

Stem Cell Research

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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.

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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/1/050100.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/ primer.htm](http://www.nih.gov/news/stemcell/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 (*shinui 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* 9:2XXXX.

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).