells do possess to some extent a characteristic called "plasticity," the ability of a cell type derived from one tissue to develop into specialized cell types of another tissue. To date, however, it has not been demonstrated that the adult stem cell can be directed to develop into *any* cell type of the body.

During the past few years, researchers have succeeded in isolating pluripotent stem cells from the early (4- to 5-day) human embryo (called the *blastocyst*) and in growing them in a laboratory setting.[3] This is a dramatic development, one that may well portend some significant advances in medicine and health. A number of deadly illnesses-among them Parkinson's disease, Alzheimer's disease, diabetes, chronic heart disease, liver failure, cancer, multiple sclerosis, and spinal cord injury- ravage the body by destroying organs and cell tissue. Scientists hope either to cure or to control these diseases by manipulating stem cells to generate new tissue to replace that which the

diseases have destroyed and to restore vital bodily functions. In addition, as this technology becomes more advanced, it is possible that whole organs might be created for use in transplantation, a critical desideratum given the ongoing shortage of donor organs available for this purpose. Finally, the study of embryonic stem cells can help us gain a better understanding of genetics and human development, including the causes of birth defects, and consequently aid us in the effort to correct or prevent them.

2. *The Moral Challenge.* Stem cell research, therefore, is fast emerging as one of the most hopeful fronts in our age-old battle against disease, and we are properly encouraged by its progress. Our happiness, however, is tempered by our concerns over the nature of this research, particularly as it involves fetal and embryonic stem cells. (The derivation of adult stem cells does not pose similar concerns; as we have noted, however, fetal and embryonic stem cells offer much better prospects for research.) In order to derive fetal stem cells, scientists must utilize aborted fetuses. In order to derive embryonic stem cells, they must destroy the embryo; that is, they must kill the human organism at its earliest stage of development. Such laboratory manipulation of human fetuses and embryos raises questions of great moral seriousness, and we must not ignore these questions even when that research carries the prospect of important medical breakthroughs. On the contrary: the demand that we behave in an ethical manner, a demand that is central to our concern as religious people, does not cease to apply to us when we enter the laboratory. In our scientific lives, no less than in our social or political lives, we are required to ask whether our acts, no matter how well-intentioned, pass muster before the bar of morality. As Jews, in particular, we ask these questions from the standpoint of our participation in a tradition that has a great deal to say concerning the ethics of science and medicine.[4]

What, then, should be our stance with regard to stem cell research? Is this procedure coherent with the duties imposed upon us by our Jewish moral tradition as we Reform Jews best understand it? Are we permitted to abort the human fetus and to destroy the human embryo for the purpose of medical experimentation? If so, are we permitted to create embryos and fetuses intentionally in order to use them subsequently in this manner?

These, as we shall see, are not easy questions to answer. While the answers we have arrived at represent in our view the best and most persuasive response to these questions, we do not claim to have resolved all problems with absolute certainty. Our chief hope, therefore, is that our *teshuvah* will suggest a fruitful way for us as Reform Jews to think and to talk about the moral issues connected with stem cell research. In that way, it may prove helpful to us as we continue our discussions and debates over this latest development in medical technology.

3. *The Mitzvah of Medicine.* Jewish tradition holds the practice of medicine to be a *mitzvah*, a religious duty. The Torah, to be sure, does not explicitly enjoin us to practice medicine, and though the Rabbis deduce from Exodus 21:19 that the physician is permitted to ply his craft,[5] they do not suggest that the verse obligates him to do so. That conclusion is left to the great post-Talmudic authorities, the rishonim, among them R. Moshe b. Nachman (Nachmanides or Ramban, 13th-century Spain).[6] In his *Torat Ha'adam*[7] Ramban writes that the "permission" of which the Rabbis speak is in fact a *mitzvah*, because medicine falls under the category of *pikuach nefesh*, the saving of life, an act that according to all opinions is most certainly a *mitzvah* and that takes priority over almost all other religious obligations set forth under the Torah.[8] This understanding, which has been adopted by the leading halakhic compendia,[9] reflects the predominant[10] Jewish attitude toward the practice of medicine. Our tradition requires that we utilize our knowledge and our power to their

utmost in order to heal the sick; "when one who delays in doing so, it is as if he has shed blood." [11]

When we speak of the *mitzvah* of medicine, we have in mind more than just the dispensing of treatment to patients by physicians and other health care professionals. "Medicine" as we understand it today is a scientific discipline, defined by the canons and practices of a scientific community. Among these canons and practices is the insistence that medicine is an *experimental* science, founded upon extensive, carefully controlled laboratory and field research. It is this body of research, a continuing process of testing, verification, and discovery subject to the critical review of peer scientists, that commands our respect for the practice of medicine [12] and that empowers physicians to speak and to act with authority. For these reasons, it is difficult to draw firm distinctions between the "pure" and "applied" aspects of medical science. The scientist who tests and develops a therapy is engaged in the *mitzvah* of healing just as surely as is the physician who administers it to the patient; the work of each is just as essential to the saving of human life as is the work of the other. [13] If we define the administration of life-saving medical therapy as *pikuach nefesh*, we should not forget that physicians could not save lives were it not for the extensive scientific research upon which our contemporary practice of medicine is based. Since research into human stem cells partakes of the *mitzvah* of healing, surely our society ought to support it.

4. *Jewish Tradition and Respect for Human Life.* Medicine, however, is not the only relevant aspect of the *mitzvah* of *pikuach nefesh*. The commandment to save life reflects our tradition's demand that we respect life and honor it. This implies an obvious limitation upon the way we are permitted to practice medicine: we are not allowed to commit murder, even if the shedding of one person's blood will lead to healing for another. [14] This idea is linked in our classical texts to the concept of *yehareg ve'al ya'avur*: [15] we recognize that there are certain actions we must *never* perform, even at the cost of our lives, because our covenant with God requires no less. In the present context, it teaches us that we may not practice medicine in such a way that is destructive of human life. For example, under certain carefully specified conditions it is morally permissible to conduct medical experimentation upon human subjects. Yet it is clearly forbidden to sacrifice the life of the subject, even if the therapy being tested has the potential to save many lives in the future, for we may not use murder as a means of healing. [16] Does this rule hold in the case before us? Does the prohibition against murder, which protects the day-old infant, [17] apply as well to the human organism in its prenatal stage? If it does, then it is difficult to imagine how stem cell research could be deemed moral from the standpoint of Jewish law.

Even if the destruction of the fetus or the embryo is not considered an act of murder under Jewish law, we cannot automatically conclude from that fact that the destruction is "permitted." The principle we call "respect for human life" is not identical with the prohibition against bloodshed. It reaches beyond the scope of specific prohibitions to touch upon our more general moral commitment to the *sanctity* of human life. [18] To say that human life is sacred is to say that, at some definable point, it is *inviolable*, that it is protected and preserved from our power to control, to manipulate, and to destroy. How does this commitment inform our attitude toward prenatal life? Is our belief in life's sanctity compatible with laboratory experimentation upon—and the concomitant destruction of—the fetus and the embryo, even if that experimentation may lead to the discovery of life-saving medical therapies?

5. *The Status of the Prenatal Human Being.* We are asking, therefore, whether and under what circumstances we may destroy the prenatal human organism for the advancement of medicine and,

ultimately, the goal of *pikuach nefesh*. To answer this question, we must determine the status of the fetus and the embryo under Jewish law. Since we would never imagine that it is permissible to sacrifice the day-old infant "in the interests of science," we must ascertain whether the fetus and the embryo possess a status that is legally inferior to that of the infant. If its status indeed is a lesser one, then perhaps we are morally justified, under certain circumstances, in sacrificing the prenatal human being for the sake of medical research.

a. *The Fetus*. The traditional Jewish discussion of the status of the fetus customarily begins with the following Mishnah:[19]

"If a woman experiences life-threatening difficulty giving birth, the fetus is dismembered in her womb and removed limb from limb, for her life comes before its life (*mipnei shechayeha kodmin lechayav*). Once the major part of (the fetus) has emerged, it may not be harmed, for one person (*nefesh*) is not sacrificed on behalf of another."

The text clearly mandates abortion in this case, but the authorities disagree as to the grounds on which it does so. Maimonides sees the fetus as a *rodef*, a "pursuer" that threatens the life of the mother; like all pursuers, the fetus may be killed if necessary to save its victim from death.[20] Rashi offers another interpretation:[21] so long as the fetus has not emerged from the womb, it is not a *nefesh*, a full legal person, and the mother's life therefore takes precedence over its own. Once it has emerged, it acquires the status of a legal person; therefore, "one *nefesh* is not sacrificed on behalf of another." Rashi, in our view, provides the better and more coherent reading of the Mishnah's text.[22] And while others may differ on that point, there is general agreement that Jewish law does not regard the fetus as a *nefesh*, a full legal person. For this reason, the killing of a fetus is not considered or punished as an act of murder under the *halakhah*. [23] And since the fetus possesses a legal status inferior to that of the mother, a number of halakhic authorities permit abortions in situations where the mother's life is not endangered by the birth of the child but where the abortion is necessary for her physical or mental health.[24] Given that the fetus does not enjoy the entire range of protections that Jewish law accords to the full legal person, we might conclude that it is permitted to abort the fetus in order to utilize its tissue for experimentation aimed at the development of life-saving treatments.

That conclusion, however, would be a hasty one. Though the fetus does not qualify as a *nefesh*, the *halakhah* nonetheless accords it a high degree of protection. We see this protection at work in both a negative and a positive context. The negative context is that Jewish law prohibits feticide in the absence of serious cause. Virtually all authorities hold this view, although they vigorously dispute the nature of the prohibition[25] and the definition of the "serious cause" that overrides it.[26] The positive context is that the laws of *pikuach nefesh* apply to the fetus: we are required to violate the laws of Shabbat or Yom Kippur if necessary in order to save its life.[27] Even though the fetus is not technically a *nefesh*, it is in any event a *potential* person, a "*nefesh* in becoming," so that "we violate one Sabbath on its behalf so that it may one day keep many Sabbaths." [28] The fetus may occupy a lower legal status than other human beings, but it is a human being; it partakes of the sanctity of human life, and it deserves our honor and respect.

Taken together, these two elements of Jewish teaching concerning the fetus can serve as a guide to our own conduct. Because the fetus is not a *nefesh* and because the mother's life and health takes precedence over it, we can confidently permit abortion in circumstances other than mortal danger to

her. Yet because the fetus is a human organism, a "potential *nefesh*," we condone abortion only for truly weighty justifications; "we do not encourage abortion, nor favor it for trivial reasons, nor sanction it 'on demand.'"[29] Specifically, abortion is indicated in order to safeguard the health of the mother or to spare her great physical or emotional pain.[30] It is difficult to define a set of abstract rules governing the decision for or against abortion. That decision requires a careful consideration of the facts and circumstances of the particular case. Yet we have written that abortion should *not* be performed for reasons other than "serious maternal anguish," that is, a real set of difficulties faced by a particular woman.[31] The destruction of fetal life for any other reason stands in direct conflict with our commitment to the sanctity of that life. We therefore cannot sanction abortion for the purpose of harvesting fetal tissue for use in medical experimentation, even though the goal of that experimentation is the advancement of science toward new life-saving therapies. On the other hand, if a pregnancy has been terminated for a reason that we would regard as morally sufficient, we are permitted to use the aborted fetus in medical experimentation. We have long approved of autopsies for scientifically valid purposes;[32] the use of fetal tissue and organs would clearly qualify for the same approval, so long as the research is not the actual motivation for the abortion.

b. The Embryo. What is the legal status of the embryo, the fertilized egg that does not reside *in utero*? This question poses a special difficulty for the halakhist. The classical sources certainly did not envision the possibility that a human embryo might exist and develop in a petri dish; how then can they speak to the legal status of that embryo? Contemporary authorities, however, note that while the sources do not discuss the embryo, they do discuss the case of the fetus at its earliest stages of development and that we can learn much from those discussions. The Talmud holds that prior to its fortieth day of gestation the fetus, lacking form, is to be regarded as "mere water" (*maya be'alma*).[33] This determination has some significant legal consequences[34] and, most importantly for our purposes, figures prominently in the Jewish law of abortion. A number of decisors agree with the stance of R. Eliezer Yehudah Waldenberg that "when an abortion is indicated for medical reasons, it is best to perform it prior to the fortieth day of gestation. The law is much more lenient at that point inasmuch as the fetus prior to forty days is *maya be'alma*." [35] We should be careful not to read too much into the forty-day distinction. The fact that abortion is easier to permit prior to the fortieth day does not mean that it is not prohibited at all.[36] And the law of *pikuach nefesh*, which as we have seen applies to the fetus, presumably applies to *any* fetus, even for one that is less than forty days old.[37] The distinction does indicate, though, that while we respect and honor human life from its conception, the human organism at this earliest stage of its development is seen as having a lesser or inferior legal status than that possessed by the fetus at a later stage. Its lesser legal status, in turn, suggests that it exercises a lesser claim to protection than it does subsequently.

How might this insight inform our understanding of the status of the embryo? An important ruling on this subject is that of R. Shmuel Halevy Wasner,[38] who considers a question arising from the IVF procedure: does the law of *pikuach nefesh* apply to the zygote? Are we permitted to violate the laws of Shabbat if this is necessary to "save" the embryo and to allow it to continue its development in the petri dish? Wasner responds that, while we are required to do just that for the fetus, and apparently even for the fetus prior to its fortieth day of gestation,[39] we are forbidden to violate Shabbat on behalf of the embryo that has not yet been implanted into the womb. He writes that the law of *pikuach nefesh* applies to the fetus, even though it is not a full legal person, because most fetuses will survive, be born, and *become* full legal persons. In Jewish ritual terms, the fetus will likely become a *ben mitzvah*, a person subject to the obligations of Torah; accordingly, we apply to it the principle

"we violate one Sabbath on its behalf so that it may one day keep many Sabbaths." We cannot say the same of the zygote. We cannot say that most of these embryos will "likely" develop into persons (*nefashot*), because they lack the minimum qualification--implantation into the womb--that would enable us to make that statement. The embryo, therefore, possesses a legal status inferior to that of the fetus, and one element of this lesser status is that Jewish law imposes no positive duty to "save" its life.

If we have no duty to protect the embryo from death, it might follow that the *halakhah* does not explicitly prohibit its destruction. And if destruction is not explicitly prohibited, it might well be *permitted* under particular circumstances. For example, the procedure of in vitro fertilization (IVF) requires the creation of many more embryos than can be implanted into the womb of the woman who donated the eggs or of a "host mother." What shall we do with the "excess" embryos, those not used for implantation? Must we preserve them *ad infinitum* or may we discard them? Two leading contemporary halakhists rule that it is indeed permissible to discard these excess embryos: not only are they not "likely" to become full *nefashot*, there is no possibility that they will do so, since there is no intention to implant them. We owe no moral duty to these embryos, in other words, that would forbid us from discarding them.[40]

This Committee has previously reached a similar conclusion.[41] We hold that it is permissible to destroy excess embryos for two reasons. First, we accept the Jewish legal doctrine of the *nefesh*. "Personhood," according to this teaching, is a characteristic possessed exclusively by members of the human community, that is, by men, women, and children; the human organism does not become a full legal person until birth. This does not mean that we owe no moral duty toward the human organism prior to its birth; we most certainly do. We believe, however, that these obligations exist precisely because the fetus and embryo are "persons in becoming." The excess embryo, unlike the fetus or the embryo that is intended for implantation, has no potential to become a *nefesh*; therefore, while we would not condone its wanton destruction, we would permit it for causes of lesser gravity than those we would ask in the case of abortion. Second, the discarding of excess embryos is positively indicated as an important element of IVF. Were we to require that every one of these embryos be preserved, we would place a cumbersome burden upon hospitals and laboratories. Under such conditions, many of these institutions would likely refuse to perform IVF, thus rendering the procedure intolerably expensive or simply unavailable to many of those who seek it. The destruction of the excess embryos therefore serves to make possible the fulfillment of the *mitzvot* of healing and procreation.[42] Moreover, we have extended this permit to cover medical experimentation: if Jewish tradition allows us to destroy these excess embryos, we think it would surely allow us to use them in experimentation aimed at the advancement of medicine, to the fulfillment of the *mitzvah* of *pikuach nefesh*.[43] These embryos may therefore be utilized in human stem cell research. This opinion, we might add, is shared by other leading scholars in the field of Jewish medical law and ethics.[44] This permit for the destruction of such embryos for research purposes would obviously extend to the use of existing stem cell lines, that is, stem cells that have already been derived and that are currently preserved in laboratories.

c. The Creation of Embryos for Medical Experimentation. The human embryo is largely "unprotected" by Jewish law. There is no explicit halakhic prohibition against its destruction, and partly for this reason we feel morally confident about permitting the destruction of "excess" embryos created as part of the IVF procedure and about permitting the use of these embryos in medical

research. Let us take our inquiry to its next logical step: would it be also permitted to *create* embryos explicitly for purposes of medical research? It is not difficult to sketch an argument in favor of a "yes" answer. Newly-created embryos, after all, are destined for the laboratory and not for the womb. Like excess embryos, they have no potential to develop into full human persons. If the lack of that potential leads us to permit the use of excess embryos in medical research, why shall we not say the same for embryos that are created for no other purpose than medical research? The analogy between the two sorts of embryos, however, is not tight enough to support that conclusion. We do not create excess embryos with the explicit intention to destroy them. They are the necessary and unavoidable by-product of the procedure of in vitro fertilization, which requires the creation of more embryos than can be utilized in the initiation of pregnancy. If we could perform IVF without creating excess embryos, we would do that; if we could use these embryos for other purposes or store them in an economically feasible manner so as to obviate the need for their destruction, we would do that. We permit the discarding of excess embryos, not because of their "inferior" legal status (though that low status does remove a major moral obstacle to their destruction), but because in order to make IVF available to those who seek it we have no choice *but* to discard them. Given that the excess embryos will in any event be destroyed, we think it is entirely proper that their destruction be accomplished as part of the research that might lead to the discovery of life-saving therapies. None of this requires the conclusion that we are permitted to create human embryos *explicitly in order to* destroy them, even for medical purposes. The analogy, in short, does not work.

On the other hand, we could argue for an affirmative response without resorting to analogies at all. We might reason in a more deductive fashion: if the *mitzvah* of *pikuach nefesh* overrides virtually all other religious and moral obligations imposed in the Jewish tradition, then surely it justifies the creation-and destruction-of human embryos in the name of medical science, particularly given the lack of any concrete prohibition against killing the embryo. This argument does have persuasive force, but that force lies in the sheer power of calculation. It depends upon the assignment of relative values to the human organism at different stages of its development: the *nefesh* receives a higher score than the not-yet-*nefesh*. It then imagines a conflict between the life of the *nefesh* and the life of the embryo, a conflict that the *nefesh* automatically wins. This mathematical approach is elegant in its simplicity, but in our judgment it is *too* simple, for it ignores some vital moral issues raised by the destruction of embryonic human life.

We repeat: embryonic human life. Let us not mince words. Although the fertilized egg may be called an "embryo," a "zygote," or a "blastocyst," these labels can mask the fact that we have here a human *being*, an organism that contains all the genetic material that would, under the proper conditions, develop into a full legal person. As a leading medical text puts it: "The time of fertilization represents the starting point in the life history, or ontogeny, of the individual." [45] The embryo may not have attained the status of a *nefesh*, a legal person, a member of the human community, and its unwarranted killing may not be defined as "murder." It *is*, however, a human being, and by that token it partakes of the sanctity of all human life.

Rather than attempt to calculate the value of one human being against that of another, let us instead ask ourselves what this sanctity means. Before we say "yes" to the creation and destruction of human embryos, with all the marketing, trafficking and commercialization that would inevitably accompany their widespread use in laboratory research, let us consider what our commitment to the essential humanity of the embryo ought to demand of us. We Reform Jews might well answer that question in

various ways. Yet even in its most minimal definition, sanctity requires the recognition that human life is at some point inviolate, that it lies beyond our reach and our manipulation. This inviolability is the single greatest moral distinction between human and all other forms of life. We accept the notion that animals can be brought into the world with the express purpose of being killed to serve our purposes. We do not apply that notion to human life, because our sense of the sanctity of human life calls forth from us a response of awe and reverence rather than dominion and utility. There is no reason to assume that this awe and reverence do not apply to human life even at the embryonic stage, for even there, in the microscopic fertilized egg, lies the supreme potential for humanity.

Differences in legal status do help us to make difficult choices. This is particularly true in the matter of abortion. It is precisely because the fetus is not classified as a *nefesh* that we are permitted to make the otherwise unjustifiable decision to sacrifice its life on behalf of the life, health, or extreme anguish of its mother. Yet that decision is made in light of the actual and direct danger that the continuation of the pregnancy poses to a particular woman. As we have suggested, the fetus's lower status would not justify its destruction for the sake of medical research that *might* yield results that *might* be helpful to some as-yet unknown persons in the distant future. We think that the same considerations apply to the embryo. The zygote's status under Jewish law may be lower even than that of the fetus;^[46] for this reason, we can countenance the destruction of excess embryos created as part of the IVF procedure and their use in medical research. We do not accept, however, that this lower status would permit us to create embryos for no other purpose than to destroy them in furtherance of research that might well not lead to therapeutic benefits for some unknown person in a far-off future. To permit that action would be to stretch the definitions of *pikuach nefesh* and *refuah* beyond plausible boundaries. To permit that action, indeed, would be incompatible with our commitment to the sanctity that inheres in these embryonic human lives.

We should emphasize, finally, that we speak here exclusively to the current scientific situation. The question before us has to do with *experimentation*, with the destruction of human embryos as part of a research protocol that might some day lead to discoveries that would offer therapeutic benefit to actual patients. It is because any such benefit is many steps and quite possibly many years removed from medical reality that we cannot apply to that research the designation of *pikuach nefesh*. Were that reality to change--specifically, were science to develop from stem cell research real therapies to treat life-threatening illnesses like those mentioned at the outset of this *teshuvah*--then our answer would quite possibly change as well. In that case, we might well conclude that the need to derive the necessary stem cell material overrides our concern for the life of the embryo. We might say this for two reasons: first, because there is no Jewish legal prohibition against the destruction of the embryo at any rate; and second, because the real prospect that this material would provide therapeutic benefit to an actual patient would easily qualify the therapy as *pikuach nefesh*. The matter requires further careful study, not only by this Committee, but by all who are concerned with Torah and its application to the fateful moral choices that we are called upon to make.

Conclusion. In summary, we hope to have made the following points.

1. The practice of medicine is a *mitzvah*, partaking of the duty to save life. Because medicine is an experimental science, the *mitzvah* of medical practice includes medical research as well as the direct treatment of patients. For this reason, we are encouraged by the dramatic therapeutic prospects offered by research into human stem cells.

2. All human life, including prenatal human life, possesses an inherent sanctity that requires our respect and honor and that conflicts with the demand that we destroy it for our own purposes, even medical purposes.
3. The fetus is not a *nefesh*, a full legal person. Abortion is therefore permitted for reason of the life or health of the mother. It is *not* permitted in order to obtain fetal tissue for medical research. The tissue of fetuses that have been aborted for morally justifiable causes, however, may be utilized in that research.
4. The legal status of the embryo that exists outside the womb is inferior to that of the fetus. There is no duty to save it from death; nor is there an explicit prohibition against its destruction. For this reason, it is permissible to discard the excess embryos created as part of the procedure of in vitro fertilization and, by extension, to use them for purposes of stem cell research. If we may destroy some embryos in order to derive stem cells for the sake of that research, it is certainly permissible for scientists to make use of the already existing lines of stem cells in possession of scientists.
5. It is not permissible to create embryonic human life for the purpose of destroying it in medical experimentation. It *might* be permissible, however, to create and destroy embryonic human life in order to derive stem cell material that would be used as medical therapy for actual patients. The development of such therapies, if it ever occurs, lies in the distant future. In the meantime, it is incumbent upon all of us to continue to study, consider, and debate the moral implications of this promising new avenue of medical research.

NOTES

1. The following account is based upon the report entitled *Stem Cells: Scientific Progress and Future Research Directions*, prepared by the National Institutes of Health of the U.S. Department of Health and Human Services, June, 2001 (available at www.nih.gov/news/stemcell/scireport.htm). Our description draws especially upon the report's "Executive Summary," numbered as pp. ES-1 to ES-10. We take this opportunity to state the obvious (which, though obvious, deserves emphasis): we are rabbis, students of Torah and Jewish text. We are *not* scientists, and we claim no particular expertise on scientific and technological matters. What follows is by no means intended to serve as a comprehensive explanation of the nature and the current state of human stem cell research; readers seeking such an explanation are encouraged to consult the report and the literature it cites. Rather we offer a basic, broad-outline sketch of the current state of the science. We hope that this account will provide sufficient background for the discussion of the Jewish religious and moral issues that are raised by this research and that are the proper focus of our *teshuvah*.
2. Embryonic stem cells are derived from a group of cells called the inner cell mass, part of the early embryo, or blastocyst. Fetal stem cells are found in fetal tissue that was destined to be part of the gonads. See *Stem Cells*, ES-2.
3. The breakthrough study is that of James A. Thompson, *et al.*, "Embryonic Stem Cell Lines Derived from Human Blastocysts," *Science* 282 (1998), 1145ff. A similar study concerning fetal stem cells (also called germ cells) is M. Shambloft *et al.*, "Derivation of Pluripotent Stem Cells from Cultured Human Primordial Germ Cells," *Proceedings of the National Academy of Sciences* 95 (1998), 13726ff.

4. The scope and depth of this tradition can be seen in the proliferation of books with titles such as "Jewish Medical Ethics" and the like. Most of these are published by Orthodox rabbis. Among the best are Fred Rosner and J. David Bleich, *Jewish Bioethics* (New York: Sanhedrin Press, 1979) and Fred Rosner, *Modern Medicine and Jewish Ethics* (Hoboken: Ktav, 1986). A particularly useful work is A.S. Avraham, *Nishmat Avraham* (Jerusalem: 1982-), a six-volume compilation of halakhic analysis and decisions on medical matters, keyed according to the order of the *Shulchan Arukh*. An important work emanating from the Conservative Jewish camp is Elliot N. Dorff, *Matters of Life and Death* (Philadelphia: JPS, 1998). In the Reform context, our own responsa tradition has produced numerous decisions and essays on medical topics, ranging from birth control and abortion, to genetic engineering, the treatment of the terminally-ill, organ donation and transplant, the social responsibility of the medical profession, and more. This tradition is summarized and annotated in Mark Washofsky, *Jewish Living* (New York: UAHC Press, 2001), 220-268 and 445-456.
5. *BT* Bava Kama 85a, a midrash on the words *rapo yirapei*. 107
6. Mention should also be made of the theory of Maimonides (*Commentary to the Mishnah*, Nedarim 4:4), who learns that medicine is a *mitzvah* from Deuteronomy 22:2 (*vahashevoto lo*), which the Talmud (*BT* Sanhedrin 73a) reads as implying a duty to rescue. Medicine, again, becomes an obligatory and not merely a permitted practice.
7. *Torat Ha'adam*, ed. H.D. Chavel (Jerusalem: Mosad Harav Kook, 1964), 41-42.
8. That we have a positive duty to save the lives of those who are in danger is derived from Lev. 19:16 ("do not stand idly by the blood of your fellow"); see *BT* Sanhedrin 73a; *Yad*, Rotzeach 1:14; *Shulchan Arukh* Choshen Mishpat 426. That this obligation outweighs virtually all other duties imposed by the Torah is derived in *BT* Yoma 85b, from a midrash on Lev. 18:5; see *Yad*, Yesodei Hatorah 5:1 and *Shulchan Arukh* Yore De'ah 157:1. Even if the Talmud does not explicitly identify medicine with *pikuach nefesh*, Ramban notes that the halakhic literature does require that the laws of Shabbat and Yom Kippur be set aside when, in the opinion of a physician, their observance would endanger life. See *M. Yoma* 8:5-6 and *BT* Yoma 83b; these rules are summarized in *Shulchan Arukh* Orach Chayim 328-329 and 618.
9. *Tur* and *Shulchan Arukh*, Yore De'ah 336:1.
10. We say "predominant" because one stream of thought in the classical and (to a lesser extent) the medieval Jewish texts condemns the practice of medicine as an affront to God's sovereignty and a demonstration of lack of faith in God's power to dispense healing. For discussion, see *Teshuvot for the Nineties*, no. 5754.18, pp. 373-374, at notes 1-6. This position, fortunately, has been rejected by the halakhic mainstream; see *ibid.* at notes 7-9, as well as the above discussion.
11. *Shulchan Arukh* Yore De'ah 336:1.
12. On the attitude of Reform Judaism toward science and its procedures, see our responsum 5759.10, "Compulsory Immunization," section 3, "A Note on Scientific Evidence."
13. This is true even though many medical research studies "fail", that is, they do not yield the positive results toward new discoveries and therapies for which those who conduct the studies may have hoped. In fact, such "failures" are not failures at all. If medicine is a science, it is an *experimental* science, and fundamental to the concept of experimentation is the notion that some experiments will fail to confirm or will disprove particular hypotheses. This "failure," no less than "success," is therefore an integral part of the procedures of science.
14. "We may do anything in order to heal disease, provided that we do not violate thereby the prohibitions against idolatry, sexual immorality, or murder"; *BT* Pesachim 25a-b; *Yad*,

- Yesodei Hatorah 5:6. "Sexual immorality" is traditionally identified with the list prohibited acts of intercourse in Leviticus 18.
15. "One must submit to death rather than violate this prohibition"; *BT Sanhedrin* 74a-b.
 16. See *Teshuvot for the Nineties*, no. 5755.11, pp. 381-389.
 17. *M. Nidah* 5:3; *Yad, Rotzeach* 2:6.
 18. This term—"the sanctity of human life"—is not native to the Jewish tradition. We do not find its probable Hebrew equivalent, *kedushat hachayim*, in the Talmudic or halakhic sources. On the other hand, it reflects the conviction, most certainly present throughout Jewish thought, that human life possesses supreme value and is therefore inviolate: human life may never be taken or destroyed, save for those circumstances under which the Torah permits or mandates that outcome. One major expression of this commitment is the notion that one's life is not one's personal property, to dispose of as one wishes; rather, human life belongs to God, to Whom we are obliged to render an account for the way in which we have used it. Thus, writes Maimonides, the *beit din* is not permitted to accept a ransom from a murderer in order to spare him from execution, "for the life of the victim is not the property of the avenger (or of the court) but of the Holy One" (*Yad, Rotzeach* 1:4). In a similar vein, under Jewish law we cannot execute a wrongdoer on the evidence of his own confession. The reason for this, explains one scholar, is that "the life of the human being is not his own property but the property of God, Who said 'all lives are mine' (Ezekiel 18:4). Therefore, a person's own confession has no power to dispose of that which does not belong to him" (Commentary of R. David ibn Zimra to *Yad, Sanhedrin* 18:6). This insight is applied in contemporary halakhic writing to the issue of suicide: Jewish law cannot abide the act of suicide (and indeed presumes that the one who takes his own life has acted under supreme duress) because the human being has no right to dispose of his own life—the possession of God—in this manner (R. Ovadyah Yosef, *Resp. Yabi'a Omer* 8, Orach Chayim 37, sec. 5). And, in fact, some present-day Orthodox writers do use the term *kedushat hachayim* or "sanctity of life" as a way of expressing these ideas; see *Piskey Din Rabani'im* 1, p. 164, and J. David Bleich in Fred Rosner and J. David Bleich, eds., *Jewish Bioethics* (Brooklyn: Hebrew Publishing Co., 1985), 273. We think, therefore, that the term "sanctity" conveys an accurate description of the Jewish belief that life possesses inestimable value and must be protected as though it belongs to the God Who created it.
 19. *M. Ohalot* 7:6. Some texts, including the printed version of *BT Sanhedrin* 72b and Rashi *ad loc.*, read *roshe* ("its head") in place of *rubo* ("the major part of it").
 20. *Yad, Rotzeach* 1:9. On the law of the *rodef*, which the Rabbis derive from Leviticus 19:16 ("do not stand idly by the blood of your fellow"), see *M. Sanhedrin* 8:7 and *BT Sanhedrin* 73a.
 21. *BT Sanhedrin* 72b, s.v. *yatza roshe*.
 22. A point we have made in *Teshuvot for the Nineties*, no. 5755.13, pp. 171-176. This conclusion is shared by the *Sefer Me'irat Einayim*, Choshen Mishpat, no. 8; *Tiferet Yisrael* to *M. Ohalot* 7:6; *Chidushey R. Akiva Eiger*, *M. Ohalot* 7:6; and *Arukh Hashulchan*, Choshen Mishpat 425, no. 7. Rashi's is the better interpretation because it fits with the Mishnah's use of the word *nefesh* to describe the infant upon its emergence from the womb and not prior to that point; clearly, the fetus *in utero* is not a *nefesh*. Rambam's *rodef* explanation is difficult: if it is permissible to destroy the fetus because its birth endangers the mother's life, why are we no longer permitted to destroy it when its head or major part has emerged from the womb? Does it not continue to endanger her life? Rather, the distinction must be based upon a difference in status between fetus and mother. So long as it is *in utero*, the fetus is not a full legal person;

- hence, in a conflict between fetus and mother, the latter, who *is a nefesh*, takes precedence ("her life comes before its life"). Once it has emerged, the fetus becomes a *nefesh-i.e.*, a day-old infant, a full legal person-and has a claim to life equal to that of the mother.
23. See Exodus 21:22 and *Sefer Me'irat Einayim*, Choshen Mishpat, no. 8. *M. Nidah* 5:3 its Talmudic commentary at *BT Nidah* 44b (on Lev. 24:17) establish that "murder" applies only to the killing of a *nefesh*, *i.e.*, the day-old infant and *not* the fetus; see *Torah Temimah* to Lev. 24:17, no. 47.
 24. See *Teshuvot for the Nineties*, no. 5755.13, pp. 171-176, which discusses the line of halakhic rulings (beginning with R. Moshe Trani, d. 1639, in *Resp. Maharit*, no. 99) that permit abortions for purposes of the mother's "health" or "need," *i.e.*, in cases that fall short of mortal danger to her. All these rulings base their legal reasoning upon Rashi's interpretation of *M. Ohalot* 7:6: the fetus is not a *nefesh* and thus may be sacrificed on behalf of its mother's overriding need. In Maimonides' view, by contrast, the only warrant for abortion would seem to be the necessity of the procedure to save the mother's life.
 25. See A.S. Avraham, *Nishmat Avraham* 3, 220-222, for a summary of views. Most Orthodox *poskim* during the preceding century and more have taken the position that abortion is forbidden *de'oraita*, as a matter of Torah law. Among these is R. Issar Yehudah Unterman, *Resp. Sehevet Miyehudah* 1:29, who defines feticide as an "appurtenance" (*avizraiya*) of murder, that is, as murder in all but name. Others, however, see the prohibition as *derabanan*, based upon Rabbinic law; see, for example, R. Ben Zion Ouziel, *Resp. Mishpetei Ouziel*, Choshen Mishpat 46.
 26. See above in text and notes 20-24. Those authorities who follow Maimonides' line of reasoning tend to restrict abortion to cases in which the mother's life is endangered by the birth of the fetus, defined as a *rodef*. Those who follow Rashi, as we have seen, are more likely to permit abortion in cases where the danger to the mother is less than mortal.
 27. This is a complicated yet vitally important point of *halakhah*. The Talmud (*BT Arakhin* 7a-b) reports in the name of Shmuel that when a woman dies during labor on Shabbat a knife may be carried through the public thoroughfare (an otherwise prohibited act) in order that we may use it to cut open her womb and save the fetus. This statement is cited as *halakhah* by Rambam (*Yad*, Shabbat 2:15) and the *Shulchan Arukh* (Orach Chayim 330:5). The 8th-century Geonic work *Halakhot Gedolot* extends this provision to earlier stages of the pregnancy: "It is proper to allow a pregnant woman to eat on Yom Kippur if we know that she might miscarry if she does not eat" (*Halakhot Gedolot*, ed. Hildesheimer, 319; Venice ed., 31c). Nachmanides writes that this permit to violate the Yom Kippur prohibitions applies when the fetus, and not necessarily the mother, is endangered by fasting. "Even though the laws of *pikuach nefesh* do not in principle apply to the fetus [for the fetus is not a *nefesh* at all], we set aside the laws of Shabbat and Yom Kippur in order that it may survive to perform *mitzvot* in the future." Ramban stresses that we are obliged to override the laws of Shabbat and Yom Kippur even on behalf of the fetus that is less than forty days old, "when it possesses no vitality (*chayut*) at all" (*Torat Ha'adam*, ed. H.D. Chavel, 28-29). It should be noted that not all *rishonim* agree with Ramban's interpretation of the *Halakhot Gedolot*. R. Nisim Gerondi (Ran) declares: "these deductions are unnecessary. There is no case of danger to the fetus that is not also a case of danger to the mother" (*Commentary of Ran* to Alfasi, Yoma, fol. 3b). In other words, we set aside the laws of Shabbat and Yom Kippur *not* on behalf of the fetus (which is not a *nefesh*) but on behalf of the mother.
 28. *BT Yoma* 85b and *Shabbat* 151b, on the verse "the Israelites shall keep the

- Sabbath...throughout their generations as an everlasting covenant" (Exodus 31:16). The Talmudic references apply this midrash to persons (*i.e.*, *nefashot*) and not to a fetus *in utero*. The extension of the rule "we violate one Sabbath on its behalf" is Ramban's innovation; see *Torat Ha`adam*, 29.
29. *Contemporary American Reform Responsa*, no. 16, p. 27.
 30. *Teshuvot for the Nineties*, no. 5755.13; *Contemporary American Reform Responsa*, no. 16; *American Reform Responsa*, no. 171.
 31. *Teshuvot for the Nineties*, no. 5755.13, end.
 32. *American Reform Responsa*, no. 82; *Rabbi's Manual* (New York: CCAR, 1987), 247.
 33. *BT Yevamot 69b*. We should note that this designation is made by the *halakhah* in accordance with its own categories and frames of reference. It is not a scientific designation, *i.e.*, it is not based upon scientific observation as we understand that term today.
 34. See, for example, *ibid.* and *Yad*, *Terumot 8:3*. The *halakhah* holds that the daughter of a priest (a *bat kohen*) who marries a non-priest forfeits her right to eat of the priestly *terumah* one she becomes pregnant with her husband's child. The question is raised: why do we not forbid her to eat the *terumah* from the time of the marriage, on the grounds that she *might* be pregnant? The answer is that the law ignores the first forty days of the pregnancy, when the fetus is but "mere water" and lacks legal (if not physical) substance.
 35. R. Waldenberg's quotation is from his *Resp. Tzitz Eliezer 7:48*, ch. 1 (pp. 190-191). See also R. Ya`akov Emden, *Resp. Chavat Ya`ir*, no. 31; R. Chaim Ozer Grodzinsky, *Resp. Achiezer 3:65* (end); and R. Yechiel Ya`akov Weinberg, *Resp. Seridey Esh 3:127* (p. 341).
 36. Some *poskim*, in fact, reject the notion that the law concerning abortion is more lenient when the fetus is not yet forty days old. See R. Isser Y. Unterman (*No`am 6, 1-11*) and R. Moshe Feinstein, *Resp. Igerot Moshe*, *Choshen Mishpat 2:69*.
 37. Ramban (*Torat Ha`adam*, ed. H.D. Chavel, 29) makes this very point.
 38. *Resp. Shevet Halevy 5:47*.
 39. Wasner notes that the permit to violate Shabbat for the less-than-fortieth-day fetus is "according to the opinion of the *Halakhot Gedolot*"; he does not indicate whether he accepts that opinion as halakhically authoritative.
 40. R. Chaim David Halevy, *Sefer Assia 8* (1995), 3-4, and R. Mordekhai Eliahu, *Techumin 11* (1991), 272-273. The latter writes explicitly that it is forbidden to destroy embryos that are intended for implantation; we may discard only those embryos that will *not* be implanted and therefore have no possibility of further development.
 41. See our responsum 5757.2, "In Vitro Fertilization and the Status of the Embryo."
 42. But see our responsum 5758.3, "In Vitro Fertilization and the Mitzvah of Childbearing." Although we do see procreation as a "*mitzvah*" and although those who desire children are certainly encouraged to make use of new techniques and procedures such as IVF, they are under no obligation to do so.
 43. CCAR Responsum 5757.2, section 4.
 44. See the testimony of Rabbi Elliot Dorff and Rabbi Moshe Dovid Tendler in National Bioethics Advisory Commission, *Ethical Issues in Human Stem Cell Research: Volume Three, Religious Perspectives* (June, 2000, Rockville MD), available at www.bioethics.gov/stemcell3.pdf.
 45. Bruce M. Carlson, *Patten's Foundations of Embryology* (New York: McGraw-Hill, 1996), 3.
 46. It is crucial to note that the reason for the embryo's inferior status is the very fact that it lacks the essential quality-implantation in the womb-that would allow us to view it as a "person in

becoming" (see the responsum of R. Wasner. note 38). Let us consider, however, the following hypothetical. Suppose it were possible for scientists to develop the fertilized egg for a full nine months in a laboratory environment, without having to implant it into a womb at all. This embryonic human life would skip the fetal stage entirely. Would we say then that it lacks even the minimal status possessed by the fetus? We do not have to address ourselves to hypothetical situations, of course. But the very fact that such a prospect is imaginable suggests to us that we should take great care before dismissing the human embryo as something not worthy of a significant level of moral concern.

If needed, please consult [Abbreviations used in CCAR Responsa](#).

[Back to Responsa Home Page](#)

[Back to Responsa Index](#)



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RESOLUTION ON STEM CELL RESEARCH

67th General Assembly
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Minneapolis, Minnesota

RESOLUTION ON STEM CELL RESEARCH

BACKGROUND

Jewish tradition teaches us that preserving life and promoting health are among the most precious of values. These values have informed our affirmative commitment to medical science throughout the ages. Judaism has always encouraged scientific and medical advances. As Nachmanides taught, the practice of healing is not merely a profession, it is a mitzvah, a righteous obligation. A recent CCAR responsum applies this principle to human stem cell research: "If we define the administration of lifesaving medical therapy as *pikuach nefesh*, we should not forget that physicians could not save lives were it not for the extensive scientific research upon which our contemporary practice of medicine is based. Since research into human stem cells partakes of the mitzvah, of healing, surely our society ought to support it" (CCAR Responsum 5761.7, *Human Stem Cell Research*, Rabbi Mark Washofsky).

Continuing developments in biological science have opened the door to life-enhancing and life-saving technologies. The sequencing and mapping of the human genome, in particular, have profound implications for medical technologies. At the forefront of these possibilities is the opportunity for treating or preventing diseases through gene manipulation, often called "gene therapy." Somatic gene therapy attempts to correct a genetic defect in the cells or tissues of an individual in order to prevent or treat disease and may help heal or prevent debilitating afflictions. Somatic gene therapy should not be confused with germline therapy, which is more controversial and involves changes to an individual's genetic makeup that can then be passed on to future generations, with unknown implications and potential complications.

Stem cell research involves cells that can potentially develop into any kind of cell, tissue, or organ in the body ("totipotent stem cells") and that may one day soon be able to replace damaged or sick cells in a patient with an injury or degenerative disease. For example, scientific research into stem cell regeneration holds the promise of finding new and effective treatments for Alzheimer's, Parkinson's, spinal cord injuries, and certain types of cancers. The moral imperative to pursue stem cell research is clear; it is an embodiment of the mitzvah, of healing. Our tradition requires that we use all available knowledge to heal the ill, and "when one delays in doing so, it is as if he has shed blood" (*Shulchan Aruch, Yorei De'ah 336:1*).

Totipotent stem cells are commonly obtained by using somatic cell nuclear transfer (SCNT) technology. This technique, commonly referred to as cloning, involves the removal of the nucleus of an unfertilized, mature egg and its replacement with a genetically complete nucleus obtained from another adult or fetal organism. Since almost all of the hereditary genetic material of a cell is contained within its nucleus, the entity into which this egg develops is genetically identical to the organism that was the source of the transferred nucleus.

While some argue that stem cells harvested from adults and the existing stem cell lines are sufficient for research, most in the scientific community maintain that the use of SCNT technology to develop new stem cell lines ("embryonic stem cells") is critical to further development of the medical research. It is important to note that there are ample sources of embryos for research that are currently being discarded and that research using embryonic tissue would not require the creation of new embryos for the purpose of such research.

"Therapeutic cloning" uses SCNT technology to create cells that develop only until the pre-embryo stage, at which point the stem cells are removed. These stem cells are then used to research possible cures for serious medical diseases and conditions. In contrast, "reproductive cloning" attempts to use this technology to produce a living, breathing human being. This resolution deals with therapeutic cloning; it does not address the issue of reproductive cloning of humans.

SCNT technology can play a vital role in exploring the causes and treatment of genetic diseases; it may help to

develop therapies for the afflictions mentioned above, and it may also help develop stem cells to regenerate human tissues, nerve cells, and skin cells.

Some opponents of SCNT technology argue that every fertilized egg could be allowed to develop into a fetus. Halting the process to harvest the stem cells seems to them like killing a fetus—a perspective the URJ has never accepted. Numerous URJ, CCAR and WRJ resolutions and CCAR Responsa about when life begins clarify our views in this area. (See, for example, the 1985 and 2000 CCAR Responsa related to abortion, found on-line at www.ccarnet.org/resp.)

To other opponents, the possibility for abuse of SCNT technology seems overwhelming, and for this reason, they would prohibit the entire field of research and therapy. While we recognize the potential abuses that could arise from SCNT technology, these concerns can be met by taking measured, cautious steps and are far outweighed by the potential benefit of medical procedures that promise to cure so many. **JEWISH TRADITION TEACHES THE VALUE OF SAVING EVEN A SINGLE LIFE, AND THE CALLOUSNESS OF FAILING TO SAVE A LIFE WHEN POSSIBLE. AS WE LEARN IN THE TALMUD, "WHOEVER CAUSES THE LOSS OF A SINGLE SOUL IS AS THOUGH HE CAUSED THE LOSS OF A WORLD ENTIRE; AND WHOEVER SAVES A SINGLE LIFE IS AS THOUGH HE SAVED A UNIVERSE" (TALMUD, SANHEDRIN 37a).**

Clearly, there is a need for moral and ethical deliberation, yet we know that millions of God's children are plagued by diseases and injuries that we have the potential to heal. The ethical choice must be to advance our research into lifesaving technologies, not abandon it.

THEREFORE, the Union for Reform Judaism resolves to:

1. Support
 - a. Research using both adult and embryonic stem cells, in addition to the existing lines currently approved for funding by the United States and Canadian governments;
 - b. Research using somatic gene therapy;
 - c. Research using somatic cell nuclear transfer (SCNT) technology for therapeutic cloning; and
 - d. Government funding for all such research;
2. Oppose efforts to restrict or penalize scientists, clinicians, or patients for participating in stem cell research and SCNT technology for therapeutic purposes;
3. Support appropriate legislative and executive actions consistent with the above objectives;
4. Support efforts by the scientific community to develop regulations and monitor those using SCNT technology; and
5. Call upon congregations, in conjunction with the URJ Department of Jewish Family Concerns and the Commission on Social Action, to create educational programs that explore the issues raised by genetic technology within a framework of Jewish values.

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69

Resolutions Adopted by the UAHC

Adopted at the 62nd General Assembly
October, 1993
San Francisco, CA

FETAL TISSUE RESOLUTION

BACKGROUND

Fetal tissue is a unique substance that has been constructively used in medical research for at least sixty years. Cultures of fetal kidney cells were used in the 1950s to develop the polio vaccine. Today, critical studies which help unlock the structure of HIV utilize human fetal tissue. Such tissue can be used to make quantities of human growth hormone, hormones such as insulin, and anti-cancer substances. Highly promising transplant therapies using human fetal tissue hold out the possibility of cure or amelioration of such conditions as Parkinson's disease, type I diabetes mellitus, DeGeorge syndrome, Alzheimer's disease, spinal cord injuries, and Huntington's disease. Because fetal cells can be grown easily in the laboratory, easily frozen for future use, and do not have a true immune system which might cause rejection, they are ideal for transplant.

It is increasingly apparent for a variety of scientific and technical reasons that this tissue, to be truly efficacious, must usually be obtained from therapeutic rather than spontaneous abortions.

There is an emerging consensus of Reform Jewish authorities that tissue obtained from either therapeutic or spontaneous abortions may be used for purposes of life-saving or life-enhancing research and treatment. Jewish requirements that we use our God-given knowledge to heal people, together with the concept of *pikuach nefesh* (the primary responsibility to save human life, which overrides almost all other laws) has been used by Jewish legal authorities to justify a broad range of organ transplants and medical experimentation. These requirements likewise justify the use of fetal tissue transplants.

The scientific community was distressed by the ban on Federal funding for participation in fetal tissue research imposed by the previous administration because it placed artificial and doctrinaire obstacles to life-saving research. We commend President Clinton for lifting this ban as one of his first acts as President.

However, there are continuing questions and concerns regarding abortions and the treatment of the fetus itself which raise ethical and moral issues.

THEREFORE, the Union of American Hebrew Congregations resolves to:

1. Support the use of fetal tissue for the purpose of life-saving or life-enhancing research and treatment with the informed consent of the donor.
2. Support good faith legislation and regulations to prevent exploitation, such as a ban on the sale or purchase of fetal tissue from donors, provided that they do not conflict with our prior resolutions regarding reproductive rights.



[Back to UAHC home page](#)

U A H C

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72

Stem Cell Research

RABBI ELLIOT N. DORFF

This paper was approved by the CJLS on March 13, 2002.

The answer to question 1 received a vote of fifteen in favor and one abstention (15-0-1). Voting in favor: Rabbis Kassel Abelson, Ben Zion Bergman, Elliot N. Dorff, Paul Drazen, Robert Fine, Baruch Frydman-Kohl, Susan Grossman, Alan B. Lucas, Daniel Nevins, Paul Plotkin, Joseph Prouser, Mayer Rabinowitz, Avram Israel Reisner, Joel Rembaum, and Gordon Tucker. Abstaining: Rabbi Joel Roth.

The answer to question 2 received a vote of fourteen in favor, one against, and one abstention (14-1-1). Voting in favor: Rabbis Kassel Abelson, Ben Zion Bergman, Elliot N. Dorff, Paul Drazen, Robert Fine, Baruch Frydman-Kohl, Alan B. Lucas, Daniel Nevins, Paul Plotkin, Joseph Prouser, Mayer Rabinowitz, Avram Israel Reisner, Joel Rembaum, and Gordon Tucker. Voting against: Rabbi Susan Grossman. Abstaining: Rabbi Joel Roth.

שאלה

1. May embryonic stem cells from frozen embryos originally created for purposes of procreation or embryonic germ cells from aborted fetuses be used for research?
2. May embryonic stem cells from embryos created specifically for research, either by combining donated sperm and eggs in a petri dish or by cloning be used for research?

תשובה

The Current State of the Science of Stem Cells

Definitions and Properties

What are stem cells, and why are we interested in doing research on them? The following paragraphs that answer those questions are quoted from a document issued in May, 2000 by the Director of the National Institutes of Health entitled "Stem Cells: A Primer":¹

Stem cells are best described in the context of normal human development. Human development begins when a sperm fertilizes an egg and creates a single cell that has the potential to form an entire organism. This fertilized egg is **totipotent**, meaning that its potential is total. In the first hours after fertilization, this cell divides into identical totipotent cells. This means that either one of these cells, if placed into a woman's uterus, has the potential to develop into a fetus. In fact, identical twins develop when two totipotent cells separate and develop into two individual, genetically identical human beings. Approximately four days after fertilization and after several cycles of cell division [up to the 32-cell stage], these totipotent cells begin to specialize, forming a

The Committee on Jewish Law and Standards of the Rabbinical Assembly provides guidance in matters of halakhah for the Conservative movement. The individual rabbi, however, is the authority for the interpretation and application of all matters of halakhah.

hollow sphere of cells, called a blastocyst. The blastocyst has an outer layer of cells, and inside the hollow sphere there is a cluster of cells called the inner cell mass.

The outer layer of cells [the “trophectoderm”] will go on to form the placenta and other supporting tissues needed for fetal development in the uterus. The inner cell mass cells will go on to form virtually all of the tissues of the human body [in a process that begins with “gastrulation” during the period between 16 and 22 days of gestation]. Although the inner cell mass cells can form virtually every type of cell found in the human body, they cannot form an organism because they are unable to give rise to the placenta and supporting tissues necessary for development in the human uterus. These inner mass cells are **pluripotent** – they can give rise to many types of cells but not all types of cells necessary for fetal development. Because their potential is not total, they are not totipotent and they are not embryos. In fact, if an inner cell mass cell were placed into a woman’s uterus, it would not develop into a fetus.

The pluripotent stem cells undergo further specialization into stem cells that are committed to give rise to cells that have a particular function. Examples of this include blood stem cells which give rise to red blood cells, white blood cells and platelets; and skin stem cells that give rise to the various types of skin cells. [Muscle, cartilage, bone, liver, brain, and fat are other examples of adult stem cells.] These more specialized stem cells are called **multipotent**.

Two things should be noted. First, the word “adult” as used in the phrase “adult stem cells” refers to any person after birth. Thus adult stem cells from infants can and have been used to cure leukemia in siblings, for example. Some very recent research suggests that some adult stem cells may be pluripotent. *Nothing in this responsum should suggest that research on adult stem cells should be abandoned; on the contrary, every effort should be expended to use adult stem cells for as many cures as possible.* It should not, however, lead us to abandon embryonic stem cell research, for that still holds out more hope to accomplish all the uses described in the next section.

Second, in normal human development, embryonic stem cells create the various organs and tissues of the body *and then turn off*; otherwise, we would have multiple heads, legs, hearts, etc., and it is questionable whether the uterus would be able to hold a human being or give birth to one. Unlike human fetal development, scientists are interested in removing embryonic stem cells to create stem cell lines, which would theoretically multiply stem cells indefinitely — although stem cells naturally “senesce” after dividing up to 100 times. Scientists then want to learn how to transform stem cells into needed tissues or organs and how to stop them when they reach the desired state.

In addition to embryonic stem cells, scientists are interested in embryonic germ (EG) cells. Those are cells from the gonadal ridge in the early embryo that in the process of the fetus’ development are set aside and protected from maturing. They migrate through the fetus to the ovary or testes, where they form the egg and sperm cells. If removed from the fetus and grown in culture, they behave much like embryonic stem cells.

Potential Uses of Stem Cells

Adult stem cells, which are normally used by the body for maintenance, have already proven useful in drug development, in treatment of diseases like osteoporosis and leukemia, and in cardiac and cartilage care. Research into further potential uses of adult stem cells in blood, skin, and other parts of the body should certainly go forward.

Scientists, though, are especially interested in doing research on the cells normally used by the body for development, i.e., our embryonic stem cells (ES) and our embryonic germ cells (EG). While some adult stem cells *may* be pluripotent, most have been differentiated to the point that they can only produce other cells like

themselves (they are only “multipotent”), with minimal ability to transform into other kinds of cells. In contrast, embryonic stem cells can and do convert into all of the tissues of the body (they are “pluripotent”). Because ES cells have this greater ability to mutate, scientists engaged in research on them hope, according to the N.I.H. document quoted above, to learn or do at least the following three things:

A. Learn About the Process of Cell Specialization

How do stem cells decide which tissues to become and how many to make of each type of tissue? We know that turning genes on and off is central to the process of human development, but we do not know much about how these decisions are made in the process of human development or how stem cells are turned on or off. Some of our most serious medical conditions, such as cancer and birth defects, are due to abnormal cell specialization and cell division. A better understanding of normal cell development is necessary for scientists to learn what goes wrong with cells when cancer or birth defects occur so that hopefully some day such abnormal developments can be arrested and reversed.

Because of their level of differentiation, adult stem cells seem to be a much less likely source for gaining this knowledge than embryonic stem cells promise to be. Thus even if adult stem cells can ultimately be used for the other two purposes listed below, embryonic stem cell research will be necessary to accomplish this end. Furthermore, even with some preliminary results indicating that some adult stem cells may be pluripotent, embryonic stem cell research still holds out greater hope for these other two purposes as well.

B. Test Drugs More Safely and Efficiently

Research on pluripotent human stem cells could also dramatically change the way we develop drugs and test them for safety. New medications could be initially tested using human cell lines before testing them on human beings.

I am currently serving on the National Human Resources Advisory Commission of the Department of Health and Human Services, whose mandate is to review and revise the federal guidelines for research on human subjects. Widely publicized fatal experiments that killed Jesse Gelsinger at the University of Pennsylvania and Ellen Roche at the Johns Hopkins Medical Center have brought to light other questionable practices used by pharmaceutical companies and academic medical centers in testing drugs. The pressures to gain reputation and money in this field are enormous, and so strict requirements to protect human subjects are necessary.

On the other hand, we all have benefitted immensely from the breakthroughs in drugs during the last six decades, beginning with penicillin in 1938, and that can only happen if drugs are ultimately tested for their safety and effectiveness on human beings. Moreover, virtually all of the drugs that are used in treating children or pregnant women have never been tested on those subsets of the general population for fear of legal liability; as a result, for such people physicians guess about the proper dosages and effects of drugs approved for non-pregnant adults, essentially using all of their patients as research subjects. That means that children and pregnant women are either denied the use of drugs that could help them or subjected to what might be dangerous or ineffective therapies.

The ability to test drugs on pluripotent stem cells will not replace the need to test them in animals and human beings, but it would streamline the process of drug development and make it much safer. Only the drugs proven to be safe and effective in cell line testing would graduate to further testing in laboratory animals and ultimately in human subjects. Specialized, multipotent cell lines like cancer cells are already being used in this way; testing pluripotent embryonic stem cells would affect a much wider group of cell types, providing the potential of more streamlined and safe drug development for many more human maladies. (In an oral presentation I heard at the offices of the American Academy for the Advancement of Science, Dr. Alan Guttmacher maintained that research in the future will not be done in laboratories altogether; it will be done instead on a computer, where cells can be quickly analyzed and changed. Exactly how this will affect the need to test the

safety and efficacy of drugs on humans is unclear.)

C. Develop Cell Therapies

Organ transplantation is currently the only way to help people whose heart, lungs, liver, or kidneys no longer work, and skin grafts are our only way to treat serious, even life-threatening burns. While the first organ transplants of kidneys go back to 1951,² organ transplantation was made much safer with the approval of cyclosporine in 1983 and other immunosuppressive drugs later on so that the immune system of the recipient would not reject the organ. Still, recipients commonly need to take such drugs for the rest of their lives, and, in any case, the shortage of organs for transplant means that thousands of people who need a transplant die each year for lack of one.

Pluripotent stem cell research has the potential to resolve this problem of shortage. Once we know how to direct such cells to create specific kinds of cells and how to turn them on and off, we have the potential of using them to create whatever organs are needed. Note that at least initially we will *not* want to implant stem cells because as the technology develops it will be much harder to control their growth once implanted than it will be outside the body; indeed, in the early stages of research in how to turn off stem cells, implanting them might very well produce tumors. We rather want to implant cells developed further into the desired organ or tissue.

Because human pluripotent stem cells derived from embryos or fetal tissue would be genetically different from the recipient, we would still need to resolve the problem of immune rejection. In addition to (i) the drug therapies currently available, pluripotent stem cell research holds out the possibility of (ii) modifying stem cells to minimize incompatibility or (iii) creating tissue banks with the most common tissue-type profiles. (iv) Another approach would be to use cloning techniques — that is, somatic cell nuclear transfer (SCNT). For example, if a person has progressive heart disease, the nucleus of any cell from his or her body (a “somatic cell” — that is, from anywhere other than from egg or sperm) would be implanted into a donor egg cell from which the nucleus had been removed. With proper electrical or chemical stimulation, the cell would develop into a blastocyst, and cells from the inner cell mass could be taken to create a culture of pluripotent cells, which, in turn, could be stimulated to develop into heart muscle cells. Because the vast majority of the genetic information is contained in the nucleus, these cells, when transplanted back into the patient, would be much less likely to be rejected.

Furthermore, stem cell therapies may cure conditions that organ transplantation has not yet been able to cure. Specifically, scientists hope to use cell therapies to cure Parkinson's and Alzheimer's diseases, spinal cord injuries, strokes, burns, heart diseases, diabetes, osteoarthritis, and rheumatoid arthritis. Preliminary work in mice and other animals has already demonstrated that healthy heart muscle cells transplanted into a diseased heart successfully repopulate the heart tissue and work together with the host cells to repair diseased heart muscle; it is therefore not simply a “pipe dream” to imagine that the same kind of therapy might work in humans. Moreover, there is already evidence that transplantation of either the entire pancreas or isolated islet cells could mitigate the need for insulin injections in those who suffer from diabetes; islet cells derived from human pluripotent stem cells could be used for such purposes without having to wait for a donated organ. ES cells may also enhance the ability of adult stem cells to overcome diseases like leukemia because they are more regenerative than adult stem cells.

Sources of Embryonic Germ and Stem Cells.

Embryonic germ and stem cells may be derived from any of the following sources:

A. Aborted Fetuses

Dr. Gearhart, one of the two physicians who first isolated pluripotent stem cells, derived them from aborted fetuses. He obtained informed consent from the donors after they had independently decided to

terminate their pregnancies. Dr. Gearhart took cells from the region of the fetus that was to develop into testes or ovaries (EG cells).³

This method, of course, immediately raises the issue of the conditions under which abortion is permitted, if ever. Moreover, the Food and Drug Administration requires patient identification for fetal tissue, and that makes it harder to procure fetal tissue because some women do not want it known that they had an abortion. That would be particularly true of adolescent or teenage mothers or those who are members of religious communities opposed to abortion.

Thus, in the context of America's past and current "abortion wars," the fetal source of embryonic germ cells is not likely to be approved for government-sponsored research. Nevertheless, private companies may and have used this source.

This, of course, raises another set of problems, for now the academic centers and private companies that have developed the methods for producing stem cells have patented those methods. Specifically, based on Dr. Thomson's work at the University of Wisconsin, the Wisconsin Alumni Research Foundation (WARF) holds the patent on embryonic stem cells (ES) and on the methods for obtaining them, and WARF has licensed Geron Corporation to develop commercial uses for stem cells. Similarly, based on Dr. Gearhart's work, Johns Hopkins has the patent on embryonic germ cells (EG) and has licensed commercial development to Geron. Had the federal government funded this research in the first place, it is likely that no patent would have been granted.

Given the federal government's skittishness on abortion, it is surprising but nonetheless true that federal funding is available for research on fetal tissue, not only in developing uses for it but even in procuring it — although not, strangely, for transplanting it. In fact, scientists may get federal funding to develop new germ cell lines from aborted fetuses, even though they cannot do so if the source is an embryo in a petri dish.⁴ All of this means, though, both that as long as stem cell production is legal in the United States (there are proposals in Congress to make it illegal), it will be done solely by private companies and also that researchers in this area may well move to places like England, Japan, and Israel, all of which have taken stands much more supportive of stem cell research in all of its facets. One of the major researchers in this field from the University of California at San Francisco has already moved to England. EG cells, though, are not as flexible as ES cells are, and you cannot study early cell development to learn about normal and abnormal cell differentiation on the basis of EG cells since they have already become germ cells.

All of this means, though, both that as long as embryonic germ and stem cell production is legal in the United States (there are proposals in Congress to make it illegal), it will be done solely by private companies and also that researchers in this area may well move to places like England, Japan, and Israel, all of which have taken stands much more supportive of stem cell research in all of its facets. One of the major researchers in this field from the University of California at San Francisco has already moved to England.

B. Frozen Embryos Destined to be Discarded

Dr. James Thomson, the other scientist who first isolated embryonic stem cells, derived his from frozen embryos destined to be discarded. That is, when couples have difficulty conceiving a child, after less technological methods of assisting them are tried, doctors now commonly use *in vitro* fertilization (IVF) — that is, fertilization in a glass dish. If both members of the couple can produce viable gametes (their infertility problem arises from something else), the sperm of the husband is united with the egg of the wife in a petri dish and nurtured there for four or five days. It is then implanted into the uterus of the woman. Because the woman must undergo a procedure to retrieve her eggs, she is generally hyperovulated with drugs to procure many eggs at once so that she need not go through the procedure any more times than necessary. Some (typically three) of the embryos created by this method are then implanted in the woman's uterus with the hope that one or more of them will ultimately develop into a baby. Alternatively, if the couple cannot produce viable sperm or eggs, a donor's gametes may be used. In the meantime, the remaining embryos are frozen and kept in an embryo

bank. When the couple has had as many children as they plan to have, they generally ask that the remaining frozen embryos be destroyed so that they no longer have to pay for the frozen storage. Dr. Thomson gained the informed consent of couples about to have their frozen embryos destroyed to use them instead for medical research. He then isolated the inner cell mass and cultured these cells, producing a pluripotent stem cell line.⁵ It is this method that most scientists interested in carrying out embryonic stem cell research plan on using.

C. Stem-Cell "Farms"

Couples, though, may not agree to have their frozen embryos used for medical research. After all, producing embryos for infertility treatments in the first place is both expensive and emotionally draining for the infertile couple. (Typical costs include \$10,000 a month for the fertility center, including the medical team that works to induce the woman's ovaries to produce eggs and the team of embryologists that labors in a tension-filled atmosphere to manipulate the microscopic eggs to produce an embryo, and \$3,200 a month for drugs.) As Dr. Jacques Cohen, director of research at St. Barnabas Medical Center in Livingston, NJ, pointed out, an infertile couple's decision to keep their frozen embryos is not so different emotionally from a fertile couple's decision not to be sterilized after their family is completed; in both cases, the couples want to hold on to their potential for future fertility, even if they are not likely to use that potential.

Moreover, embryos that come from infertile couples have used the eggs of older women who had difficulty conceiving, and such embryos are less likely than younger eggs to grow into blastocysts producing stem cells. In addition, until recently frozen embryos were put into solutions that were not optimal. Thus Dr. Barry Behr, who directs the *in vitro* fertilization laboratory at Stanford University and at four other California fertility centers, said that "...the vast majority of embryos that are frozen are not good. If we thawed 10,000 embryos, we would get 100 or so that are viable blastocysts."⁶

In the midst of the recent debate, the Jones Institute for Reproductive Medicine of Eastern Virginia Medical School revealed that it had procured sperm and eggs from donors who had expressly agreed that their gametes would be used not to overcome infertility but for medical research. The embryos were ideal, made from the eggs and sperm of young and healthy volunteers and never frozen. Even so, Dr. William Gibbons, a reproductive endocrinologist there, reported that only 3 out of 110 embryos yielded stem cells.⁷ Their very effort to create embryos intentionally for research raised a storm of protest. Indeed, years earlier, an advisory panel for the National Institutes of Health published a report on December 4, 1994 recommending that creation of embryos specifically for research be allowed, but that very evening President Clinton declared that it would not be.

While 80% of human concepti never survive to birth in normal human reproduction, it is one thing if nature destroys an embryo and quite another for human beings to take the moral responsibility to do so. Indeed, ever since 1995, appropriations bills for the National Institutes of Health have included a clause prohibiting NIH from funding any research that destroys a human embryo. Since stem cells are not embryos, the federal government *may* fund research on applications of stem cells, but it may not fund research that produces stem cells if, as most methods require, that involves destroying an embryo.

D. Somatic Cell Nuclear Transfer (SCNT)

Another possible way for obtaining pluripotent stem cells is through the technique that has been used for cloning plants and animals. Specifically, in studies with animals using SCNT, researchers take a normal animal egg cell and remove the nucleus (which contains the animal's chromosomes). The material left behind in the egg cell contains nutrients and other energy-producing materials that are essential for embryo development. Then, a somatic cell – any cell other than an egg or a sperm cell – is placed next to the egg from which the nucleus has been removed, and the two are fused using specifically developed laboratory techniques. The resulting fused cell and its immediate descendants, are believed to have the full potential to develop into an entire animal and hence are totipotent. If they indeed are, then they will develop a blastocyst, from which the

inner cell mass can be extracted as a source of pluripotent, embryonic stem cells. This method, described in the federal government's document on stem cells,⁸ is at best a possible source of stem cells; to date it has not actually been used to produce any.

E. Extracting a Cell From an Embryo

Instead of using the entire embryo for stem cells, one possibility suggested to me by Dr. Spencer Gilbert, a friend in California, is an offshoot of a process already in use for another purpose. When a family has a history of a genetic disease, geneticists can take one cell (a "blastomere") from an eight-cell embryo and test it for that disease ("pre-implantation genetic analysis"). Then, if a couple has produced a number of embryos through IVF, doctors can choose to implant only those embryos that will not have (or even carry) the disease. The remaining seven cells are fully capable of producing a full human being. But using the same technique, one cell could be taken from an embryo and might possibly be used instead to generate a full line of stem cells. Since this method does not destroy the embryo, as the use of the full frozen embryo does (method [b] above), it may be more acceptable as a source of lines of stem cells to those, like the Catholic Church, who object to destroying an embryo, even one in a petri dish. On the other hand, since a cell at this stage may itself, if implanted in a woman's womb, grow into a full human being, this method may not satisfy those objections. Moreover, at a conference at the offices of the American Association for the Advancement of Science, though, Dr. John Gearhart, who specializes in embryonic stem cell research, said that Dr. Gilbert's suggestion, while tempting, is impossible because if you extract a blastomere and culture it, it will divide once or twice but it will stop reproducing before forming a blastocyst and therefore cannot generate a stem cell line. According to Dr. Gearhart, at the two-cell stage you indeed could take one and it would produce a blastocyst and stem cells — but, again, that would not circumvent the objections of those who construe an embryo as a full human being. Still, the state of science on parthenogenesis is very much in flux, as it is on many of these techniques, and so some day parthenogenesis may become a possible source of stem cells.

F. The Egg Cell Alone.

Dr. Jerry Hall, of the Institute of Reproductive Medicine and Genetic Testing in Los Angeles, has developed yet another technique. By shooting an electric stream through an egg, the egg can be fooled into thinking that it has been fertilized, and it alone begins to produce a blastocyst. This process of parthenogenesis has no possibility to produce a human being, for lacking fertilization by a sperm the blastocyst dies within a few days. Still, during the brief time it exists, the blastocyst so created can, Dr. Hall says, create a line of embryonic stem cells. This would presumably avoid the Catholic Church's objections to the use of embryos, and it would certainly avoid objections by Catholics, Jews, and others to the use of aborted fetuses. It is, however, a very new procedure, and it has yet to be tested widely.

A Jewish Perspective on Stem Cells: Fundamental Theological Principles⁹

1. The Jewish tradition uses both theology and law to discern what God wants of us. No legal theory that ignores the theological convictions of Judaism is adequate to the task, for such theories lead to blind legalism without a sense of the law's context or purpose. Conversely, no theology that ignores Jewish law can speak authoritatively for the Jewish tradition, for Judaism places great trust in law as a means to discriminate moral differences in similar cases, thus giving us moral guidance. My understanding of Judaism's perspective on stem cell research therefore will, and must, draw on both theological and legal sources.

2. Our bodies belong to God; we have them on loan during our lease on life. God, as owner of our bodies, can and does impose conditions on our use of our bodies. Among those is the requirement that we seek to preserve human life and health (*pikkuah nefesh*). As a corollary to this, we have a duty to seek to

develop new cures for human diseases

3. The Jewish tradition accepts both natural and artificial means to overcome illness. Physicians are the agents and partners of God in the ongoing act of healing. Thus the mere fact that human beings created a specific therapy rather than finding it in nature does not impugn its legitimacy. On the contrary, we have a duty to God to develop and use any therapies that can aid us in taking care of our bodies, which ultimately belong to God.

4. At the same time, all human beings, regardless of their levels of ability and disability, are created in the image of God and are to be valued as such.

5. Moreover, we are not God. We are not omniscient, as God is, and so we must take whatever precautions we can to ensure that our actions do not harm ourselves or our world in the very effort to improve them. A certain epistemological humility, in other words, must pervade whatever we do, especially when we are pushing the scientific envelope, as we are in stem cell research. We are, as Genesis says, supposed to work the world *and* preserve it;¹⁰ it is that *balance* that is our divine duty.

6. Animals are part of God's world and deserve to be protected from pain whenever we interact with them as much as possible (*tza'ar ba'alei hayyim*). Only human beings, however, are created in the image of God, and so we may and should use animals for medical research before we experiment on human beings. That is, of course, accepted medical practice in North America and elsewhere. Both because the Jewish tradition requires it and because the research methods scientists use demand it as well, this responsum will assume that scientists have done all their initial experiments of any proposed therapy on animals and turn to using human cells only when they have learned all they can from animal experiments and when those experiments suggest good reasons to hope that the therapy will work in humans.

Jewish Views of Genetic Materials

A. Since human embryonic germ (EG) cells may be procured from aborted fetuses, the status of abortion within Judaism immediately arises. That, in turn, depends on the way that the Rabbis viewed gestation. During most of gestation — specifically from the 41st day until birth — the Rabbis classify the fetus as “the thigh of its mother.”¹¹ Neither men nor women may amputate their thigh at will because our bodies belong to God, we have them on trust during our lives, and hence we are forbidden to inflict injuries on ourselves.¹²

On the other hand, if the thigh turns gangrenous, then both men and women have the positive duty to have their thigh amputated in order to save their lives. Similarly, if the woman's life or health is at stake, an abortion *must* be performed to save the life or the physical or mental health of the woman, for she is without question a full-fledged human being with all the protections of Jewish law, while the fetus is still only part of the woman's body.

When there is an elevated risk to the woman beyond that of normal pregnancy but not so much as to constitute a clear threat to her life or health, abortion is permitted but not required; under such circumstances (e.g., if the woman has diabetes), the woman should assess the risks of carrying the baby to term in consultation with the father, other members of her family, her physician, her rabbi, and anyone else who can help her grapple with the many issues involved in her particular case, and then she may decide to take the risks involved or to abort the pregnancy. This intermediate category, where abortion is permitted but not required, would include cases where the fetus poses serious threats to the mother's mental health, as, for example, if the fetus was conceived through incest or rape. In such circumstances, the woman may choose to abort, or, alternatively, because the child poses no physical risk to her beyond that of normal pregnancy, she may choose to

carry the child to term and give it up for adoption or even raise it herself. Some recent authorities, including the Conservative Movement's Committee on Jewish Law and Standards, would also permit abortions in cases where testing indicates that the fetus is "severely defective," suffering from serious malformations or terminal diseases like Tay-Sachs.

Where no physical or mental risk exists beyond that of normal pregnancy, though, Jewish law would forbid abortion, not as an act of murder, but as an act of self-injury. Thus Jewish law would forbid abortion on demand (i.e., because the couple simply does not want another child) or for economic reasons. Those are good reasons to use birth control, but not to abort.

In sum, the official statement on abortion of the Committee on Jewish Law and Standards says this:

Jewish tradition is sensitive to the sanctity of life, and does not permit abortion on demand. However, it sanctions abortion under some circumstances because it does not regard the fetus as an autonomous person. This is based partly on the Bible (Exodus 21:22-23), which prescribes monetary damages where a person injures a pregnant woman, causing a miscarriage. The Mishnah (*Ohalot* 7:6) explicitly indicates that one is to abort a fetus if the continuation of pregnancy might imperil the life of the mother. Later authorities have differed as to how far we might go in defining the peril to the mother in order to justify an abortion. The Rabbinical Assembly Committee on Jewish Law and Standards takes the view that an abortion is justifiable if a continuation of pregnancy might cause the mother severe physical or psychological harm, or when the fetus is judged by competent medical opinion as severely defective. The fetus is a life in the process of development, and the decision to abort it should never be taken lightly. Before reaching her final decision, the mother should consult with the father, other members of her family, her physician, her spiritual leader and any other person who can help her in assessing the many grave legal and moral issues involved.

13

The upshot of the Jewish stance on abortion, then, is that *if* a fetus had been aborted for legitimate reasons under Jewish law, then the aborted fetus may be used to advance our efforts to preserve the life and health of others. In general, when a person dies, we must show honor to God's body by preparing it for burial and burying it as soon after death as possible. To benefit the lives of others, though, autopsies may be performed when legally required or when the cause of death is not fully understood, and Jews are urged to make their organs available for transplant to enable other people to live.¹⁴ If we may and even should use the bodies of human beings to enable others to live, how much the more so may we use a part of a body — in this case, the fetus — for that purpose.

This all presumes, though, that the fetus was aborted for good and sufficient reason within the parameters of Jewish law. American and Canadian law permits the mother to abort at will during at least the first two trimesters, while Jewish law permits abortion only under the more restrictive conditions described above. Thus undoubtedly some North American Jews abort their fetuses for reasons not justified by Jewish law. While in North America one can presume that the majority of aborted fetuses are not Jewish, the Rabbis understand the Noahide Covenant, given to all descendants of Noah, to forbid abortion altogether or, according to another opinion, to allow it only if the mother's life is at stake.¹⁵ Non-Jews in North America also abort for many other reasons. Thus one might think that doing research using embryonic stem cells from aborted fetuses would constitute a *mitzvah ha-ba'a b'aveirah*, a commanded act accomplished through a sin, and thus using the materials themselves would be forbidden.

The Talmud, though, restricts that consideration to prohibiting the people who committed the wrongful act from benefitting from it; after the fact, the Talmud specifically permits the community to benefit from such a

sin in performing a commanded act of its own, a *mitzvah d'rabbim*.¹⁶ Thus even if Jewish law would not condone the particular abortion, once it has been done we may use the aborted fetus for a sacred purpose like curing diseases and saving lives. Using aborted fetuses to do *research* is not as directly and clearly permitted as using them for the cures themselves once they have been developed; but since aborted fetuses would otherwise just be discarded or buried, we may and should extend the permission to use them for research that holds out the hope for curing diseases and saving lives.¹⁷ What is critical here is what the Talmud states and what Rabbi Bleich recognizes, namely, that the results of a prohibited act may be used for sacred purposes without in any way condoning the prohibited act. Moreover, in our case, at least some, and perhaps many, of the aborted fetuses may have been aborted for reasons approved by Jewish law.

In sum, then, if a fetus was aborted in accordance with the dictates of Jewish law, we clearly have the right to use it for research purposes. Even if it was not aborted for reasons sanctioned by Jewish law, there are sufficient grounds in Jewish law to permit using it for research intended to produce cures for human ailments.

B. Stem cells for research purposes, though, can also be procured from sperm and eggs mixed together in a petri dish and cultured there. In fact, in light of the controversial nature of abortion in the United States, scientists are much more interested in harvesting stem cells from embryos created by couples in the process of using *in vitro* fertilization and other treatments to overcome infertility that have been frozen until such time that the couples decide to use them. Some couples ultimately decide never to use some of their frozen embryos, either because they have already had as many children as they want or because they have given up in their effort to bear a child. Some of those are, in turn, willing to donate their frozen embryos to research rather than simply discarding them. This, then, raises the question of the status of such early embryos in Jewish law.

According to the Talmud, during the first forty days of gestation, the embryo is "simply water."¹⁸ That is because, as the Mishnah asserts, "a woman who miscarries [up to or] on the fortieth day need not worry that she has delivered a child [for which she has to observe the special period of impurity after the birth of a child, for]...the Sages say, the creation of both the male and the female takes place on the forty-first day."¹⁹ Furthermore, according to the Mishnah, "Anything that does not have the form of a child is not a child,"²⁰ and thus an embryo before the forty-first day, which is without a form, is not a child. Maimonides calls upon his medical experience in saying that even on the forty-first day the figure of a human being is "very thin," and that within forty days "its shape is not yet finished."²¹ Similarly, the *Shulhan Arukh* specifies that it is a vain prayer (*tefillat shav*) if a man prays after the fortieth day that his pregnant wife be carrying a boy, for by the forty-first day the gender of the child had already been determined.²²

In our own day, when we understand that the fertilized egg cell has all the DNA that will ultimately produce a human being, we must clearly have respect for human embryos and even for human gametes alone (sperm and eggs), for they are the building blocks of human procreation. This is generally understood to entail a ban on abortion except for therapeutic purposes even during the first forty days. Indeed, our tradition demands that we have respect even for inanimate objects such that we refrain from destroying them unnecessarily (*bal tashh it*),²³ and if that is true, how much the more so must we respect animate and living substances such as human cells. Even the prohibition against destroying inanimate objects has its limits, though; we may, after all, use inanimate objects for our purposes, and we may even kill plants and animals for food. Thus the question is this: even if we may ultimately use embryonic stem cells for research, what level of respect should we ascribe to them, especially those outside the womb where they have no potential for becoming a human being, and how should that level of respect find expression in action?

We can, but we should not, say, in a positivistic mode, that since the sources of Jewish law never talk about embryos outside the womb, no law exists on the subject, and we may do with them whatever we wish. Such an approach is an irresponsible way to approach Jewish sources, for it makes the Jewish tradition irrelevant to many modern issues not contemplated in the past. That does a disservice to both the Jewish tradition and to contemporary Jews trying to live by it. Where no precedents on point exist, we must rather

seek to apply foundational Jewish concepts and values to the new case. People can, of course, disagree as to which concepts are relevant or how to apply them, but Jewish law is no stranger to disputes even when rabbis are reading and weighing precedents that are on point to the case at hand. For that matter, determining whether or not existing precedents are relevant is itself a matter of judgment. Still, when past rulings do not seem to give moral or legal direction, identifying Jewish concepts and values that can reasonably apply to the case at hand is the proper method to use, for it has the advantage of enabling the tradition to speak to new circumstances in a way that, while not a direct conclusion from the tradition, is strongly rooted in it.²⁴

In this case, the Rabbis' classification of a fetus in the uterus up to forty days of gestation as "simply water" is a good precedent for us to consider in determining the status of such a fetus outside the womb, but only if modern science does not undermine the basis for seeing the embryo that way and, on the contrary, suggests some grounds for that talmudic perception. If, instead, that is only outdated science, we cannot reasonably rely on that rabbinic precedent.

As it happens, modern science provides good evidence to support the Rabbis' understanding. As Rabbi Immanuel Jakobovits noted long ago, the Rabbis' "forty days" is, by our obstetrical count, approximately fifty-six days, for the Rabbis counted from the woman's first missed menstrual flow, while doctors today count from the point of conception, which is usually about two weeks earlier.²⁵ By 56 days of gestation by obstetrical count the basic organs have already appeared in the fetus. Moreover, we now know that it is exactly at eight weeks of gestation that the fetus begins to get bone structure and therefore looks like something other than liquid.²⁶ Indeed, the Rabbis probably came to their conclusion about the stages of development of the fetus because early miscarriages indeed looked like "merely water," while those from 56 days on looked like a thigh with flesh and bones. For that matter, even the Rabbis who proclaimed the embryo in the first forty days to be "simply water" clearly were announcing an analogy and not an equivalence, for they clearly knew that from that water a child might develop, unlike any glass of drinking water!

Thus while we should have respect for gametes and embryos in a petri dish as potential building blocks of life, they may be discarded if they are not going to be used for some good purpose. If an embryo during the first forty days of gestation is "simply water," an embryo situated outside a woman's womb, where it cannot with current technology ever become a human being, surely has no greater standing; it is *at most* "simply water." Therefore, when a couple agrees to donate such embryos for purposes of medical research, our respect of such pre-embryos and embryos outside the womb should certainly be superceded by our duty to seek to cure diseases. Finally, because the embryo in the first 40 days is "simply water" and "not a child," and all the more so in the first 14 days, when stem cells would be removed for research, our duty to seek to cure diseases provides ample warrant, in my opinion, for removing the inner cellular mass in the first place so that stem cell research can go forward. In doing so, we are not killing a human being, as we would be if we were to remove a person's heart before death; we are rather taking a part of an object that has not yet achieved the status of a formed fetus, let alone a human being.

What would happen, though, if we could gestate a human being entirely outside a woman's womb in some sort of machine? Infertile couples who can produce sperm and eggs but cannot carry a baby to term might indeed be highly interested in such a possibility. Would that change our perception of the fetus during its first days of gestation?

The problem is more theoretical than real, for it would take considerable time, effort, and money to develop such a machine. At this time, we do not know enough of what happens *in utero* even to know what we should try to reproduce artificially, let alone have the ability to do that. Moreover, given the options of surrogate mothers and adoption, and given the inevitably great cost of developing and then using such a gestation machine, it is not likely that such machines will be available for quite some time.

Second, it is important to note that the wisdom and authority of moral and legal decisions depend critically on their context. Sexual intercourse, for example, is both a good and, indeed, a commanded act in the context of marriage, but it becomes one of the three things that we Jews are commanded never to do, even on

pain of death, if it is in the context of adultery or incest. Similarly, *at this time*, at least, we can and must say that an embryo outside a woman's womb is relevantly different from an embryo within a woman's womb. If and when we develop the ability to gestate a person outside a woman's womb, then the physical location of an embryo in a petri dish may cease to have as much import as it does now, but that would be a *different* context requiring a new weighing of the evidence.

The most important thing to note, though, is that I am not basing my argument for seeing the embryo as less than a person solely on the basis of where the embryo in a petri dish happens to be. Rather, characteristics of the early embryo itself argue for assigning it the status of "mere water." Specifically, to procure stem cells scientists can use only embryos during the first fourteen days of gestation, for then the neural streak, which later develops into the spine, appears. During that early period, the embryo in a petri dish can be distinguished from a human being not only according to its location outside of a womb and its resulting inability to develop into a human being (that is, its lack of human potential), but also by *its low level of cell organization, the short period of time that it will remain in this state, and its incapacity to live on its own*. Thus if very good scientific reasons support the talmudic precedent to classify an embryo of up to forty days to be "mere water," an embryo of fourteen days of gestation or less is even more justifiably classified as that, even if it were within a woman's uterus, and how much the more so outside one. At no point during those fourteen days, then, do stem cells become a human entity, and so stem cell research represents an enormous good at no human price. (In contrast, we regularly use full human beings in medical research because animal research alone cannot guarantee the safety and efficacy of medications for human beings. While we take safeguards to protect the human subjects in such research, people in recent cases at the University of Pennsylvania and Johns Hopkins University have died as part of such research, as I indicated earlier. Stem cell research poses no such risks to human beings.) Thus even if it were possible to gestate a human being mechanically, we would still have good reason to classify an embryo during the first forty days as "simply water" and thus to use it for stem cell research.

In sum, then, frozen embryos originally created for purposes of overcoming infertility but which the couple no longer intends to use for that purpose may be discarded, but they may also be used for good purposes. One such purpose is to produce stem cells for medical research (scenario A-3-b above). Indeed, couples should be encouraged to donate their extra embryos — and any fetuses that they abort — to such efforts. Donating such materials for purposes of research is minimally an act of *hesed*, of loyalty and love, and possibly, given its goal of cure, even a *mitzvah*. This is *not* to say that men or women are duty-bound to donate their sperm or eggs for this purpose, although that is laudable; it is only to say that when they have frozen fertilized eggs or aborted fetuses that they would otherwise discard, it is at least an act of *hesed*, possibly a *mitzvah*, to donate such products to stem cell research. We rabbis need to educate our laity to the goodness and possibly even the duty of donating such materials to that research, much as we need to educate our laity to the *mitzvah* of organ donation.²⁷

C. Couples, though, are often reticent to donate their extra frozen embryos for research.²⁸ This has led scientists to investigate other possibilities of obtaining embryonic stem cells. Creating embryos specifically for the purpose of doing medical research (scenario A-3-c above) lacks the justification of using materials that would just be discarded anyway, but creating embryos specifically for research is nevertheless permissible under one condition.

Unlike the Catholic view, the problem in doing this for the Jewish tradition is *not* that it would amount to murder to destroy an embryo outside the uterus, for in that state an embryo has no greater claim to protection than an embryo in its first forty days *in utero*, much less that of a person. Based, in part, on the story of Onan in Genesis 38, classical Jewish law forbids "wasting seed" (*hashatat zera*).²⁹ Even so, procuring the sperm for "farmed" embryos through masturbation would not constitute "wasting seed," for here the purpose of masturbating would be specifically to use the man's semen for the consecrated purpose of finding ways to

heal illnesses.

Procuring eggs from a woman for this purpose, however, does pose a problem. It is not so much that this requires subjecting her to an invasive medical procedure, for now eggs can be procured without surgery and with minimal risk or pain through laparoscopy. To produce the eggs, though, the woman must be exposed to the drugs that produce hyperovulation, and there is some evidence that repeated use of such drugs increases a woman's risk of ovarian cancer and other maladies.³⁰ While such risks may be undertaken to overcome a woman's own infertility or even, I have held,³¹ to donate eggs once or twice to infertile couples, assuming such risks for medical research is less warranted, especially since embryos can also be obtained from frozen stores that couples plan on discarding and possibly from some of the other methods that I described above. Still, the demonstrated risks for her to do this once or twice is minimal, especially if she is pre-screened and deemed safe to undergo that procedure, and so a woman may donate eggs for this purpose with those limitations.

The same concerns about the risks in procuring human eggs would apply to using eggs to obtain stem cells from cloning procedures (A-3-d above) or from parthenogenesis (A-3-f), if that proves to be possible. Thus while obtaining embryonic stem cells from frozen embryos that would otherwise be discarded is best, embryos may also be specifically created and eggs may be cloned or tricked into producing stem cells through parthenogenesis for purposes of medical research on the condition that the woman providing the eggs for such efforts is pre-screened to insure her safety and even then does this only once or twice.

Some have raised two other objections to creating embryos intentionally for research. Some might object that the embryo in a petri dish is, after all, potential life in that it could be implanted in a woman's uterus and some day we may even be able to grow it in a machine. Some also worry that allowing the use of embryos specifically created for research creates a slippery slope in that human genetic materials will then be diminished in our estimation as just means to a practical end, that human creation will lose its mystery and holiness. In Kantian terms, this smacks of violating the second version of the categorical imperative— that is, never treat a person merely as a means. Or, in the terms of more modern theorists, even though I am assuming that the donors are not paid, this seems awfully close to commodifying people in that we are looking at both men and women as (merely?) sources for genetic products. Without articulating it precisely this way, it is this concern that often underlies how the average person responds to the prospect of doing research on embryos.

Stem cell research does, of course, entail the destruction of potential life, but one must remember that the embryo in a petri dish remains potential life only through considerable scientific interventions to provide an environment where the zygote will remain alive in that state. Its hold on life is, at best, tenuous; indeed, since 80% of conceptions miscarry, usually in the first month, the Rabbis were right in classifying such early embryos as "merely water" – and that is *in utero*. Thus it seems to me that we need to realize how weak the potentiality of that life is. In contrast, the potentiality of stem cell research rests on a solid foundation of successful attempts to use adult stem cells in humans and embryonic stem cells in animals. Thus when we speak of an embryo in a petri dish, we must remember that we are, at most, balancing *potential* life against what we have good reason to hope will be actual treatments for serious diseases; that is much easier to justify than balancing *actual* lives against that hope, as we do whenever we use human subjects in medical research. If we do the latter – and we must, albeit under stringent controls, if we are ever going to have medications that are safe and effective – then we should do the former with yet greater warrant.

As for the second objection, I certainly agree that human creation must be honored and respected, and that steps to protect that special status must be taken. The critical thing to note, though, is that we are not dealing with a *person* when we use embryos to advance stem cell research; we are dealing with genetic materials that, even *in utero*, have a long way to go before they become a person, and not one that is likely to succeed, at that. *That is, in the end we are dealing with a thing, not a person*; that is what the classification of embryos as "simply water" entails. We surely *are* allowed – indeed, commanded – to use *things* to find ways to cure diseases. Moreover, in our case I do not see a serious danger of a slippery slope in the status of human genetic materials, for the use to which these embryos would be put is nothing less than another holy

cause – namely, curing people of serious diseases. Thus I do not consider the deliberate creation of embryos for purposes of stem cell research to demean the birth process in any way.

D. Obtaining stem cells by removing a cell from an embryo (A-3-e) poses no problems for the Jewish tradition whatsoever. The embryo itself outside the womb is at most “simply water,” and, moreover, in this procedure the embryo from which the cell was taken can still develop normally in a woman’s womb. Thus if this method proves viable, it would be as acceptable as using frozen embryos that would otherwise be discarded for the sacred purpose of trying to cure diseases.

E. Obtaining stem cells through cloning is now low in researchers’ priorities because we are just at the beginning of research on cloning in general. Moreover, Congress is currently engaged in a dispute about whether to fund or even to permit therapeutic cloning. We clearly do not want to support reproductive cloning, at least at this stage of development of the technique, for it is neither safe nor effective. It is one thing to kill or discard all 272 attempts to clone a sheep before Dolly was created as the first cloned sheep; it would be quite another thing to create and kill multiple human beings with major birth defects. In therapeutic cloning, though, we are dealing with cells or, at most, organs, and those we may discard, if necessary, in the process of perfecting the technique. When we can clone cells more effectively and safely, in fact, that method for obtaining stem cells should jump to the top of the list as our source of stem cells for cures since it produces tissues from the patient him/herself and thus does not pose the problems of recipient rejection. At such time, the careful distinction that has emerged in recent times would apply – namely, that cloning may be used only for therapeutic, and not for reproductive, purposes.³²

Other Factors in this Decision

1. Given that the materials for stem cell research can be procured in permissible ways, the technology itself is morally neutral. It gains its moral valence on the basis of what we do with it.

2. The question, then, reduces to a risk-benefit analysis of stem cell research. The articles in a recent *Hastings Report*³³ raise some questions to be considered in such an analysis, and I will not rehearse them here. I want to note only two things about them from a Jewish perspective:

a. The Jewish tradition sees the provision of health care as a communal responsibility, and so the justice arguments in the *Hastings Report* have a special resonance for Jews. That is, when and if this technology becomes available, poor people as well as the middle class and the rich should be able to benefit from it. That is especially true since much of the basic science in this area was funded by public funds. At the same time, the Jewish tradition does not demand socialism, and for many good reasons, we, in the United States, have adopted a modified, capitalistic system of economics. The trick, then, will be to balance access to applications of the new technology with the legitimate right of a private company to make a profit on its efforts to develop and market applications of stem cell research.³⁴

b. The potential of stem cell research for creating organs for transplant and cures for diseases is, at least in theory, both awesome and hopeful. Indeed, in light of our divine mandate to seek to maintain life and health, I would even argue that from a Jewish perspective we have a *duty* to proceed with that research. As difficult as it may be, though, we must draw a clear line between uses of this or any other technology for cure, which are to be applauded, as against uses of technology for enhancement, which must be approached with extreme caution.

As I shall explain below, enhancement and therapy do not present a neat and clear dichotomy; they rather lie on a spectrum, where the ends are easy to define but the middle is murkier. Thus, research in ways to cure cancer, neurological diseases, and the like, is clearly therapeutic. On the other end of the spectrum, Jews

have been the brunt of campaigns of eugenics in both the United States and Nazi Germany,³⁵ and so we are especially sensitive to creating a model human being that is to be replicated through some of the technologies that have evolved in our time and in times to come. Moreover, when Jews see a disabled human being, we are not to recoil from the disability or count our blessings for not being disabled in that way; we are rather commanded to recite a blessing thanking God for making people different.³⁶ Contrary to Nazi policy, then, we clearly should not kill the disabled; we should rather value them as much as we do the (temporarily) able-bodied while still striving to cure disabilities.

Defining exactly where the category of disability (and therefore therapy) ends and where the category of enhancement begins, though, is a very hard problem, especially because people's expectations change continually as medicine develops. Thus what looks like enhancement today may look like expected therapy tomorrow. Eyeglasses, for example, might have been considered at some point in the past as enhancement, while now they are clearly therapy covered by many medical insurance plans. Similarly, abortions to prevent the birth of malformed fetuses are now justified as "therapeutic abortions" even though a generation ago we had no idea of the fetus' status *in utero* and would have considered an abortion based on the potential of malformation unwarranted. While genetic engineering poses the problems of enhancement much more starkly than stem cell research *per se*, it is important to underscore that this responsum only addresses stem cell research for purposes of medical cures; a discussion of the use of this or any other technology for purposes of enhancement would require another paper.

Summary

1. We both may and should take the steps necessary to advance stem cell research and its applications in an effort to take advantage of its great potential for human healing. We may and should engage in such research for two reasons: First, we have a duty to heal and, as a corollary to that, to develop our means to heal; and second, genetic materials, including embryos, lack the status of a person or even part of a person (e.g., a thigh): within the womb, the Talmud declares that before forty days of gestation they are "simply water," and outside the womb they are certainly not any more to be protected than pre-embryos and embryos are within the womb. Embryos and even gametes themselves deserve our respect, for they are the materials that have the potential of creating human beings, but that status is outweighed by the duty to seek to cure.
2. In accordance with Jewish law, stem cells may be procured from all of the following sources, but the following list ranks sources from the most desirable to the least desirable:
 - a. Aborted fetuses.
 - b. Frozen embryos originally created for overcoming infertility which the couple has now decided to discard but has agreed to donate for stem cell research instead.

In both (a) and (b), researchers are not responsible for the abortion itself or for creating the frozen embryos, and they are using materials that would otherwise just be discarded, but (a) avoids legal fights over frozen embryos as well as the frequent unwillingness of couples to donate their frozen embryos. Still, it may be the case that more can be done with ES cells than with EG cells because the latter have already differentiated into reproductive cells, while the former are totipotent; at this stage we do not know. If ES cells indeed turn out to be more malleable, then this order may be reversed, or it may be that both sources are equally acceptable, each with its advantages and disadvantages.

- c. A cell taken from an embryo and grown independently. This technique would avoid the extra dangers to the woman involved in the methods listed in (d) below, but it does not have the advantage of using materials that would otherwise be discarded, as in (a) and (b), and it has

not yet proven to be successful in producing stem cells.

- d. Embryos created specifically for medical research by combining sperm and eggs donated for that purpose, by cloning (SCNT), or by parthenogenesis . These are the least desirable because of the increased danger to the woman donating her eggs, but they are permissible sources of stem cells if the woman donates eggs for this purpose only once or twice after being pre-screened to insure that it is safe for her to do this. A man does not violate any laws by masturbating to contribute to stem cell research. The use of cloning poses the additional risks raised by our inexperience with the technique and our current inability to assure good results, but if and when cloning technology improves, cloning will become more desirable than any of the other methods to produce stem cells because the patient's immune system will not reject the therapy taken from his/her own tissues and will not need to be subjected to immunosuppressive drugs for the rest of his/her life.

3. We should also pursue healing methods that can be developed from adult stem cells, but such efforts must not replace nor even slow down our attempts to develop healing methods from embryonic stem cells, for the latter hold out much more promise than the former.

4. We should pursue this research, though, with restrictions to enable access to its applications to all who need it.

5. This responsum deals only with stem cell research conducted for purposes of curing diseases. Applications of this or any other technique to the goal of enhancement must be considered in another paper.

Conclusions

Answer to Question 1: After scientists have accomplished all that they can toward a given goal through animal experiments, (1) human embryonic germ cells from aborted fetuses and embryonic stem cells from (2) frozen human embryos originally created for purposes of procreation not only may, but should be aggressively used for research into creating cures for a number of human ailments. Toward that end, just as we need to educate our laity about the importance of organ donation, so too we should educate them to know that those who have aborted a fetus or created frozen embryos that they are not going to use should donate such materials to scientists pursuing stem cell research. As difficult as the distinction between therapy and enhancement is to define, and as much as the line may change over time, this responsum deals only with stem cell research for purposes of therapy; another paper is required to consider the possible use of this and other techniques for purposes of enhancement.

Answer to Question 2: Embryonic stem cells from embryos created specifically for research, either by (3) combining donated sperm and eggs in a petri dish, (4) by cloning, or (5) by extracting a cell from an early embryo, may also be used for research to provide therapies for diseases, but only if the woman donating the eggs does so only once or twice and is pre-screened to avoid undue risks to her own health.

NOTES

1 "Stem Cells: A Primer," National Institutes of Health, May 2000, pp. 1-2. <http://www.nih.gov/news/stemcell/primer.htm>.

2 Renee C. Fox and Judith P. Swazey, *Spare Parts: Organ Replacement in American Society* (New York: Oxford,

1992), p. 9. This book generally treats many of the conceptual and social problems that have arisen as a result of the explosion of organ transplantation after the approval of immunosuppressive drugs.

3 Michael Shablott, *et al.*, "Derivation of Pluripotent Stem Cell Lines from Cultured Human Primordial Germ Cells," *PNAS* 95:13726-13731, Nov. 1998. The National Institutes of Health Restoration Act banned fetal transplantation research, but not fetal tissue research. In fact, basic fetal tissue research is not governed by the Common Rule (a protocol endorsed by 17 government agencies regulating research on human subjects), and so parental consent is not required. Still, obtaining the fetal tissue involves all the issues described in this paragraph of the responsum.

4 Presentation at the meeting on December 10, 2001, of the American Association for the Advancement of Science by Dr. Lana Skirboll, who is the administrator of applications for stem cell research to the NIH. This, of course, raises another set of problems, for now the academic centers and private companies that have developed the methods for producing stem cells have patented those methods. Specifically, based on Dr. Thomson's work at the University of Wisconsin, the Wisconsin Alumni Research Foundation (WARF) holds the patent on embryonic stem cells (ES) and on the methods for obtaining them, and WARF has licensed Geron Corporation to develop commercial uses for stem cells. Similarly, based on Dr. Gearhart's work, Johns Hopkins has the patent on embryonic germ cells (EG) and has licensed commercial development to Geron. Had the federal government funded this research in the first place, it is likely that no patent would have been granted.

Given the federal government's skittishness on abortion, it is surprising but nonetheless true that federal funding is available for research on fetal tissue, not only in developing uses for it but even in procuring it – although not, strangely, for transplanting it. In fact, scientists may get federal funding to develop new stem cell lines from aborted fetuses, even though they cannot do so if the source is an embryo. EG cells, though, are not as flexible as ES cells are, and you cannot study early cell development to learn about normal and abnormal cell differentiation on the basis of EG cells since they have already become germ cells.

5 James Thomson, *et al.*, "Embryonic Stem Cell Lines Derived from Human Blastocysts," *Science* 282:1145-1147, Nov. 6, 1998.

6 Gina Kolata, "Researchers Say Embryos in Labs Aren't Available: Few Couples Have Agreed to Allow Frozen Specimens to Be Used in Experiments," *New York Times*, August 26, 2001, pp. 1, 21. The quotation is on p. 21.

7 *Ibid.*, p. 21.

8 "Stem Cells: A Primer," National Institutes of Health, May 2000, p. 2. <http://www.nih.gov/news/stemcell/05/00/primer.htm>.

9 For more on these and other fundamental assumptions of Jewish medical ethics, and for the Jewish sources that express these convictions, see Elliot N. Dorff, *Matters of Life and Death: A Jewish Approach to Modern Medical Ethics* (Philadelphia: Jewish Publication Society, 1998), Chapter 2.

10 Gen. 2:15.

11 B. *Hullin* 58a, where the status of the fetus is a dispute between Rabbi Eliezer and Rabbi Joshua; B. *Sanhedrin* 80b, where the position that the fetus is the thigh of its mother is just assumed; and elsewhere (e.g., B. *Gittin* 23b; B. *Bava Kamma* 78b).

12 See M. *Bava Kamma* 8:6 for the prohibition on self-injury. For more discussion, together with sources, on God's ownership of our bodies and the implications of holding them in trust, see the chapter of my book cited in note 9 above.

13 *PCJLS, 1980-1985* (New York: Rabbinical Assembly, 1988), p. 37 with supporting papers for that stance on pp. 3-35. For more on the Jewish stance on abortion, together with the biblical and rabbinic sources that state that stance, see Dorff, *Matters of Life and Death*, pp. 128-133, and David M. Feldman, *Birth Control in Jewish Law* (New York: New York University Press, 1968), reprinted under the title *Marital Relations, Abortion, and Birth Control in Jewish Law* (New York: Schocken, 1973), Chapters 14 and 15.

14 For classical sources on this, see Dorff, *Matters of Life and Death*, Chapter 9. According to a teshuvah by Rabbi Joseph Prouser, approved by the Conservative Movement's Committee on Jewish Law and Standards in December, 1995, post-mortem donation of vital organs and tissue constitutes *pikkuah nefesh* and is actually obligatory, not optional.

15 B. *Sanhedrin* 57b; M.T. *Laws of Kings* 9:4. "Another view is that this extension of the Noachide laws was intended, on the contrary, as a protest against the widespread Roman practice of abortion and infanticide." Immanuel Jakobovits, *Jewish Medical Ethics* (New York: Bloch, 1959), p. 181, based on Weiss, *Dor, Dor Ve-Dorshav* 2:22. This creates a problem, though, for elsewhere in the Talmud the presumption is stated that Noachide law may not be more stringent than Jewish law; see B. *Sanhedrin* 59a. Tosafot therefore seek to show that Noachides may also avail themselves of the permission in Jewish law to abort to save the mother's life or health; Tosafot, B. *Sanhedrin* 59a, s.v. "Leyka," cf. Tosafot, B. *Hullin* 33a, s.v., "ehad"; J. *Shabbat* 14:4 (14d); and J. *Avodah Zarah* 2:2 (40d). On all of this, see David Novak, *The Image of the Non-Jew in Judaism* (New York: The Edwin Mellon Press, 1983), pp. 185-187 with the endnotes at p. 197.

16 B. *Berakhot* 47b. This exception is also asserted in B. *Gittin* 38b; cf. M.T. *Laws of Slaves* 9:6; S.A. *Yoreh De'ah*

267:79. See also B. *Sukkah* 30a and B. *Bava Kamma* 94a, although in those places the exception for a *mitzvah d'rabbim* is not developed. The owner of the aborted fetus that was to be discarded has also despaired of getting it back (*ya'ush*), and if researchers are now in possession of the aborted fetus, a change of location and ownership (*shimui reshut*) has also taken place, and so one also could argue that the fetus no longer bears the taint of its origins, but the Talmud's permission for the community to use ill-gotten gain for sacred purposes seems to me to be the more appropriate category here — assuming that the abortion was not done for a reasons condoned in Jewish law in the first place.

17 Even Rabbi J. David Bleich, who objects to federal funding of research on fetal tissue lest that encourage abortion, permits using organ tissue obtained from a homicide victim because "Utilization of the body of the victim for scientific purposes could not conceivably be construed as an endorsement of the antecedent homicide" (p. 201). He also permits the use of scientific data obtained through immoral experimentation, as in the case of the Nazi experiments. See J. David Bleich, *Contemporary Halakhic Problems*, vol. iv (New York: Ktav and Yeshiva University Press, 1995), pp. 171-202 and 218-236, esp. pp. 234-235. I would like to thank Rabbi Aaron Mackler for drawing Rabbi Bleich's positions to my attention. I frankly think that the possibility that a woman would be persuaded to abort her fetus so that it could be used for stem cell research is very remote.

Rabbi Moshe Tendler, in his testimony to the National Bioethics Advisory Commission, invoked a different source to justify the use of aborted fetuses — namely, M.T. *Kilayim* 9:3. Even though biblical law prohibits cross-breeding of any two species of animal, such as a horse and a donkey, the product of such an illicit mating, the mule, may be used for the benefit of the owner, even though a biblical prohibition was transgressed. (Rabbi Moshe David Tendler, "Stem Cell Research and Therapy: A Judeo-Biblical Perspective," in *Ethical Issues in Human Stem Cell Research*, vol. III: *Religious Perspectives* (Rockville, MD: National Bioethics Advisory Commission, June, 2000), p. H-4. Rabbi Avram Reisner, however, in his responsum entitled "Curiouser and Curiouser: Genetic Engineering in Nonhuman Life," points out that the laws of cross-breeding have been treated by Rashi and other authorities in Jewish law as a special case — a *hukah* and a *hiddush* — and cannot legitimately be extended to other areas of the law. See Avram Reisner, "Curiouser and Curiouser: Genetic Engineering in Nonhuman Life," in Aaron L. Mackler, ed. *Life and Death Responsibilities in Jewish Biomedical Ethics* (New York: Jewish Theological Seminary, 2000), pp. 506-522, esp. p. 511-514.

18 B. *Yevamot* 69b. See n. 26 below.

19 M. *Niddah* 3:7 (30a).

20 M. *Niddah* 3:2 (21a).

21 M.T. *Laws of Forbidden Intercourse* 10:2, 17.

22 S.A. *Orah Hayyim* 230:1. The Mishnah on which this is based, however, does not mention the limitation on this to after forty days; see M. *Berakhot* 9:2XXXXX.

23 B. *Shabbat* 67b, 129a, 140b; B. *Kiddushin* 32a; B. *Bava Kamma* 91b; B. *Hullin* 7b.

24 For more on these methodological issues, see the Appendix of my book, *Matters of Life and Death: A Jewish Approach to Modern Medical Ethics* (Philadelphia: Jewish Publication Society, 1998).

25 See Immanuel Jakobovits, *Jewish Medical Ethics* (New York: Bloch, 1959, 1975), p. 275, for his estimation that "forty days" in Rabbinic counting amounts to just under two months in modern obstetrical count.

26 The forty day marker comes originally from Aristotle, and it was adopted by none other than Augustine and Aquinas. In fact, the Catholic Church itself did not hold that a fertilized egg immediately became a person until 1869, when, at the First Vatican Council, they wanted to strongly affirm the virgin birth of Mary, and so they needed to see her as a person immediately upon conception by the Holy Spirit. That change did not occur in Canon Law until 1917.

27 I am here assuming that the donors are not compensated financially. As Rabbi Joel Roth has discussed with regard to kidney donation, monetary compensation for organs raises a host of halakhic problems. Even though stem cells have developed even less toward human status than a full organ has, the same difficulties and arguments that Rabbi Roth raises would, in my judgment, apply to stem cells as well. I would like to thank Rabbi Susan Grossman for pointing out this wrinkle to me.

28 Gina Kolata, "Researchers Say Embryos in Labs Aren't Available: Few Couples Have Agreed to Allow Frozen Specimens to Be Used in Experiments," *New York Times*, August 26, 2001, pp. 1, 21.

29 The Mishnah and Talmud forbid a man from touching his penis lest he induce it to become hard and ejaculate (B. *Niddah* 13a-13b), and later Jewish sources use the phrase *hashatat zera* (Tosafot on B. *Yevamot* 12b, 32b and B. *Ketubbot* 39a; S.A. *Even Ha-ezer* 23).

30 Robert Spirtas, Steven C. Kaufman, and Nancy J. Alexander, *Fertility and Sterility* 59:2 (February, 1993), pp. 291-293. Still, after the 1992 Stanford study, on which that article is based, suggesting that fertility drugs might raise the risk of ovarian cancer, "later research cast doubt on that finding — but only after thousands of women were terrified." (Michael D. Lemonick, "Risking Business? Do infertility treatments damage babies' genes? Doctors used to think not. Now they are not so sure," *Time*, March 18, 2002, pp. 68-69; the quotation is on p. 69. Still, the 1988 congressional report stated that a number of other possible complications caused by commonly used drugs to stimulate the ovaries, including early pregnancy loss, multiple gestations, ectopic pregnancies, headache, hair loss, pleuropulmonary fibrosis, increased blood

viscosity and hypertension, stroke, and myocardial infarction; see U.S. Congress, Office of Technology Assessment, *Infertility: Medical and Social Choices*, OTA-BA-358 (Washington, D.C.: U.S. Government Printing Office, 1988), pp. 128-129. The demonstrated risks are thus not so great as to make such stimulation unwise for a woman who needs to do this to overcome her own infertility or even to donate eggs once or twice to infertile couples, but they are sufficient to demand that caution be taken and that the number of eggs donated be limited. Here, where the eggs will be used not for producing a child but for medical research, undertaking such risks seems even less warranted.

31 Elliot N. Dorff, "Artificial Insemination, Egg Donation, and Adoption," *Conservative Judaism* 49:1 (Fall, 1996), pp. 48-50; reprinted in Aaron L. Mackler, ed., *Life and Death Responsibilities in Jewish Biomedical Ethics* (New York: The Jewish Theological Seminary of America, 2000), pp. 81-84, and in Elliot N. Dorff, *Matters of Life and Death: A Jewish Approach to Modern Medical Ethics* (Philadelphia: Jewish Publication Society, 1998), pp. 106-107.

32 On the very same day that the CJLS approved this responsum (March 13, 2002), the Union of Orthodox Jewish Congregations of America and the Rabbinical Council of America approved the same position – namely, opposing reproductive cloning but supporting therapeutic cloning. See Alan Cooperman, "Jewish Groups Back Therapeutic Cloning: Orthodox Leaders Break with the Right," *The Washington Post*, March 13, 2002, p. A04.

33 *Hastings Center Report*, March-April, 1999, pp. 30-48.

34 For more on Judaism's view on communal responsibilities in the distribution of health care, see Elliot N. Dorff and Aaron L. Mackler, "Responsibilities for the Provision of Health Care," in *Life and Death Responsibilities in Jewish Biomedical Ethics*, Aaron L. Mackler, ed. (New York: The Jewish Theological Seminary of America, 2000), pp. 479-505, and Elliot N. Dorff, *Matters of Life and Death: A Jewish Approach to Modern Medical Ethics* (Philadelphia: Jewish Publication Society, 1998), Chapter Twelve.

35 See Stephen J. Gould, *The Mismeasure of Man* (New York: W. W. Norton & Company, Inc., 1996) and George J. Annas and Michael A. Grodin, *The Nazi Doctors and the Nuremberg Code: Human Rights in Human Experimentation* (New York: Oxford, 1992).

36 For a thorough discussion of this blessing and concept in Jewish tradition, see Carl Astor, "...Who Makes People Different:" *Jewish Perspectives on the Disabled* (New York: United Synagogue of America, 1985).

Survey of Recent Halakhic Periodical Literature

STEM CELL RESEARCH

I. THE PROBLEM

Other than the ongoing debate concerning the moral legitimacy of abortion, the heated controversy that erupted during the summer of 2001 regarding government funding of embryonic stem cell research is without parallel in bioethical discourse. The vehemence of the debate is such that each side accuses the other of gross insensitivity to the value of human life. Those who favor such research point to the potential for developing cures for diabetes, Parkinson's disease, senility and other life-threatening maladies and accuse their opponents of crass disregard for the lives that might be saved. Those who oppose research upon developing embryos assert that snuffing out nascent human life is as immoral as harvesting organs from terminally ill patients. By their lights, such research involves destroying some human lives in order to preserve others.

It should be emphasized that the controversy is limited to research involving utilization of stem cells derived from human embryos. Ongoing research involving stem cells obtained from the placenta or from adult cells does not pose a moral dilemma and may ultimately prove to be more fruitful than embryonic stem cell research.¹ However, many scientists believe that use of embryonic stem cells is crucial and is more likely to yield beneficial results.²

The moral issue is reducible to precisely the same set of issues upon which, for society at large, the abortion debate revolves. Is or is not a fetus or an embryo a human being? If yes, at what stage of gestation does it acquire that status? If the fetus or the embryo is indeed a human entity, rare is the ethicist who would sanction the overt destruction of a human being for any purpose, no matter how laudatory. If it is not a human entity, it is argued, no countervailing argument can prevail against the compelling moral value inherent in the preservation of human life.

Elsewhere,³ this writer had examined in detail the diverse views of various rabbinic scholars with regard to feticide. To put the matter as succinctly as possible, destruction of a fetus by a non-Jew bound by the Noahide Code is a capital crime. For Jews, feticide is a form of non-capital homicide, at least according to Rambam; other authorities regard destruction of a fetus as an infraction of Jewish law but regard it as constituting a less serious transgression. For Rambam, an abortion can be considered only for the purpose of preserving the life of the mother from a threat posed by the fetus; for other authorities, an abortion may be performed for somewhat less compelling reasons as well.⁴

II. SCIENTIFIC RESEARCH

Stem cell research is certainly of no benefit to the mother, i.e., the donor of the ovum, whose life is not endangered. Hence, if feticide is a form of homicide, preservation of life can not be invoked as a justification. Lesser prohibitions are suspended only in situations in which there is an identifiable danger as well as a direct cause and effect relationship between the otherwise forbidden act and the life-saving effect. The classic examples are those offered by R. Ezekiel Landau, *Teshuvot Noda bi-Yehudah, Yoreh De'ah, Mahadura Tinyana*, no. 210. If such is the medically prescribed therapy, a mother may—indeed must—build a fire and heat milk on the Sabbath on behalf of a seriously ill infant. But she may not make a fire or boil milk simply in order to be prepared for the unlikely eventuality that the child may become seriously ill during the course of the Sabbath day. An autopsy may be performed in the anticipation of obtaining information that may be useful in the life-saving treatment of an already ill, similarly afflicted patient but may not be performed with the hope that some item of information will be obtained that may be of benefit at some time in the future. Moreover, halakhic restrictions are suspended in anticipation of preserving life only in the case of a *refu'ah bedukah*, i.e., a therapeutic procedure known to be efficacious or with regard to which there is cogent reason to presume it to be efficacious.⁵ Thus, the very nature of virtually all scientific research is such that Sabbath restrictions, for example, may not be disregarded in order to enhance the likelihood of success in such endeavors. Despite the fact that it may be predicted with certainty that a successful outcome of a research endeavor will save lives and hence the situation may be tantamount to that of a *holeh be-faneinu*, nevertheless, at the research

93

stage the endeavor almost by definition involves a *refu'ah she-einah bedukah*.⁶ Hence no rabbinic authority has argued that a scientist may engage in activities prohibited on *Shabbat* in the course of conducting research on stem cells just as no one has argued that Sabbath restrictions are suspended for purposes of cancer investigation or the like. By the same token, no other prohibition may be ignored in order to engage in such research. Accordingly, stem cell research can be sanctioned by Halakhah only if it involves no infraction associated with the destruction of a fetus.⁷

Moral responsibility is readily perceived in the context of direct, proximate causal relationships. Obligations in less proximate situations are not at all obvious. For example, is a person obligated to develop life-saving skills so that he can succor others in time of need? Certainly, acquisition of such skills should be encouraged and is surely deserving of approbation. But is it incumbent upon any individual to acquire such skills? Society as a whole may well be obligated to train lifeguards and to post them at public beaches, but no individual need necessarily feel obligated to make this profession his life vocation. Similarly, the training and deployment of policemen, firemen, lifeguards, etc. in anticipation of potential emergencies is a social rather than a personal obligation.

A similar distinction may be employed in resolving dilemmas arising from conflicting moral duties. May a person on his way to a class in first-aid instruction ignore the plight of a dying man on the plea that he must perfect his skills which may enable him to rescue a greater number of persons at some future time? One's instinctive response is a clear-cut negative. No person may plead that engaging in an activity designed to advance future societal benefits provides justification for ignoring an immediate responsibility. Immediate needs create immediate obligations. Anticipated needs do not generate immediate, compelling obligations. The "here and now" test is a general rule of thumb which may be applied to most situations requiring an ordering of priorities.

The obligation of society at large is, however, much broader. This enhanced obligation is reflected in a statement of the Gemara, *Bava Batra* 7b, which is cited as definitive by *Shulhan Arukh, Hoshen Mishpat* 163:1. Jewish law provides that the inhabitants of a city can compel one another to contribute the funds necessary for the erection of a wall around the city and for a door in the wall, as well as for bolts to secure the doors. Construction of the wall is designed to fortify the city against armed attack. Since the wall is constructed in order to preserve the lives of the inhabitants, all the townspeople may be compelled to contribute

equally because all individuals derive equal benefit from the fortifications.

Were this an ordinary case involving an immediate danger to human life, each person would be required to do all in his power to erect the requisite fortifications. At best, he would have a cause of action against his fellow townspeople for reimbursement of funds expended on their behalf—but each person capable of doing so would be required to act on his own initiative and to act without delay. Such an individual obligation does not exist because, in the case in question, there is no imminent danger. Fortifications are erected, not to protect against present danger, but in anticipation of future contingencies.

Precaution against future dangers is not an individual obligation but a societal obligation. The obligations of society are not only greater than those of an individual but are qualitatively different as well. An individual must respond to an immediate danger. While every individual aware of the danger and capable of alleviating that danger is obligated to respond, such individuals, no matter how large their number may be, respond as individuals rather than as members of a society. However, no person is obligated to respond to an as yet non-existent danger. The individual's responsibility to act is limited to a danger which is clear and imminent.

Society as a whole must see to it that there are lifeguards, physicians, and firemen trained to perform their functions and must provide facilities and incentives for the training of physicians. Any member of society may demand that a wall be built or that locks and bolts be provided. The individual who expresses a legitimate concern with regard to possible danger which may be alleviated and a legitimate way of doing so must be heard and his demands fulfilled. His demand is not for fulfillment of the duty of *pikuah nefesh*, which is personal in nature, but for fulfillment of a societal obligation flowing from its social context. Individuals form societies in order to benefit from social amenities that they would experience extreme difficulty providing for themselves as individuals. Prevention of future danger is certainly such an amenity.

Development of therapeutic agents is no different from erection of fortifications; both are designed to forestall future loss of life. So long as a *refu'ah bedukah*, i.e., a tried and tested therapy, does not exist there is no obligation to attempt a cure. Nevertheless, pharmaceutical research designed to develop what will become a *refu'ah bedukah* is no less of a social amenity than construction of thoroughfares and plazas and is quite properly the responsibility of society at large.

Elimination of health hazards, development of pharmaceutical agents and research designed to prevent and cure disease are entitle-

ments that may justly be demanded by members of the body politic. Societies are established for the purpose of fulfilling such needs no less so than for the provision of social and recreational amenities. Such needs must be met by society by virtue of the reciprocal obligations into which its members have entered. But fulfillment of such obligations is not mandated by the *mizvah* of *pikuah nefesh*. The differing nature of those diverse obligations is manifest in one striking manner: As noted earlier, halakhic strictures are suspended for purposes of *pikuah nefesh*; they are not suspended for purposes of avoiding a future danger or for an activity that is not known to be causally connected to elimination of sickness. Thus, even on *Shabbat*, the physician may do whatever is necessary for the treatment of a seriously ill patient, but on *Shabbat* neither the patient nor the physician may engage in activities forbidden on the day of rest even in hopeful anticipation of hastening a discovery that may ultimately save countless lives.

Scientific endeavors designed for purposes similar to those of stem cell research are certainly laudable. Members of society may not only urge but may rightfully demand that the cost of such research be defrayed by the public treasury. But because they do not fall within the parameters of *pikuah nefesh* no halakhic violation can be sanctioned even for the purpose of furthering those noble goals.

It is thus readily apparent that the prohibition against feticide would serve to prohibit destruction of a fetus even for purposes of scientific research. Accordingly, that consideration would appear to preclude the legitimacy of experimentation utilizing embryonic stem cells. Nevertheless, a number of considerations have been advanced which, if germane, would serve to establish that the procedures involved in embryonic stem cell research do not represent an infraction of the prohibition against feticide.

III. FETICIDE DURING EARLY PERIODS OF GESTATION

A. WITHIN THE FIRST FORTY DAYS

There is a significant difference of opinion among rabbinic authorities with regard to whether the prohibition against destroying a fetus is applicable within the first forty days of gestation.⁹ There is at least one talmudic text which, upon first reading, seems to provide strong support for the permissive ruling. The Gemara, *Yevamot* 69b, records a declaration of Rav Hisda to the effect that the daughter of a *kohen* who

becomes widowed shortly after marriage to an Israelite may partake of *terumah* during the first forty days following consummation of her marriage. Permission to eat *terumah* is a privilege accorded to an unmarried daughter of a *kohen* and to a widowed daughter who has born no children to her Israelite husband. The concern in the case presented to Rav Hisda is that the widow, unknown to herself, may be pregnant with child, in which case *terumah* would be forbidden to her. Rav Hisda argues that, whether or not she is pregnant, the widow may certainly be permitted to eat *terumah* during the initial forty day period. If the widow is not pregnant there is no impediment to her partaking of *terumah*; if she is pregnant the embryo is considered to be "mere water" until after the fortieth day of pregnancy. Accordingly, the widow may continue to eat *terumah* for a full forty days following her marriage. Rav Hisda's ruling appears to indicate that, in the eyes of Halakhah, fetal development within the initial forty days of gestation is insufficient to warrant according the fetus independent standing.⁹

Another source for this distinction is the Mishnah, *Niddah* 30a, which declares that a fetus aborted less than forty days following cohabitation does not engender the impurity of childbirth ordained by Leviticus 12:25.¹⁰ Similarly, according to *Mishneh le-Melekh, Hilkhot Tumat Met* 2:1, the defilement associated with a dead body is not attendant upon an embryo expelled during the first forty days of gestation. Furthermore, in the opinion of many authorities, a fetus cannot acquire property prior to the fortieth day of development.¹¹

There are, however, sources indicating that the prohibition against destroying the life of a fetus is applicable even during this early period. In his *Torat ha-Adam*, Ramban notes that, according to the opinion of *Ba'al Halakhot Gedolot*, the Sabbath may be violated even during this forty-day period in order to preserve the life of the fetus.¹² The author of *Havvot Ya'ir*, citing *Tosafot, Niddah* 44b, shows that the right to violate the Sabbath for the sake of saving a prenatal life is incompatible with permission to kill it deliberately.¹³ It follows that, according to *Ba'al Halakhot Gedolot*, inducement of abortion during this period is forbidden. Responding to a specific inquiry, R. Meir Dan Plocki, *Hemdut Yisra'el*, (Pietrkow, 5687), Indexes and Addenda, p. 17a, granted permission for termination of pregnancy within this forty-day period only when the life of the mother is threatened.

Drawing a parallel from the commandment against the kidnaping and subsequent sale of a person into involuntary servitude, R. Iser Yehudah Unterman, *No'am*, VI, 4f.,¹⁴ cites the opinion of Rashi,

Sanhedrin 85b, who maintains that this prohibition encompasses the sale of an unborn child as well. Although the fetus may not be considered a fully developed person, the kidnapper is culpable because he has stolen an animate creature whose status is conditioned by its potential development into a viable human being. Rabbi Unterman further notes that if the unborn fetus lacks human status it is excluded from the ambit of the injunction "And he [man] shall live by them" (*Leviticus* 18:5) which justifies violation of other precepts in order to preserve human life. Nevertheless, numerous authorities permit violation of the Sabbath in order to preserve fetal life. Rabbi Unterman views such permission as being predicated upon a similar rationale: anticipation of potential development and subsequent attainment of human status gives rise to certain privileges and obligations with regard to the undeveloped fetus. Consideration of future potential is clearly evidenced in the talmudic declaration, *Shabbat* 151b, "Better to violate a single Sabbath in order to observe many Sabbaths." Rabbi Unterman concludes that reasoning in these terms precludes any distinction that might otherwise be drawn with regard to the various stages of fetal development.

Surprisingly, there is one source that appears to rule that destruction of the fetus by Noahides, at least under some circumstances, does not constitute a moral offense. R. Isaac di Trani, *Teshuvot Maharit*, I, no. 99, writes: "I remember having seen in a responsum of the Rashba that he bears witness that Ramban rendered medical aid to a gentile woman in return for compensation in order that she might conceive and aided her in aborting the fruit of her womb."¹⁵ It is of course inconceivable that an individual of Ramban's piety and erudition would have violated the injunction "Thou shalt not place a stumbling block before a blind person" (*Leviticus* 19:4) or that he would have actively assisted transgressors. Applying the line of reasoning adduced above, Rabbi Unterman draws the conclusion that there is a fundamental distinction between Jewish law and Noahide law with regard to the assessment of potential life. According to many authorities, Noahides are under no obligation to preserve the lives of their fellows, to "be fruitful and multiply" or to refrain from wasting the male seed.¹⁶ They are forbidden to commit homicide and to take the life of "a man within a man" but bear no responsibility for the safeguarding and preservation of nascent life. It would appear, then, that Halakhah holds them accountable only for *actual*, in contradistinction to *potential*, life.¹⁷ Accordingly, there is no objection to Noahides aborting, or to a Jew giving advice and rendering indirect assistance to Noahides in aborting,

a fetus within the first forty days of gestation. Since during this initial period the embryo has not as yet developed distinctly recognizable organs or an independent circulatory system, argues Rabbi Unterman, it cannot be considered "a man within a man" and hence its destruction does not constitute murder under the Noahide dispensation. Ramban, Rabbi Unterman avers, sanctioned the performance of abortions by Noahides only within this forty-day period.¹⁸

Rabbi Unterman's distinction between Jews and Noahides with regard to termination of pregnancy within the first forty days following conception was anticipated by an earlier authority. In his *Hemdat Yisra'el*, Part I, p. 89b, Rabbi Plocki marshals evidence demonstrating that an embryo may be destroyed with impunity during the first forty days of its development based upon Rabbenu Tam's interpretation of the talmudic dispute recorded in *Yevamot* 12a concerning the "three [categories of] women" who may resort to contraceptive devices in order to prevent conception. Rabbenu Tam explains that the dispute concerns the insertion of a tampon *after* cohabitation. The *Tanna*, R. Meir, rules that the use of contraceptive devices by these women is mandatory since pregnancy would place their lives in jeopardy; the Sages assert that such action is not incumbent upon these women stating that the verse "The Lord preserves the simple" (*Psalms* 116:6) permits reliance upon divine providence to avert tragic consequences. However, according to Rabbenu Tam, the Sages *permit* the use of contraceptives after cohabitation reasoning that women are not commanded to refrain from "destroying the seed." *Hemdat Yisra'el* points out that fertilization most frequently takes place immediately following cohabitation. Contraception following cohabitation is then, in effect, not destruction of the seed but abortion of a fertilized ovum.¹⁹ If abortion is forbidden even in the earliest stages of gestation, how then can Rabbenu Tam permit the use of contraceptive devices following cohabitation? *Hemdat Yisra'el* concludes that destruction of the embryo during the first forty days following conception does not constitute an act of feticide; rather, destruction of a fetus during that early period falls under the category of "destroying the seed." Since the opinion of those authorities who rule that women are also bound by the prohibition against "destroying the seed" is regarded as normative, *Hemdat Yisra'el's* reasoning (as evidenced by his own remarks) finds practical application only with regard to Noahides. According to those authorities who maintain that the ban against destroying the seed does not apply to Noahides, the latter may be permitted to interrupt pregnancy during the first forty days of gestation.

Distinctions pertaining to the early period of gestation are echoed by numerous other authorities. R. Chaim Ozer Grodzinski, *Teshuvot Ahiezer*, III, no. 65, sec. 14, writes, "It appears that a Noahide is not put to death for this and perhaps even with regard to an Israelite there is no biblical prohibition." *Torat Hesed, Even ha-Ezer*, no. 42, sec. 33, states explicitly that the prohibition against destroying an embryo within the first forty days following conception is rabbinic in nature. R. Joseph Rosen, *Teshuvot Zofnat Pa'aneah* (New York, 5714), no. 59, comments, "Before the fortieth day there is not such a stringent prohibition according to many authorities." In an earlier collection of responsa, *Teshuvot Bet Shlomoh, Hoshen Mishpat*, no. 162, R. Solomon Drimer of Skole concludes that there is no prohibition against destroying an embryo less than forty days old and notes that in punishment for performing such a deed "even a Noahide is not put to death." Rabbi Weinberg, in his original responsum, *No'am IX* (5726), 213f., also concluded that it is permissible to induce abortion prior to the fortieth day of pregnancy, but later added in a note published in his *Seridei Esh*, III, no. 127, note 7,²⁰ that having read the contrary opinion expressed by Rabbi Unterman in *No'am VI*, 8f.,²¹ he reserves decision pending consultation with other halakhic authorities. The late Rabbi Moses Jonah Zweig of Antwerp, *No'am VII* (5724), 48, concurs in the view that forbids abortions even during the first forty days of pregnancy other than on medical grounds.²²

R. Moshe Feinstein, *Iggerot Mosheh, Hoshen Mishpat*, II, no. 69, sec. 3, cites *Havvot Ya'ir* in stating emphatically that, for Jews, destroying a fetus is forbidden even within the first forty days of gestation. *Iggerot Mosheh* finds Maharit's report to the effect that Ramban assisted gentile women in aborting their fetuses troubling in the extreme and, accordingly, finds Rabbi Unterman's assessment to be the only plausible explanation for such conduct. Acceptance of that explanation would necessarily lead to endorsement of Rabbi Unterman's distinction between Jews and gentiles with regard to abortion during the first forty days of gestation.

However, *Iggerot Mosheh* finds that distinction troublesome because he regards the prohibition against feticide to be subsumed within the prohibition against homicide. However, if a fetus within the first forty days is not yet a "man" within a man" according to the provisions of the Noahide Code, why should the fetus even during that early stage be regarded as a "man" for Jews?²³ In the same responsum *Iggerot Mosheh* points to other difficulties posed by Maharit's responsum, including what *Iggerot Mosheh* describes as a contradiction between Maharit's comments in the latter's responsa nos. 97 and 99. Accordingly, he dismisses

Maharit's latter responsum, and particularly the citation of the report that Ramban assisted in the abortion of non-Jewish fetuses, as a forgery interpolated in *Teshuvot Maharit* by an errant student. If it is indeed the case that there is no reliable evidence of Ramban's comportment in this regard, there is no evidence upon which to base a distinction between Jews and non-Jews insofar as destruction of a fetus within the first forty days of gestation is concerned. *Iggerot Mosheh* concludes his discussion with the comment that the matter requires further reflection.

B. SUBVISUAL ZYGOTES

Elsewhere,²⁴ this writer has argued that there may be grounds to permit destruction of a nascent embryo in the earliest stages of development even according to the many authorities who do not accept the permissive view with regard to destruction of a fetus within the initial forty day period. A distinction may be drawn that is analogous to a legal concept that is well-known in the common law tradition: *De minimis non curat lex*. The notion that the law does not concern itself with trifles finds expression in Jewish law as well. Although, in Jewish law, the concept has extremely limited application in matters of jurisprudence, a closely related concept is of paramount importance within the context of religious law.

For example, Jews are commanded not to eat creeping animals, including marine creatures that live in an aquatic environment. If one takes a small drop of water, places it on a slide and examines it under a microscope, one will observe the presence of literally thousands of creeping organisms. The phenomenon has been observed by countless students in performing laboratory assignments in conjunction with introductory courses in biology. Nevertheless, Judaism does not forbid the drinking of a glass of water. But on what basis can the concomitant imbibing of the forbidden creatures be sanctioned? The answer must lie in the recognition that, insofar as such prohibitions are concerned, Jewish law concerns itself only with gross phenomena. A physical phenomenon that is subvisual is of no consequence. An organism that can be seen only under a microscope or by means of a magnifying glass is an organism of which Jewish law takes no cognizance; for the purposes of the Jewish legal system, it is as if the organism does not exist.²⁵

Similarly, a broken letter in a Torah scroll, a *meuzah* or in the biblical sections contained within *tefillin* renders such religious objects unfit for their ritual purpose. Yet, under high-power magnification it is immediately evident that all letters contain gaping chasms. The prob-

lem dissipates upon the recognition that a "break" in a letter is defined as a break that can be perceived with the naked eye by a person of normal eyesight.

If one applies this principle to the developing human organism, it yields the conclusion that legal cognizance can be taken of the organism only when it becomes visible to the naked eye. However, during its early stages of development, when the zygote is subvisual,²⁶ the law takes no cognizance of its existence. If so, it may well be argued that there is no prohibition associated with its destruction.

The application of the general principle regarding subvisual phenomena to stem cell research may be the subject of some disagreement. In a discussion of genetic manipulation of agricultural species, R. Shlomoh Zalman Auerbach, *Minhat Shlomoh*, II (Jerusalem, 5759), no. 97, sec. 27, declares that pollination of one species with pollen of another species does not result in a fruit that would be halakhically classified as a hybrid. Thus, although Rabbi Auerbach affirms that the fruit of an *etrog* tree produced as the result of grafting a lemon branch may not be used on *Sukkot* for the purpose of fulfilling the *misvah* of the four species, he nevertheless regards pollination as an entirely different matter. Accordingly, rules Rabbi Auerbach, if an *etrog* is pollinated with the pollen of a lemon tree the resultant fruit is an *etrog* and may be used for fulfilling the *misvah*. Rabbi Auerbach declares that the prohibition against hybridization of species applies only to the planting or grafting of vegetative material that might independently yield fruit or a growing seed capable of germinating independently. Pollen can never grow into fruit; hence, for purposes of Halakhah, introduction of foreign pollen does not affect species identity. Again, it is quite obvious that such pollination conducted artificially by humans is not prohibited. Similarly, it follows that introduction of a gene of a foreign species is not forbidden as a form of hybridization since an isolated gene can never develop into a tree or into a plant.

However, an apparently contradictory statement by Rabbi Auerbach appears in a different volume, *Minhat Shlomoh, Tinyana* (Jerusalem, 5760), no. 100, sec. 7. In that work Rabbi Auerbach writes that hybridization of trees is forbidden "even if the hybridization is [performed] only by means of injection of sap that, if planted in the ground, would not at all sprout." In context, Rabbi Auerbach's statement in *Minhat Shlomoh, Tinyana* seems to be offered in order to establish a negative view regarding genetic manipulation of agricultural species.

In the latter discussion Rabbi Auerbach himself addresses the issue

raised by the fact that genetic engineering involves manipulation of material that is not visible to the naked eye and dismisses that consideration with the remark that "since people engage themselves (*metaplim*) with these particles and transfer them from one species to another, this must be considered as visible to the eyes and not at all comparable to worms that are invisible." Put somewhat differently, it may be argued that Halakhah disregards subclinical phenomena only when they are freestanding. A microorganism will never be more than a microorganism; a subvisual break in a letter will never become anything other than a subvisual break in the letter. However, when such subvisual phenomena serve as causal factors yielding readily perceived effects, cognizance must be taken of such phenomena, he asserts, because they are, in effect, recognizable in their effects.^{26a} If that position is regarded as correct, it might well be argued that a developing, albeit subvisual, zygote is regarded as a fetus for purposes of Halakhah from the moment of conception because of its potential for development into a viable human being.

Be this as it may, the principle *de minimus non curat lex*, even if accepted in this context, is currently of little avail in addressing the issue of stem cell research. According to reports published in the media, destruction of the embryo in the course of such research takes place as late as on the fifth day of pregnancy when the embryo has grown in size to over 120 cells.

IV. STEM CELLS DERIVED FROM PARTHENOTES OR CHIMERIC EMBRYOS

There is, however, one form of embryonic stem cell research that may pose no moral quandary. In an article published in the February, 2002 issue of *Science* magazine, scientists associated with Advanced Cell Technologies Inc. report some success with embryonic cells obtained in a novel manner.²⁷ The researchers claim to have taken oocytes, i.e., unfertilized eggs, from a monkey and exposed them to chemicals that induced the cells to divide and to develop into fledgling embryos. Cell division usually occurs only when the ovum is fertilized by a sperm. Science has long known that cell division can also be asexually induced by means of electrical or chemical stimulation. That phenomenon is known as parthenogenesis. The company claims that it has begun development of the same procedure utilizing human oocytes with encouraging results.²⁸

88

Unlike embryos created from the fertilization of an ovum by sperm, on the basis of experiments performed on mice and other animals, it is believed parthenogenic embryos will not survive even if returned to the mother's womb for gestation. If the parthenogenic embryo is not viable from the moment of its inception, destruction of such an embryo in the course of research may not constitute the destruction of a fetus or of potential human life.²⁷

In a subsequent development, researchers at the Institute for Reproductive Medicine and Science, a fertility clinic associated with St. Barnabas Medical Center in West Orange, New Jersey, have proposed a novel method for obtaining embryonic stem cells from nonviable embryos. Fertility clinics routinely discard large numbers of embryos fertilized in vitro because they manifest abnormalities rendering it highly unlikely that they would survive if transferred to a woman's uterus. In a paper published in the July-August, 2002 issue of *Reproductive Biomedicine Online*²⁸ titled "Human Blastocysts from Aggregated Mono-Nucleated Cells of Two or More Non-Viable Zygote-Derived Embryos," Mina Alikani and Dr. Steen M. Willadsen report that they extracted cells from 107 such defective embryos and combined those cells to make thirty-six chimeric embryos, i.e., embryos that could not possibly survive for an extended period of time. Twelve of those embryos survived five or six days by which time a cluster of stem cells had already developed. It is anticipated that those stem cells can be isolated and grown in a laboratory.

The claim that the discarded embryos from which such hybrids are derived are uniformly nonviable has been challenged by some scientists engaged in fertility research.²¹ However, if the claim can be substantiated with regard to at least some aberrant embryos, the potential for deriving stem cells from hybridized nonviable chimeric embryos clearly exists and, as is the case with regard to parthenogenic embryos, destruction of such chimeric embryos may not constitute the destruction of a fetus or of a potential human life.

There is strong evidence suggesting that a *nefel*, a nonviable neonate, i.e., an infant suffering a congenital, physiological or anatomical anomaly that will cause it to die within the first thirty days of life is not deemed to be a human being. The Gemara, *Shabbat* 136a, addresses the case of a *safek nefel*, i.e., an infant whose status as a viable neonate is a matter of doubt. If the infant is known to be nonviable there is no obligation to circumcise the child. Nevertheless, the Gemara declares that a "doubtful" *nefel* should be circumcised even on *Shabbat*

despite the consideration that circumcision involves an act of bloodletting that is prohibited on *Shabbat* other than in conjunction with fulfillment of the commandment regarding circumcision. The Gemara justifies that pronouncement with the statement that if the infant is indeed a *nefel*, and hence no *mizvah* is fulfilled, the very fact that it is a *nefel* means that the act of circumcision is "merely [an act] of cutting flesh," i.e., the status of the *nefel* is equated with that of a cadaver. Since "wounding" or bloodletting on *Shabbat* is prohibited only with regard to a living organism, no such prohibition is attendant upon the circumcision of a *nefel*. In addition, the Gemara, *Shabbat* 135a, *Yevamot* 80a and *Bava Batra* 20a, compares an infant that cannot survive for a period of thirty days to an inanimate stone and declares that it may not be moved on *Shabbat*.

It would thus follow that just as a nonviable neonate is not considered to be a living person, a nonviable fetus or zygote is similarly not a developing human being.²² It should further follow that there can be no violation of the prohibition against homicide or feticide in the destruction of an organism whose status is depicted as "mere flesh." It may also be noted in this context that the prohibition against bloodletting on *Shabbat* is a derivative of the prohibition against "slaughter." It is thus logical to assume that if circumcising the flesh of a *nefel* is not an act of "wounding" or bloodletting its destruction is similarly not an act of "slaughter." Accordingly, R. Moshe Sternbuch, *Be-Shevilei ha-Refu'ah*, no. 8 (Kislev 5747); R. Zalman Nechemiah Goldberg, *Tehumin*, V (5744), 250; and Abraham S. Abraham, *Nishmat Avraham, Hoshen Mishpat* 425:1, assert that there is no prohibition against the destruction of a nonviable fetus.

It must, however, be noted that a disciple of *Noda bi-Tehudah*, R. Eleazer Fleckles, *Teshuvah me-Ahavah*, I, no. 53, who was consulted with regard to the destruction of a nonviable monster-like creature, ruled that the destruction of such life is biblically prohibited and is punishable by death at the hands of Heaven. It is quite possible that *Teshuvah me-Ahavah* would regard destruction of even a nonviable fetus as similarly interdicted. The weight that should be assigned to the opinion of *Teshuvah me-Ahavah*, particularly since it seems to stand in contradiction to the earlier-cited declarations of the Gemara requires careful determination. Unfortunately, *Teshuvah me-Ahavah's* statement has neither been analyzed nor cited by contemporary scholars.

V. DESTRUCTION OF A FETUS EX-UTERO

Another argument in support of the permissibility of stem cell research involving destruction of a developing zygote is based upon the fact that the research is performed on nascent embryos that have been fertilized outside the mother's womb. The issue that must be analyzed is whether there is a prohibition attendant upon destruction of an embryo conceived and gestated in vitro, i.e., in a petri dish rather than in the uterus. The issue more commonly arises in the context of disposal of surplus conceptuses obtained in the course of in vitro fertilization. A normal, fertile woman is endowed from birth with an extremely high number of Graafian follicles. Typically, each month, beginning at puberty and continuing until menopause, a single Graafian follicle develops and becomes a mature ovum. When in vitro procedures are employed because of inability to conceive naturally, the infertile woman is treated with hormones in order to stimulate superovulation. For reasons that are not fully understood, the percentage of zygotes resulting from in vitro fertilization that successfully implant in the uterine wall is low. In order to enhance the likelihood of at least a single successful implantation, it is deemed advisable to introduce multiple fertilized ova into the uterus. At present, in order to avoid the possibility of an excessive number of fetuses, the usual practice is to implant three fertilized ova. However, superovulation usually yields more than that number of ova. Surplus fertilized ova are either frozen for later possible use,³³ donated to women whose fertility problem arises from lack of ovulation,³⁴ used for scientific purposes such as stem cell research³⁵ or discarded and destroyed.³⁶

Several rabbinic scholars have adopted the position that there is no prohibition attendant upon destruction of a fetus conceived in a petri dish and gestating *ex utero*. The most prominent of those authorities is Rabbi Moshe Sternbuch, author of *Mo'adim u-Zemanim*. In an article that appeared in *Be-Shevilei ha-Refu'ah*, no. 8 (Kislev 5747), published by the Laniado Hospital in Netanya, Rabbi Sternbuch writes, "... the prohibition against abortion is [limited to destruction of the embryo] in the woman's uterus, for the [embryo] has the potential to develop and become complete in her womb and it is destroyed. But here, outside the womb, an additional procedure is required to implant [the embryo] in the woman's uterus and without that [procedure] it will ... perish of its own accord and not reach completion. . . ." Rabbi Sternbuch cites no sources in support of the view that an embryo developing outside of the womb may be destroyed with impunity. A similar view is

advanced without elaboration or citation of sources by R. Chaim David Halevy, *Assia*, vol. XII, no. 3-4 (Kislev 5750).

Ostensibly, one source that might be cited in support of such a conclusion is *Teshuvot Hakham Zevi*, no. 93. The Gemara, *Sanhedrin* 65b, reports that Rabbi Zelra commanded a *golem* created by utilization of incantations derived from *Sefer Yezirah* to return to dust. It is thus quite obvious that destruction of a *golem* does not constitute an act of homicide. *Hakham Zevi* suggests that a *golem* might indeed enjoy human status but that its destruction might nevertheless not constitute an act of homicide for an entirely different reason. Rabbinic exegesis presented by the Gemara, *Sanhedrin* 57b, renders Genesis 9:6 as "Whosoever sheds the blood of a man within a man, his blood shall be shed." The Gemara immediately queries, "Who is a 'man within a man'?" and responds, "It is a fetus within its mother's internal organs." Accordingly, argues *Hakham Zevi*, destruction of a *golem* does not constitute a prohibited form of homicide because the gestation of a *golem* is not in the mode of "a man within a man." Similarly, it might be argued, an embryo conceived in a petri dish and not yet implanted in a human uterus is also not "a man within a man" and hence its destruction involves no transgression.

Hakham Zevi's suggestion was rebutted by R. Gershon Leiner, popularly known as the *Radzyner Rebbe*, in his *Sidrei Toharot, Oholot* 5a, on the basis of what he considered to be a *reductio ad absurdum*. If *Hakham Zevi's* criterion of "a man within a man", i.e., of issuance from a womb, is consistently applied, it would lead to the conclusion that a person who might have murdered Adam would not have been guilty of homicide since Adam had no mother.

More significantly, the exegetical interpretation of Genesis 9:6 cited by *Hakham Zevi* serves to establish a provision limited to the Noahide Code. That rendition of Genesis 9:6 as "a man within a man" serves to establish feticide as a form of capital homicide in the Noahide Code. However, feticide is certainly not a capital transgression in the Sinaitic Code. Presumably, the prohibition against feticide for Jews as a non-capital form of homicide according to Rambam and those who concur in his view, flows from the general prohibition "Thou shalt not murder" Exodus 20:13).^{36a} Accordingly, there might be grounds for assuming that a Noahide does not incur capital punishment for destruction of an embryo fertilized in vitro but not for support of the position that a person born of in vitro fertilization may be destroyed with impunity by a Jew or for the position that there is no halakhic consideration forbid-

100

ding a Jew to destroy a developing embryo while it is yet outside the human body.

Moreover, absent evidence to the contrary, there is no reason to assume that the exegetical interpretation "a man within a man" is designed to impose a limiting condition serving to exclude from the denotation of the verse what would otherwise be an act of culpable homicide. Rather, the exegetical interpretation should be understood as supplementary in nature, *viz.*, as adding to the ambit of the verse an act that would otherwise not be connoted by the literal meaning of the verse, i.e., the killing of a fetus who is "a man within a man." Accordingly, it is not *only* the killing of "a man within a man" that constitutes homicide but *also* the killing of "a man within a man" that constitutes homicide.

In any event, *Hakham Zevi's* discussion cannot serve as a basis for distinguishing between a fetus *in utero* and a fetus *ex utero* because *Hakham Zevi* concludes that a *golem* lacks status as a Jew or as a human being for other purposes as well.¹⁷ Accordingly, even for *Hakham Zevi*, there is a more fundamental explanation for Rabbi Zeira's lack of reticence in destroying the *golem* and no evidence that *Hakham Zevi* accepted his tentative justification of R. Zeira's act as a normative thesis.

Acceptance of a distinction between *in utero* and *ex utero* gestation would lead to the conclusion that were the scenario depicted in Huxley's *Brave New World* not to remain within the realm of science fiction but to become a reality, a human being conceived *in vitro* and allowed to develop in a laboratory incubator for the full nine month period of gestation might be killed with impunity at any stage of his life. Such a conclusion is certainly counterintuitive.

It should also be noted that if, as discussed earlier, destruction of a developing fetus within the first forty days of gestation entails a violation of the prohibition against "destroying the seed," that prohibition

applies with equal force to destruction of an ovum fertilized *ex utero*. The concept of "a man within a man" applied only to the prohibition against homicide but not to other relevant transgressions.

Moreover, there are sources indicating that active measures must be taken to preserve fetal life during all stages of pregnancy. The Gemara, *Yoma* 82a, describes in great detail the procedure to be followed in instances in which a pregnant woman manifests symptoms of great craving for a particular food. If she cannot otherwise be assuaged, she may be given the food she craves lest she suffer a miscarriage. Some medieval commentators regard the danger to be obviated to be danger to the life

of the mother. Miscarriage, they assert, is tantamount to parturition and childbirth is statutorily defined as a life-threatening event. Despite the fact that a pregnant woman will sooner or later experience the danger of parturition, they maintain that the obligation to refrain from food on *Yom Kippur* is suspended in order to avoid unnatural preponing of that danger.

However, Ramban, cited by Ran, *Yoma* 82a, and Rosh, *Yoma* 8:13, maintains that the requirement to fast on *Yom Kippur* is suspended entirely for the purpose of preserving the life of the fetus. Ramban's position clearly reflects the view that there is an obligation to preserve fetal life. There is no obvious basis for assuming that nascent human life need not be preserved and may be destroyed with impunity simply because it is not sheltered in its natural habitat, i.e., because its development takes place outside the mother's womb.¹⁸

Among contemporary decisors, that view appears to be reflected in a ruling by R. Samuel ha-Levi Wozzner, *Teshuvot Shevet ha-Levi*, V, no. 47. Rabbi Wozzner expresses the opinion that Sabbath restrictions may not be breached for the sake of preserving the viability of a zygote that is the product of *in vitro* fertilization and that has as yet not been implanted in the uterus of the gestational mother. He does not argue that the status of a human life generated outside the mother's body is in any sense inferior to that conceived *in utero*. Rather, he argues that the vast majority of such zygotes are not viable and that Sabbath restrictions are not suspended to prolong the life of a nonviable fetus. Rabbi Wozzner carefully adds the cautionary note that the empirical situation may change and that with advances in the development of reproductive knowledge and techniques any future halakhic ruling would reflect the changed reality. If so, it would appear that, even at present, overt destruction of a possibly viable zygote cannot be sanctioned. Nevertheless, in a letter appended by R. Abraham Friedlander to his *Hasdei Avraham*, II (Brooklyn 5759), 317, Rabbi Wozzner permits the destruction of surplus zygotes.

VI. PUBLIC POLICY AND STEM CELL RESEARCH

As noted in the introductory comments, federal funding of stem cell research has become a matter of passionate debate. The question what position, if any, the Jewish community should adopt with regard to this issue has also become a matter of discussion. There are, however, a number of considerations that should inform public policy decisions that, in this writer's opinion, have not been sufficiently addressed.

making recommendations regarding governmental policy vis-a-vis stem cell research. *Ethical Lessons in Human Stem Cell Research*, the report and recommendations of the Advisory Commission, issued in January, 2000, does not really constitute the formulation of an ethical position and resultant recommendations. Indeed, it is certainly arguable that adjudication of ethical norms is no more the province of the federal government than is resolution of theological disputes. Rather, the report addresses matters of public policy that cannot and dare not be formulated in a moral vacuum.

In conjunction with its deliberations, the Advisory Commission appropriately solicited the testimony of both ethicists and theologians. Not quite as appropriately, some of the experts consulted raised the shibboleth of separation of church and state, thereby betraying their own lack of understanding of the anti-Establishment Clause and/or the nature of government involvement in stem cell research. The issue is not—and never was—a proposed governmental ban on stem cell research akin to a governmental ban on abortion. Imposition of such a ban would indeed give rise to the question of whether or not such a policy, in effect, “establishes” a particular religious or moral belief. The issue confronting the Advisory Commission was not proscription of a certain avenue of research; the issue addressed was government encouragement and participation in such research in the form of federal funding. And that is a horse of a quite different constitutional color!

In public policy, no less so than in medicine, the fundamental principle must be: *Primum non nocere*—“First, do no harm.” The Founding Fathers erected a wall of separation between Church and State in order to preserve the independence and integrity of religious institutions. The purpose was to shield religion from the pernicious and corroding influence of government. The notion of government funding designed to undermine the religious or moral convictions of even a portion of the populace would have been unthinkable.

The issue posed by stem cell research, in very blunt terms, is whether it is appropriate to use tax dollars in a manner that offends the religious sensibilities of some citizens. Deference to religious sensibilities in the form of non-involvement is not at all a constitutionally prohibited form of establishmentarianism; quite to the contrary, it is mandated by the spirit, if not the letter, of the First Amendment.

No ethicist would gainsay the moral value reflected in research. But, at the same time, no ethicist has called

... funding of every project designed to preserve human life. Policymakers begin with the axiological principle that only a finite amount of sociological resources can be dedicated to such projects with the result that selection of projects to be funded must be determined on the basis of competing scientific, pragmatic, and—yes—moral considerations. Triage decisions are oftimes made in light of moral considerations.

No ethicist, at least to this writer's knowledge, is opposed to stem cell research per se. The opposition that has been voiced is to research that requires destruction of human life and is predicated on the position that human life begins at the moment of conception. Some ethicists regard any benefit derived from an evil or immoral action as itself immoral. Some are concerned that advancement of science may be regarded as exculpatory in nature and, thereby, in the popular mind, diminish the odium associated with the destruction of the conceptus. Some are concerned that awareness of the potential benefit to humanity may impact upon the abortion decision of a vacillating woman confronted by conflicting emotional and moral vector forces. Nascent human life, they argue, dare not be sacrificed even for the noble purpose of preserving other human life.

Regardless of one's personal faith commitment or moral viewpoint, one must recognize that the social contract that is the cornerstone of American democracy demands that proper deference be paid to opposing views in formulation of public policy and, in particular, in expenditure of public revenue collected from all citizens.

The recommendations of the Advisory Commission certainly reflect sensitivity to the challenge with which it was confronted. Thus, the Commission strongly recommended that research involving embryos specifically created for research purposes not be funded. For the same reason the Commission recommended that federal funds not be allocated for research involving transfer of a somatic cell nucleus into an oocyte since the procedure, in effect, results in the creation of a human organism.

At the same time, the Commission found no objection to federal funding of projects involving cadaveric fetal tissue, including fetal tissue obtained as a result of non-therapeutic abortions. It does, however, insist upon establishment of procedures to prevent fetal tissue donation from influencing the abortion decision. The Commission also endorses funding of research that will utilize embryos remaining after infertility treatment is completed provided that the donors have already decided to have those embryos discarded instead of donating them to an infertile couple or storing them. The Commission justified this recommendation with the comment, “If the decision to discard the

embryos preceded the decision to donate them for research purposes then the research determines only how their destruction will occur, not whether it occurs."

The Commission has certainly endeavored to create a wall of separation between the scientific benefits of stem cell research and the morally contested actions that make the research possible. If effective safeguards are actually in place, it is certainly possible that the issue is entirely analogous to the question of whether it is morally acceptable to derive benefit from research upon the body of a homicide victim assuming, of course, that society assures itself that no homicide will ever be carried out in contemplation of such research. Certainly, Judaism posits no principle akin to a Miranda principle³⁹ that would categorically repudiate any scientific benefit derived from an antecedent immoral act.⁴⁰

Commendably, the recommendations attempted to establish procedures designed to preclude the possibility that the research itself provide a motive or impetus for destruction of a fetus or embryo. Although the Commission's attempt to prevent research benefits from becoming a motivational consideration is salutary, the proposed procedures are only partially effective. The primary safeguard consists of divorcing consent to use the abortus from the decision to abort by refraining from soliciting such consent until the decision to abort has already been made. However, the decision to abort is not final until the deed is done. Not only is the decision morally and legally revocable, but there is significant evidence pointing to the phenomenon of vacillation and actual abandonment of plans to abort on the part of pregnant mothers. Intervening consent to use of the abortus for research designed to save human lives is as much of a concern with regard to a decision not to rescind consent as it is with regard to the original abortion decision. Only by delaying mention of possible research upon the abortus and solicitation of consent for such purposes until after the abortion is actually a *fait accompli* can this concern be assuaged.⁴¹

Use of surplus embryos obtained in attempts to overcome infertility presents an apparently insurmountable moral problem. Research is not performed upon already inanimate embryos. It is the research itself that causes destruction of the embryo. The argument that the embryos are in any event destined for destruction carries little moral weight. No ethicist would sanction the conduct of a transplant surgeon who plucks out the heart of a person already destined to be killed by a hired assassin. The fact that the putative victim faces imminent death does not vitiate an act of homicide. Morally, research upon the body of a homicide

victim is light years removed from lethal research upon a living subject already marked for death. The excess embryos may indeed be destined for destruction whether or not the research is allowed to go forward, but they will not be destroyed with government funding. When the public coffers are used for such purposes society becomes implicated in the act of destroying nascent human life.

The present administration has endeavored to resolve the moral dilemma by limiting government spending to research utilizing cell lines already in existence at the time that approval of such research was announced, *viz.*, 9:00 p.m., August 9, 2001. Some cell lines are already in existence; others will no doubt become available without government funding or encouragement. The United States government, fearful that potential use in conjunction with federally funded research might encourage privately-funded development of additional cell lines by means that would entail destruction of embryos, refused to authorize use of newly-developed cell lines in federally-funded research. Limitation of government involvement to research using existing cell lines not only removes the government from implication in destruction of nascent life but also eliminates a federal imprimatur implying that society has bestowed its blessing upon the procedure. The fear that such a perception may become a self-fulfilling prophecy is probably the most serious ethical issue in the current debate. Limiting government funding to research employing only existing cell lines serves to vitiate that concern.

In light of both the absence of a halakhic imperative to engage in stem cell research as well as the grave halakhic issues posed by destruction of even nascent embryos, the present policy of the United States government would merit, at the very minimum, the tacit support of the Jewish community. The inevitable association of the issue of stem cell research with the broader abortion controversy serves as an additional consideration auguring in favor of support of that policy.

Rambam, in a censored portion of chapter eleven of *Hilkhot Melakhim*,⁴² questions why divine providence makes it possible for Christianity and Islam to flourish and capture the minds and hearts of so many devotees. Rambam asserts that those religions play a role in the divine blueprint for human history in promulgating and keeping alive the notion of the coming of the Messiah. Were Rambam writing today, he might well conclude that the function of preservation of belief in the coming of the Messiah has been assumed by the Chabad movement and find that the Catholic church now uniquely fulfills a different role in the transcendental divine plan, i.e., it tenaciously promulgates the notion of

the sanctity of fetal life and the teaching that abortion constitutes homicide. Non-Jews who engage in that endeavor do so with divine approbation. Non-Jews engaged in fulfilling a sacred mission are surely deserving of commendation, applause and support.

NOTES

1. A team of American scientists has presented compelling evidence of success in isolating a stem cell from adult human bone marrow that can produce all tissue types, including blood, muscle and nerve tissue. They also isolated stem cells from adult mice and injected descendants of those cells into mouse embryos. The injected cells were found to be present in almost every tissue, including blood, brain, muscle, lung and liver. See Catherine M. Verfaalle *et al.*, "Pluripotency of Mesenchymal Stem Cells Derived from Adult Marrow," *Nature*, 417, published online 20 June, 2002; doi:10.1038/nature 00870; www.nature.com/cgi-taf/DynaPage.taf?fil.../nature00870_r.html&filetype=&dynoptions.
2. Published in the same issue of the earlier cited online journal is an article reporting success in reversing the symptoms of Parkinson's disease in rats using embryonic stem cells derived from mice. See Ron McKay *et al.*, "Dopamine Neurons Derived from Embryonic Stem Cells Function in an Animal Model of Parkinson's Disease," *Nature*, 417, published online 20, June 2002; doi:10.1038/nature 00900; www.nature.com/cgi-taf/DynaPage.taf?fil.../nature00900_r.html&filetype=&dynoptions.
3. "Abortion in Halakhic Literature," *Contemporary Halakhic Problems*, I (New York, 1977), 325-371 and *Jewish Bioethics*, augmented edition, ed. Fred Rosner and J. David Bleich (Hoboken, N.J., 2000), pp. 155-196.
4. See *Contemporary Halakhic Problems*, I, 347-356 and *Jewish Bioethics*, pp. 167-174.
5. See this writer's "Experimental Procedures: The Concept of Refu'ah Bedukah," *Contemporary Halakhic Problems*, IV (New York, 1995), 203-217. For a critique of reliance upon these views see R. Moshe Feinstein, *Iggerot Mosheh, Hoshen Mishpat*, II, no. 69 and this writer's "Tay-Sachs Re-examined," *Contemporary Halakhic Problems*, I, 112-115 and *Jewish Bioethics*, p. 194, note 97.
6. For an analysis of the halakhic category of a *holeh be-fancinu* see this writer's *Bioethical Dilemmas: A Jewish Perspective* (Hoboken, N.J., 1998), pp. 154-156.
7. Stem cell research may present no problem according to R. Jacob Emden who regards abortion as permissible in the face of any "grave need" or according to those who understand Maharit's view to be that abortion is prohibited because it represents "wounding" the mother rather than the fetus. Destruction of the developing embryo cannot be regarded as devoid of problems according to *Havvot Ya'ir* who regards the prohibition against feticide to be rooted in the ban against destruction of the male seed but

8. For a detailed review of sources dealing with this issue see *Contemporary Halakhic Problems*, I, 339-347 and *Jewish Bioethics*, pp. 163-167.
9. Those authorities who reject the distinction between the first forty-day period and subsequent stages of gestation presumably maintain that a fetus within the first forty days is not a "child" in the meaning of the verse "But if a priest's daughter be a widow or divorced and have no child" (Leviticus 22:13), i.e., the talmudic term "mere water" connotes only that during that early period the fetus is not sufficiently developed to be termed a "child" but does not define the fetus' ontological status for other halakhic purposes.
10. It is of interest to note that Aristotle, *De Historia Animalium*, VII, 3, declares that the male fetus is endowed with a rational soul on the fortieth day of gestation and the female on the eightieth. This distinction corresponds not only to the respective periods of impurity prescribed by Leviticus but to the opinion of R. Ishmael in the Mishnah, *Niddah* 30a, who maintains that the prescribed periods of impurity correspond to the number of days required for the animation of the respective sexes and therefore declares that no impurity results from the miscarriage of a female embryo of less than eighty days. Aristotle's representation of animation as occurring on the fortieth or eightieth day, depending upon the sex of the fetus, was later incorporated in both Justinian and canon law. See Rabbi Immanuel Jakobovits, *Jewish Medical Ethics* (New York, 1959), p. 175.
11. *Shakh, Hoshen Mishpat* 210:2; *Teshuvot Zofnat Pa'aneah*, (New York, 5714), no. 59; and R. Elchanan Wasserman, *Kovev Shi'urim*, II, no. 11, sec. 1.
12. *Torat ha-Adam, Sha'ar ha-Sakanah*, ed. R. Bernard Chavel, *Kitvei Ramban* (Jerusalem, 5724), II, 29; also cited by *Rosh* and *Ran* in their respective commentaries on *Toma* 82a. See also *Korban Netanel, Toma, Perek Tom ha-Kippurim*, sec. 13:10.
13. Reference by the late R. Moshe Yonah Zweig of Antwerp, *No'am*, VI (5723), 53, to an opinion by *Havvot Ya'ir*, to the effect that there is no prohibition against abortion during this period is erroneous. *Havvot Ya'ir*, in his introductory comments, calls attention to the fact that various stages of fetal development are recognized in different contexts, *viz.*, forty days, three months and independent movement of the fetal limbs, but quickly adds that it is not his desire to render judgement on the basis of "inclination of the mind or reasoning of the stomach." On the contrary, *Havvot Ya'ir's* failure to note such distinctions in the course of developing his own thesis portends his rejection of such a distinction.

701

It may be of interest to note that this misconstrual of *Havvot Ta'ir* is legend. *Sedei Hemed* cites with perplexity conflicting positions attributed to *Havvot Ta'ir* with regard to this question by other sources and notes in resignation that he does not have access to the responsa of *Ha'avot Ta'ir* and hence cannot determine which quotation is correct. Upon reading these comments, R. Solomon Abraham Rezechte wrote to the author of *Sedei Hemed* that he had indeed seen the words of *Havvot Ta'ir* in the original and reported that the latter views the prohibition against feticide as binding during the early periods of pregnancy as well. See *Bikkurei Shlomoh* (Pietrkow, 5664), no. 10, sec. 35.

R. Weinberg's summary declaration in his *Seridei Esh*, III, no. 127, sec. 22 (p. 350), that such a prohibition does not exist even according to the *Ba'al Halakhot Gedolot*, who permits desecration of the Sabbath in order to save an embryo even within this forty-day period, is contradictory to the reasoning of *Havvot Ta'ir*, as indicated by R. Weinberg himself *ibid.*, sec. 5 (p. 339). R. Weinberg argues that *Havvot Ta'ir* fails to give consideration to the opinion of Ramban who maintains that, despite the law against feticide, the Sabbath may not be violated on behalf of an unborn child. This allegation is readily refutable since *Havvot Ta'ir* argues only that permission to violate the Sabbath in order to save a fetus logically entails a prohibition against destroying such a life, but not vice versa. It cannot be inferred from *Havvot Ta'ir's* comment that the absence of such permission necessarily entails license to destroy the fetus.

14. See also R. Iser Yehudah Unterman, *Shevet me-Tehudah*, I, 9f.
15. The authenticity of this quotation is highly questionable. R. Unterman, *No'am*, VI, 8, notes that he searched *Teshuvot ha-Rashba* in an unsuccessful attempt to locate this responsum. It seems probable that Maharit's quotation is culled from responsum no. 120 of vol. I in the published text (Bnei Brak, 5718). That responsum deals with the permissibility of rendering medical assistance to Noahide women so that they may be enabled to conceive. In language similar to that quoted by Maharit, mention is made of Ramban's actually having done so in return for financial compensation. However, no mention whatsoever is made of Ramban's having assisted in medical abortion. Maharit apparently had a variant textual version. Cf., also, R. Samuel Hubner, *Ha-Darom*, Tishri 5729, p. 33, who attempts to resolve the issue by suggesting an alternative punctuation of this quotation. R. Moshe Feinstein points to the absence of such a responsum in the works of Rashba as evidence that the responsum attributed to Maharit is itself a forgery. For other attempts to resolve the problems surrounding these two responsa see *Teshuvot Aryeh de-Bei Ilai*, *Toreh De'ah*, no. 19; R. Eliezer Waldenberg, *Zis Eli'ezer*, IX, no. 51, chap. 3, sec. 1; and R. Ovadiah Yosef, *Tahbi'a Omer*, IV, *Even ha-Ezer*, no. 1, sec. 7.
16. Regarding the question of whether Noahides are bound by the prohibition against onanism see *Tosafot*, *Sanhedrin* 59b; *Mishneh le-Melekh*, *Hilkhot Melakhim* 10:7; R. Naphtali Zevi Yehudah Berlin, *He'emek She'elah* 165:2; and *Teshuvot Zofnat Pa'aneah* (New York, 5714), I, no. 30.
17. Examination of the phraseology of *Hemdah Tisra'el*, Indexes and Addenda, p. 17a, indicates that Rabbi Plocki also had such a distinction in mind. In

- cases of danger to the mother he permits abortion of embryos of less than forty days without further qualification and adds that there are grounds for permitting abortion at subsequent stages of development provided this procedure is performed by a Jewish physician. Rabbi Unterman fails, however, to note the comments of R. Jacob Zevi Jalish in his *Melo ha-Ro'im*, *Sanhedrin* 57b, who expresses a contrary view.
18. For a discussion of how this thesis may serve to explain the Septuagint's puzzling mistranslation of Exodus 21:22-23 see *Contemporary Halakhic Problems*, I, 344, note 40 and *Jewish Bioethics*, p. 190, note 43.
 19. *Hemdah Tisra'el's* argument is predicated upon a faulty biological premise. Fertilization takes place in the Fallopian tube and subsequently the fertilized ovum descends into the uterus. A tampon inserted into the vagina does not penetrate beyond the cervical os. Contraception following cohabitation is designed to prevent sperm which have not already done so prior to insertion of the tampon from penetrating beyond the vagina. Thus there is no possibility of destroying an already fertilized ovum. Cf. *Teshuvot R. Akiva Eger*, no. 72.
 20. Rabbi Weinberg's responsum discussing abortion of fetuses suffering congenital anomalies was originally published as an article in *No'am*, IX (5726), pp. 193-215, and was reprinted in the third volume of *Seridei Esh* with a number of added notes.
 21. R. Unterman's opinion was actually expressed much earlier in his *Shevet me-Tehudah*, I, 50.
 22. See also R. Samuel Engel, *Teshuvot Maharash Engel*, VII, no. 85, who, after drawing a distinction between the first forty days and the subsequent periods of pregnancy, concludes with the statement "but it is difficult to rely upon this."
 23. *Iggeret Mosheh's* perplexity stems from his presumption that the prohibition against feticide as applied to Jews is derived from the prohibition in the Noahide Code on the basis of the principle recorded in *Sanhedrin* 59a: "There is nothing forbidden to a Noahide that is permitted to a Jew." *Iggeret Mosheh* also assumes that this presumption is inherent in the comments of *Tosafot*, *Sanhedrin* 59a, s.v. *lekha mid'am*.
- That presumption cannot be correct according to Rambam as his position is understood by the many scholars who maintain that Rambam rejects the principle of *mi ikka midai*. Those scholars must maintain that, for Rambam, the prohibition against feticide is subsumed in the commandment "Thou shall not murder" (Exodus 20:13) while capital punishment for feticide is excluded by the verse "And the person who smites any soul of man shall die" (Leviticus 24:17) on the grounds that a fetus is not a "soul" (*nefesh*) in the full sense of the term as is indeed the case with regard to a *terefah*.
- Thus, if there is validity to the position that a fetus within the first forty days of gestation is excluded from the Noahide prohibition, according to Rambam such exclusion must be based upon the premise that the term "man" (*adam*) in Genesis 9:6 refers only to a fetus that has acquired a "form" of a "man." Accordingly, the exclusion is limited to the Noahide prohibition derived from Genesis 9:6 but not to the prohibition addressed to

Jews, "Thou shalt not commit murder," in which no such exclusion occurs.

Since Rambam's position must be understood in this manner, there is no reason to postulate that *Tosafot* disagree. In invoking the principle of *mi ikka midi*, *Tosafot*, in context, may be understood not as declaring the source or basis of the governing prohibition, but as identifying the particular aspect of feticide that is the subject of *Tosafot's* discussion, i.e., prohibition of the destruction of the fetus even for the purpose of preserving the life of the mother. It is that particular application of the provision, rather than the fundamental prohibition against feticide, that *Tosafot* in their query assert should be transposed to the law and applied to Jews as well. Feticide itself, *Tosafot* might freely concede, is explicitly prohibited to Jews on the basis of Exodus 20:13 but a ban against sacrifice of the fetus even when it threatens to cause the death of the mother can be suggested only on the basis of *mi ikka midi*.

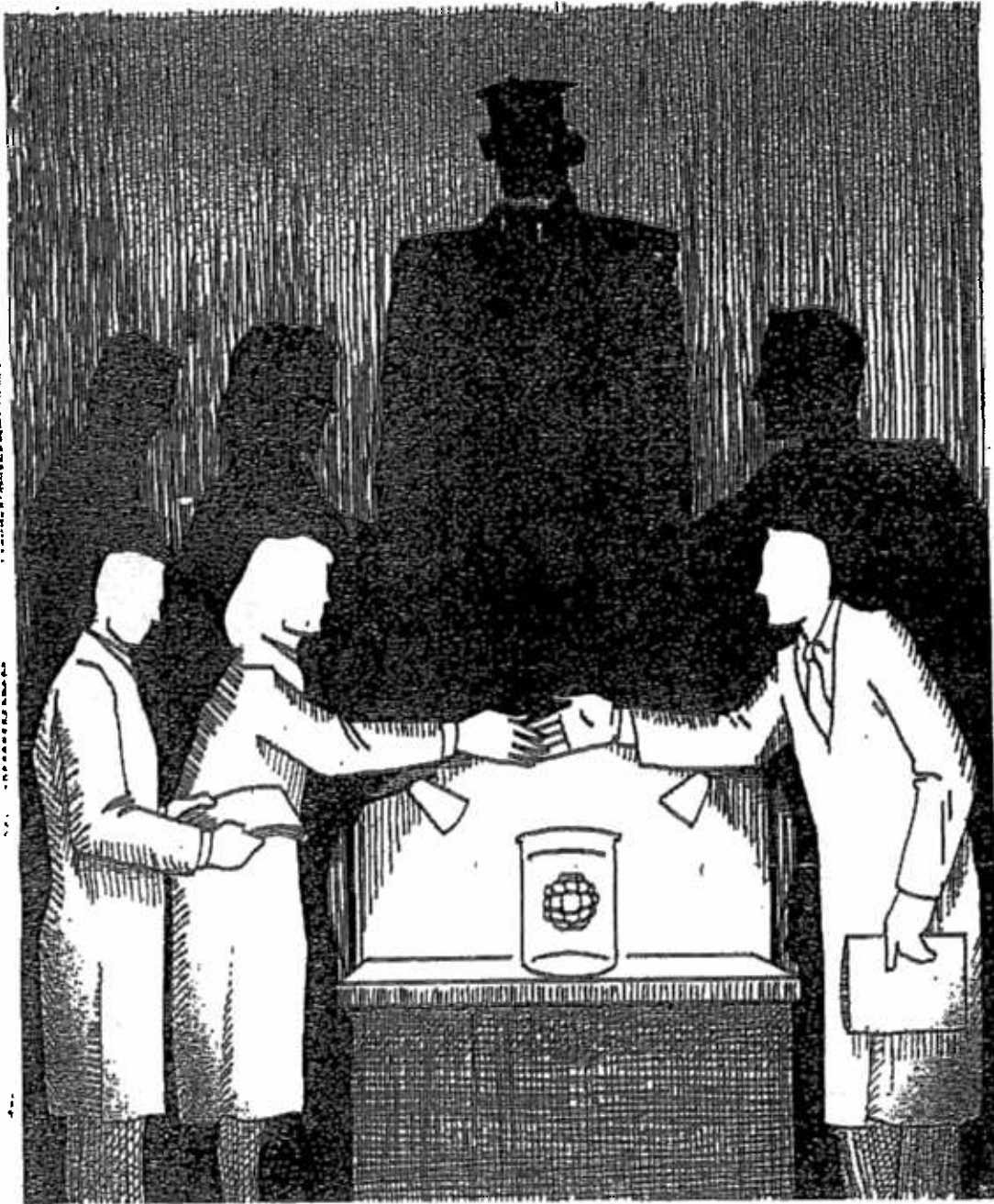
24. "Artificial Procreation," *Bioethical Dilemmas*, pp. 210-211.
25. See R. Israel Lipshutz, *Tiferet Yisra'el, Avodah Zarah* 2:6 and R. Yechiel Michal Epstein, *Arukh ha-Shulhan, Yoreh De'ah* 83:15 and 84:36. See also R. Abraham Danzig, *Hokhmat Adam* 38:8; *idem*, *Binat Adam*, sec. 34; R. Shlomo Kluger, *Teshuvot Tuv Ta'am va-Da'at, Mahadurah Tinyanah, Kuntres Aharon*, no. 53; R. Zevi Hirsh Shapiro, *Darkei Teshuvah, Yoreh De'ah* 18:20; R. Eliezer Waldenberg, *Zis Eli'ezor*, VIII, no. 15, chap 14, sec. 10; and R. Moshe Feinstein, *Iggerot Mosheh, Yoreh De'ah*, II, no. 146; *idem*, *Iggerot Mosheh, Even ha-Ezer*, III, no. 33; and R. Pesach Falk, *Teshuvot Mahazeh Eliyahu*, no. 91. Cf. also, R. Yom Tov Lipman Heller, *Ma'adanei Tom Tov, Halakhot Ketanot, Hilkhot Tefillin* 9:40; and R. Dov Berish Weidenfeld, *Teshuvot Dovev Meisharim*, I, no. 1. Cf., however, R. Iser Zalman Meltzer, *Haskafah ve-He'arot*, appended to R. Yechiel Michal Tucatzinsky, *Sefer Bein ha-Shemashot*, p. 153; R. Betzael Zolti, *Mishnat Ta'aves, Orah Hayyim*, no. 66; and R. Moshe Sternbuch, *Mo'adim u-Zemanim*, II, no. 124 and VIII, no. 124. See also R. Elyakim Dworkes, *Be-Shevelei ha-Halakhah*, II (Jerusalem, 5752), 50-62.
26. At the eight-cell stage the developing zygote is roughly half the size of a period that appears at the end of a sentence in the *New York Times*. I am not quite certain whether something of that size is to be characterized as an object that can be perceived by the naked eye. If it is not to be classified as something perceivable by the naked eye, it may well be the case that, at that stage of development, Halakhah takes no cognizance of the zygote and regards it as non-existent for purposes of the prohibition against destroying an embryo or of the prohibition against destroying the male seed.
- 26a. An analogous, but by no means identical, concept is reflected in the talmudic controversy regarding whether or not *yesh shevah ezim be-pat*, i.e., whether or not forbidden wood consumed as fuel is present and halakhically recognized in its enhancement of the dough in causing it to become baked.
27. See Jose B. Cibelli, Kathleen A. Grant, Karen B. Chapman *et al.*, "Parthenogenetic Stem Cells in Nonhuman Primates," *Science*, vol. 295, no. 5556 (February 1, 2002), p. 819. See also "Stem Cell Research:

Primate Parthenotes Yield Stem Cells," *ibid.*, pp. 779-780, and *New York Times*, February 1, 2002, p. A23.

28. See *Science*, p. 780.
29. If a reliable method of deriving stem cells from human parthenotes is perfected, therapeutic cloning in which a potentially viable embryo is created would be unnecessary for the treatment of females having oocytes.
30. *Reproductive Biomedicine Online*, vol. 5, no. 1 (July-August, 2002), pp. 56-58, at <http://www.rbmonline.com/Article/656>.
31. See Gina Kolata, "Hybrid Embryo Mixture May Offer New Source of Stem Cells for Study," *New York Times*, June 4, 2002, p. F3.
32. Cf., *Teshuvot Radvas*, II, no. 695, who rules that it is forbidden to hasten the death of a fetus whose mother has died in childbirth.
33. Freezing fertilized ova even in perpetuity presents no halakhic problems. Even according to the authorities cited later in this text who maintain that an embryo may not be allowed to perish, there appears to be no halakhic impediment to maintaining an embryo in a state of suspended animation.
34. Assuming there is a maternal-filial relationship between the genetic mother and the child, anonymous donation which entails suppression of maternal identity would serve to bar such donations. See this writer's "Surrogate Motherhood," *Bioethical Dilemmas*, pp. 253-254.
35. In vitro fertilization presents other halakhic issues, particularly with regard to semen procurement. See *ibid.*, pp. 249-251.
36. It is precisely because of a concern for destruction of fertilized ova that German federal law strictly regulates fertility clinics and prohibits physicians from fertilizing more ova than will be implanted at any one time.
- 36a. See *supra*, note 28.
37. See also R. Joseph Rosen, *Teshuvot Zofnat Pa'aneah* (Jerusalem, 5728), II, no. 7.
38. This also appears to be the view of R. Mordecai Ellyahu, *Tehumin*, XI (5750), 272.
39. In *Miranda v. Arizona*, 384 U.S. 43 (1966), the U.S. Supreme Court ruled that tainted evidence in the form of an improperly obtained confession may not be admitted as evidence in judicial proceedings.
40. For a fuller discussion of this issue see this writer's "Utilization of Scientific Data Obtained Through Immoral Experimentation," *Contemporary Halakhic Problems*, IV, 218-236.
41. For a fuller discussion of this issue see this writer's "Fetal Tissue Research: Jewish Tradition and Public Policy," *Contemporary Halakhic Problems*, IV, 171-202.
42. Those passages have been restored in the more recently published *Rambam la-Am* (Jerusalem, 5715) and Frankel editions of the *Mishneh Torah* (Jerusalem-Bnei Brak, 5759), as well as in the single volume indexed edition edited by Zevi Preisler (Jerusalem, 5746). Those sections also appear in the Yale Judaica Series translation, *The Code of Maimonides: The Book of Judges*, translated by Abraham M. Herschman (New Haven, 1949).

Science Anxiety

TOWARD A LESS FEARFUL FUTURE



ELIZABETH ROCK

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Many recent scientific advances in medicine and the life sciences involving genetic engineering leave many people concerned. Our new and increasing power to control heredity is based on a growing knowledge of our own genetic makeup as well as that of other living things. Scientists are also rapidly expanding their knowledge of how particular genes lead to the creation of different traits, characteristics and diseases.

The moral standoff that will quickly come to characterize the 21st century is becoming clear. It is not the teaching of intelligent design vs. evolution in American schools. Almost no one but

biblical literalists takes the ID position with any seriousness as science. Nor will it be the heated squabble over embryonic stem-cell research. That scum is actually over as well. Many nations around the world are doing this type of research, so the question is only where not whether.

The real battle — the battle that will come to occupy the moral center stage of American politics, morality, law, public policy, editorial pages, and water-cooler discussions — will be waged over where genetic engineering ought to take us and whether we are satisfied to leave it to scientists to guide us there.

Our present moment is seeing a host of
See GENETICS on D3

ONLINE EXTRA

For the Web site of the Center for Bioethics at the University of Pennsylvania, go to <http://www.bioethics.upenn.edu/>
For a blog on bioethics written by the editors of the American Journal of Bioethics, go to <http://blog.bioethics.net/>

107

Science anxiety: Moving to a less fearful future

GENETICS from DNA scientific breakthrough by which we are changing, modifying, inserting, altering or tweaking plant, animal and human genes.

Not everyone is thrilled. Recently, a student from Temple University visited my office. We were talking about different courses and career options when he looked straight at me and said, "Aren't you worried about where scientists and technicians are taking us?" He did not mention any specific form of genetic engineering or a particular experiment, but he was clearly worried about all this genetic modifying.

He is hardly alone. Polls in the United States, Brazil and other nations show that significant numbers of people, as many as 75 percent in some polls, are worried either about the speed of advancement in science or the chance that scientists will lose control over their

There are plenty of reasons to worry about the misapplication and abuse of genetic. The greatest mass murder in the Western world in the 20th century was undertaken by Nazi Germany's scientist Jews, Gypsies, Slavs, Poles, and those of "inferior race" in the name of genetics. But it was the government of Germany — supported by its people, including scientists — that created the genetically engineered, scientifically approved mass murder of the Holocaust.

Still it is to argue, prove mistakes to argue that we must put all forms of genetic engineering off limits. The much good will be lost. Our only hope of controlling some of the worst genes and plagues that ever existed will be lost. Our only hope of curing some of the worst genes and plagues that ever existed will be lost. Our only hope of curing some of the worst genes and plagues that ever existed will be lost.

very much a matter of public, regulation and oversight. When biologists or members of the public point the finger of moral worry at scientists, they need to redirect it. It is governments and the marketplace that we need to shape and hold accountable for how genetic knowledge is or is not applied.

Still, there are some things scientists can and must do. The scientific community, its leaders, and its brightest lights must make sure people know they are aware of popular concerns and doubts. Sometimes it seems scientists are trying to do a study just without caring what anybody thinks. It is easy to let the love of the laboratory blind one to the need to engage such fellow citizens in the adventure and drama that is genetics. Few scientists do so. All ought to.

The traditional high standards of science — transparency, information-sharing, openness to falsification, strict adherence to the best methods, no reliance of trust and fabrication — must continue. They are not enough. Scientists also need to stay in touch with the rest of us to strive to be good communicators, to be engaged citizens. In a world that they're leaving behind, it is not enough to be good communicators, to be engaged citizens. In a world that they're leaving behind, it is not enough to be good communicators, to be engaged citizens.

The pope condemned efforts to "modify the very grammar of life as planned and willed by God — a risky and dangerous venture."

Invention.

Even those in the highest places of moral leadership are worried. His comments were at a meeting of the Good Friday and Easter celebrations in the Vatican, but Pope Benedict XVI recently issued some stern warnings about genetic engineering.

The pope condemned efforts to "modify the very grammar of life as planned and willed by God — a risky and dangerous venture." He did not stop there. He also inveighed against "unsafe, risky and dangerous" biomedical modifying that attempts to "take God's place without better God."

The prospect of more and more food; the repair and enhancement of genetic material like Tay-Sachs, juvenile diabetes, sickle cell disease, and hemophilia; the prospect of TR, growth, stem cell, SAKS, HIV, and many other plagues. And it will allow us to rebuild broken, worse off, or injured body parts.

Any of these alone would be enough reason to pursue genetic research. Together, they all but obligate us to do it. They are an all but unanswerable reply to those who say "No" to genetic research and engineering. Our society would be health and proud to build and

debated and discussed as best and as with as much passion as they are at the Vatican in your church, synagogue or mosque; or at your dinner table. Scientists do not, and they are deeply what their peers think and what you and I think.

What we need is what C.E. Lewis once called for: a bridge between the two cultures. For him, the bridge was between the sciences and the humanities. Today we need a bridge between those who do science and those who do ethics. Scientists do "do without" — it is just that few outsiders get to see them do so. And many of us are fascinated by genetic science but quickly give up trying to follow it because there are so very few to teach us.

What we need today is a dialogue, a conversation, some old-fashioned talking. We do not need demagoguery, fear-mongering or

Age of Advances and Unease

Even for people who barely know where their genes are in every cell of the body except red blood cells — it is pretty clear from the headlines that something momentous is about to happen in the world of biology. Here are just some of the amazing and, to many people, quite disturbing advances going on right now. Scientists are:

- Trying to cure diseases by using modified viruses to alter our genes.
- Targeting new drugs to "fix" genes possessed by specific ethnic or racial groups.
- Bringing up new forms of infectious diseases in order to develop antibodies against bugs that bioterrorists might launch against us.
- Taking human genes into the cells of animals to create creatures that can supply us with useful new medicines.
- Changing the genes of seeds to increase agricultural productivity.
- Cloning animals for meat or milk.
- Making fish, rabbits and monkeys that can glow in the dark for our amusement.
- Genetically testing embryos to determine which ones will be implanted into fertile women to minimize the chances of their having a baby with severe diseases or disabilities.

control over the industrialization, commercialization and financing of genetic science.

In the hands of its practitioners, that science is very, very unlikely to take us anywhere we do not want to go. But ignorance, inattention or indifference to what governments, business and the military do with genetics could lead us to places no one wanted to reach.

The process starts with education. It is up to each one of us to know enough about genetics to understand the possibilities, risks, opportunities and dangers. It is also up to each of us to insist that our educators make genetics a central part of the curriculum in our secondary schools and Sunday schools including the school teaching youth.

Hold your politicians accountable. Ask them to explain how funding for genetics is allocated and accounted for. Insist that your congressmen and senators do not succumb to keeping private genetic applications and products that might offend the moral sense of the community or, worse, our health and well-being.

The genetic genie is out of the bottle. There is not much anyone can do to get it back now, once we understand its potential for good, ought we to do so. This genie will, however, do the bidding of those who control it. To enjoy the benefits genetics offers, it will be up to you and me and our children to build a politics, media, marketplace and educational system strong enough to show the genie who is the boss. We must all — scientist and non-scientist alike — play god when it comes to genetics.

To ensure the future of this century, we must secure sufficient education, dialogue, oversight, accountability and

Control. Author: L. Caplan at caplan@mc.man.ac.uk

In reflecting on the pope's pronouncements, I could not help thinking of an experiment in the scientific pipeline right now, which has not gotten much media attention: creating life itself.

Scientific teams at universities here and overseas think they can create a living microbe. The idea is to assemble bits of DNA into an entirely new genetic sequence, build a crude sort of cell out of fat molecules and other ingredients, feed it the right chemicals and — voilà — a new, never-before-seen, living organism!

One of the scientists pursuing the creation of synthetic life is reported in a recent interview as saying: "For me, life is just like a machine — a machine with a computer program. There's no more to it than that. But not everyone shares this point of view."

I suspect Pope Benedict, my visitor from Temple, and many of those worried about where biology and genetics are headed are in that latter camp. Worse still, this scientist sounds like the kind of materialistic, morally tone-deaf upstart that provoked the papal Easter condemnation.

So is there reason for extreme concern? Should we be shutting the genetic revolution down in its tracks? My own view is that the pope's position — that meddling with God's genetic creations is morally wrong and even insane — while genuine and sincerely held, is not the guidance to follow. His fear and the fear of many others about where genetics is heading is based on the notion — a very false notion — that scientists lack values and moral character.

genetic research given the needs of the sick, starving, impaired and those of future generations for solutions and treatments. Will we really turn away from those who literally are dying before our eyes, or who will die before our children's eyes, simply out of fear of scientists pushing public policy?

That said, many people of deeply held moral principles worry about the abuse of genetic science. So when is the assurance, the guarantee against the thickest clouds that genetic science will go off the ethical rails?

I do not believe we have

God-fearing and reverently guided by God's will cannot be permitted to use their power over heredity to take us places we should not go.

It is true that there are many materialist non-believers among the ranks of genetic researchers. But this is not "godless science" at all.

The scientists I know are full of reverence for life, for people, and for our future possibilities together. They are in awe of nature. They are humble in the presence of the simplest cell, bacteria, virus or bit of mold in a lab dish. There is a spirituality about pursuing science as

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much to fear from the actions of any individual scientist. Few, contrary to the pope's concern, aspire to play God. Science has no tolerance for such fantasies.

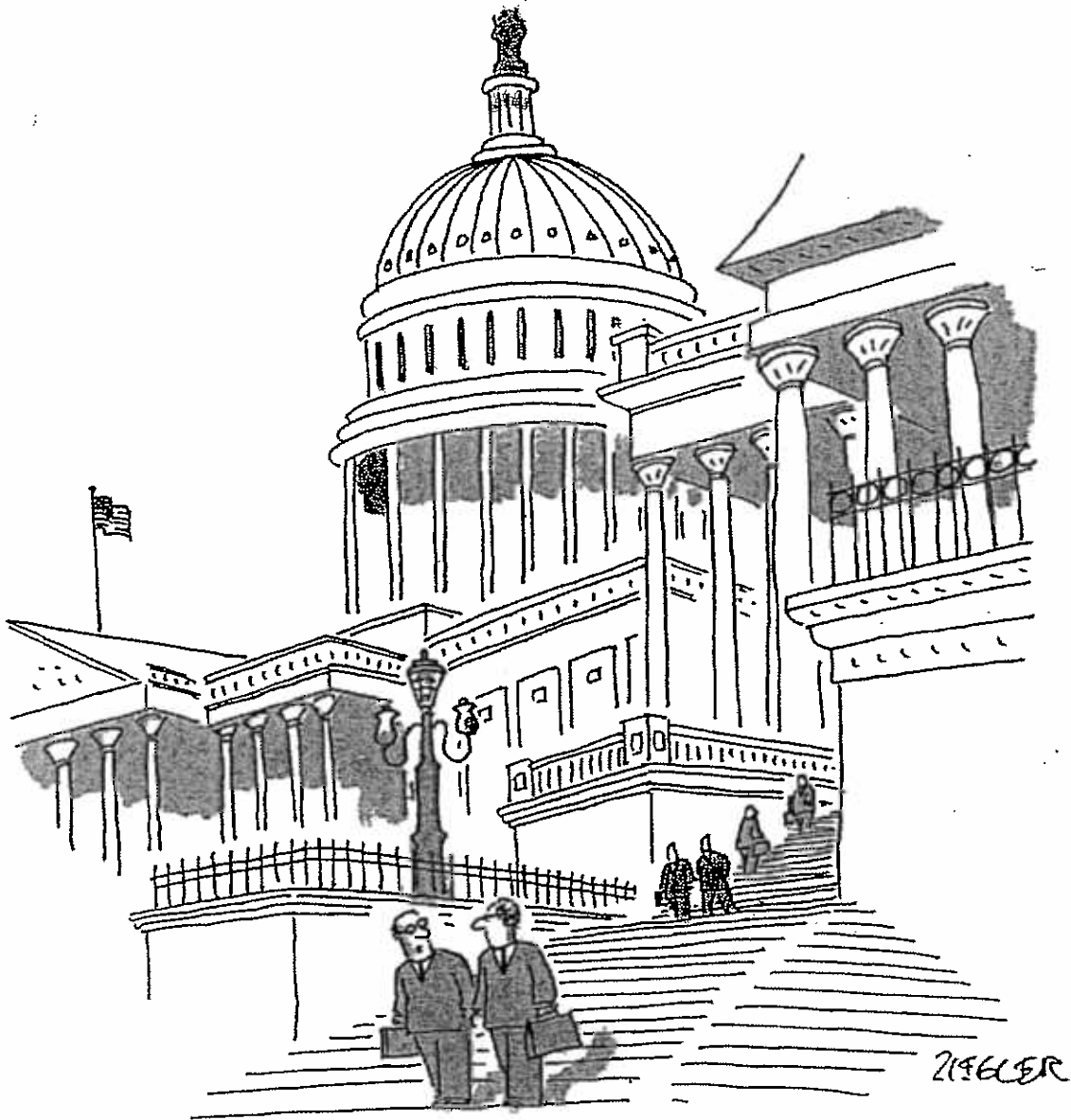
Geneticists know how little they know individually and how hard it is to manipulate nature. Moreover, most of them, not even the best and brightest, is capable of transforming a discovery from the lab into the real world by himself or herself. That sort of power is reserved for the deity, government or the market.

What the deity does is beyond our control. But what government or the market does or is allowed to do is

deep and as sincere as any to be found in religion.

There are indeed important moral and ethical questions to be debated about the "humanness" of the genetic research being carried out in labs, behind closed corporate doors, and in distant lands whose cultures and traditions merit an eye.

That said, I do not know a single genetic scientist, not one, who thinks that moral, ethical and even public reflection about the morality of genetic engineering is silly, pointless or unnecessary. In the halls I am lucky enough to travel in universities, companies and research institutes, these subjects are



"Of course, it would be a different story entirely if we could extract crude oil from stem cells."