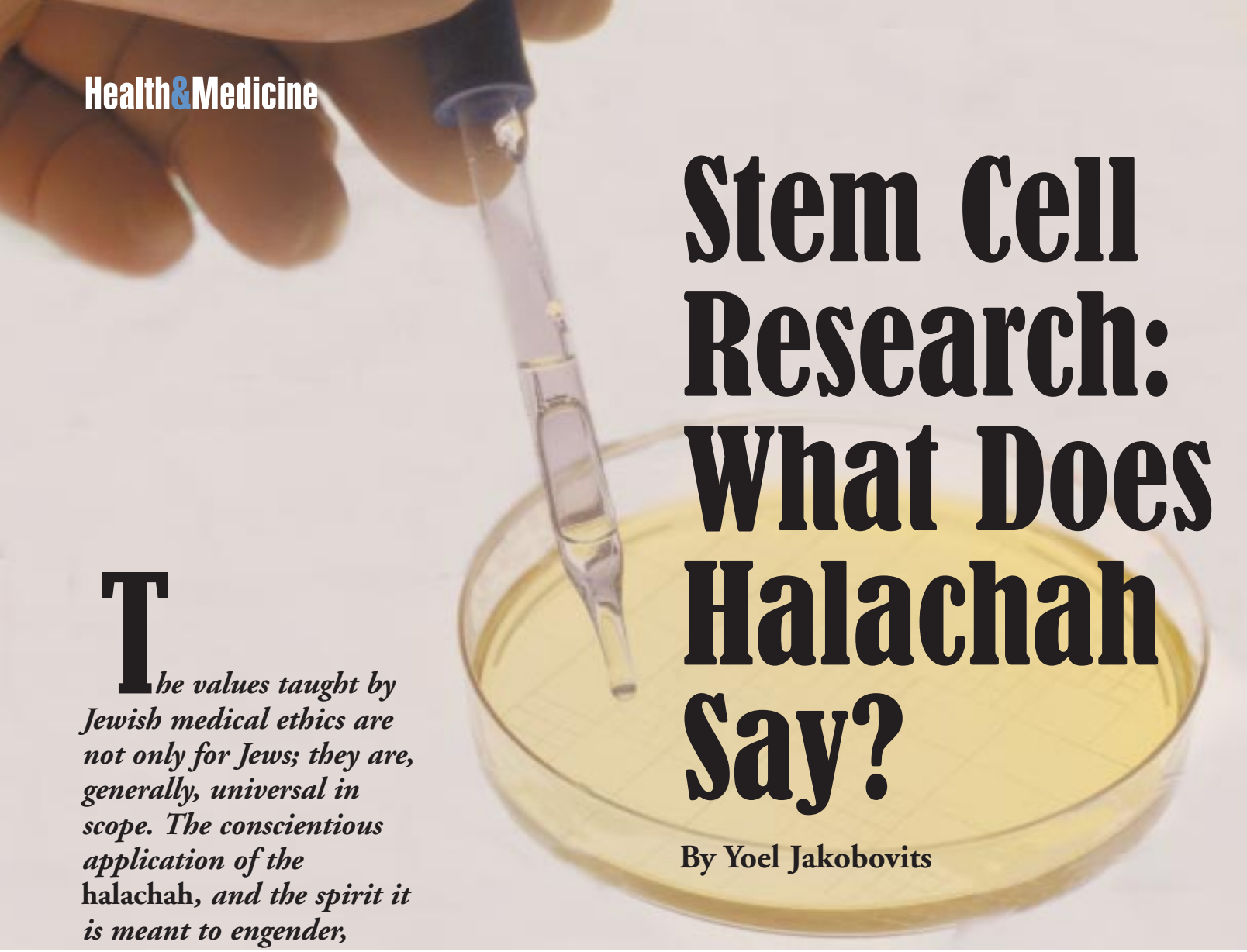

Stem Cell Research: What Does Halachah Say?

By Yoel Jakobovits

The values taught by Jewish medical ethics are not only for Jews; they are, generally, universal in scope. The conscientious application of the* halachah*, and the spirit it is meant to engender, intensifies the appreciation we have for the gift of life in all its forms. As these lines are written, our anguished attention is riveted on the news from Eretz Yisrael where we are reminded daily of the catastrophic consequences of the callous disregard for these values. May our enhanced sensitivity to these morals, as we search for the* devar Hashem*, contribute in some small way to the resolution of the painful crises we now face.

With one spectacular development tumbling over the next in ever more rapid succession, our generation is witnessing the compression of history in the scientific and medical realm just as much as in the geopolitical realm. Indeed, it may well be that in the long term, the direction of humanity and its history ultimately will be affected more profoundly by these scientific and medical developments than even by the current unprecedented global political upheavals.

New Technology—New Issues

Medical ethics concentrates largely on the opposite ends of life. For example, at the beginning of life, questions relate principally to abortion, contraception and conception issues even before birth. At the other end of life, inquiries relate to the management of dying, the moment of death, autopsies and organ harvesting even after death. The intervening years prompt relatively few medical ethics problems.

Over the past several decades, "end of life" issues have been the focus of much attention, largely due to the new life-prolonging technologies. Some of the issues raised relate to advanced life

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supports, defining the moment of death and the allocation of expensive, scarce resources to prolong life. In contrast with the great advances in life-prolonging technologies, perhaps the most exciting recent medical developments have been related to life-creating techniques at the other end of life. These developments include the mapping of the Human Genome Project, ever-more sophisticated in vitro fertilization techniques, stem cell development and cloning technology.

In addition to the "old" ethical questions concerning abortion and contraception, the new technology has spawned a whole new range of ethical issues concerning the beginning of life. The stage for these developments was set already half a century ago by the pioneering work of Watson, Crick, and others who discovered and described the fundamental elements governing the structure and function of DNA. Over the ensuing decades, there has been an ever-accelerating application of these basic scientific advances, culminating in successful mammalian cloning and effective stem cell therapy.

In writing this article, limited to an analysis of stem cell issues, I have set myself two chief objectives: To outline the essential medical facts pertaining to stem cell research and therapy, and to summarize the principal halachic approaches which have been proposed thus far. Clearly, given the novelty of these innovations, both the medical and scientific questions as well as halachic answers are in flux and must be tentative at this point in time.

What Are Stem Cells?

Every discussion of medical ethics must be governed by the axiom: good ethics—and good *halachah*—require good facts.

All the various parts of a plant or tree—the trunk, branches, leaves and fruits—develop from the stem. Similarly, all the cells of a living organism develop from "precursor" cells, known as stem cells.

Mammalian development begins with the union of a male's sperm cell with a female's egg. The resultant cell has the inherent potential to develop into the entire gamut of cells forming the organism. This prime cell divides, within several hours of fertilization, into two identical duplicate cells, each of which retains this broad potential. After several more divisions, by about the fourth day, these cells begin to specialize, forming a hollow sphere called a blastocyte, which is composed of an outer and inner layer of cells. Cells of the outer layer are destined to form the placenta and other supporting tissues of pregnancy. The inner layer cells go on to develop into all of the organs and tissues of the developing fetus. These cells are now somewhat more limited in their potential—they can give rise to many but not all the types of cells necessary for fetal development. As stem cells "mature," their potential to develop into any kind of human tissue decreases. Soon after, these stem cells undergo further specialization (called differentiation) becoming cells committed to developing into a given line of cells.

Ultimately, stem cells develop into "master cells," designed to multiply into specific tissue types. For example, blood cell stem cells will develop into the various types of blood cells; skin stem cells into the various types of skin cells. Once they reach this level of specialization, they are committed to developing specific tissues.

The cells related to developing the blood are the best understood stem cells. They reside in the bone marrow of all children and adults, and are, in fact, usually present in very small numbers in the circulating blood stream as well. Because red and white cells in the peripheral blood have limited life spans, these stem cells are crucial to maintaining an adequate blood supply in the healthy person.

Parenthetically, a few words about the techniques involved in bone marrow transplantation are in order. Bone marrow is not a solid organ; it is transplanted by transfusion from the donor to the recipient. Bone marrow cells are almost all stem cells, committed to producing mature blood cells. The donor is treated to prompt his marrow to become overactive, spilling large numbers of cells into the circulating blood stream. From here, these cells can be readily harvested by phlebotomy (opening a vein). The collected bone marrow stem cells can then be transfused through a vein into the recipient. Patients with leukemia, for example, are treated with powerful medications which completely eradicate their diseased bone marrow. Healthy stem cells, which have been previously harvested from a matching healthy person's circulation, can be administered by transfusion to replenish the now barren bone marrow of these patients. This procedure is the essence of bone marrow transplantation.

A fairly widely used variation of this process can also be applied to patients with a variety of cancers. Treatment with sufficiently high doses of chemotherapy, designed to destroy all traces of their cancer, often leads to the incidental eradication of their bone marrow. In these circumstances, bone marrow stem cell transplants can be offered to rescue the patient by replenishing the destroyed bone marrow.

Cells early in the chain of developmental events are less clearly committed to any specific tissue line. Therefore in trying to induce cells to develop new and controlled tissue lines, these early "omnipotent" cells are the most desirable. Once cells differentiate into specific cell lines, they can generally be expected to develop only into cells of that family. Getting cells to climb back up the chain of development, and thereby regain the ability to develop into other cell types forms the basis of cloning technology. The technological and ethical issues involved in cloning, however, are beyond the scope of our current discussion.

Where Are Stem Cells?

At present there are several sources of stem cells:

- Early human embryos. In general

these embryos are developed as a result of couples using in vitro fertilization to conceive a child. The union of sperm and eggs in a petri dish produces many embryos. Implanting them all into the mother's uterus would present a grave danger to her because of the multiple fetuses she would have to carry. Therefore, only a few are implanted; the remaining are leftover or spare. These pre-implanted embryos are a widely used source of stem cells.

- Tissue obtained from aborted fetuses.
- Cells obtained from the umbilical cord.
- Using "somatic cell nuclear transfer" (SCNT), an adult cell's gene-containing nucleus can be combined with an egg from which the nucleus has been removed. Using special techniques, the resultant cell can be induced to divide and develop as an early stem cell to form a blastocyte from which very potent cells can be obtained. This is the basis of cloning.

Stem Cell Research and Implications for the Future

Why isolate and develop pluripotent stem cells, that is, stem cells that have the ability to become any human tissue? At the most fundamental level, stem cell research will help enormously in understanding the complex events of early mammalian development. Secondly, such research could dramatically change the way in which drugs are developed and tested. Specific healthy and diseased cell lines could be exposed to specific drugs, largely obviating the need for much more dangerous and expensive human testing.

The most far-reaching applications would come in the area of "cell therapies." Thousands of people are on waiting lists for organ transplants. Because the supply of donors is much smaller than the number of waiting patients, many patients will die of their illnesses before suitable donors can be found. Incidentally, a major cause of limited donor supply is the strict application of seat belt laws! Ultimately it is hoped that stem cells could be stimulated to develop into a source of replacement cells to create banks of transplantable human tissue. There is already reason to believe that this will be possible in replenishing the diseased or absent brain cells caused by Parkinson's and Alzheimer's diseases, strokes, spinal cord injuries, various heart diseases, diabetes, and arthritis.

Halachic Considerations

We begin the outline of the halachic approach to stem cell research by stressing some general overarching principles. In contrast with other religions, Judaism has no problem with "playing God," provided we do so according to His rules as expressed by authentic halachic mandate. Far from being shunned, "playing God" in the Jewish tradition is, in fact, a religious imperative: "*Mah Hu af atah,*" the concept of *imitatio Dei* is implicit in the mandate to heal and provide effective medical relief wherever possible. Of note, the only two "professions" ascribed to God Himself are those of teaching ("…*hamelamed Torah l'amo Yisrael*") and healing ("…*ki ani Hashem rofecha*"). By teaching and/or healing, we fulfill the obligation to "play God."

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There is no reason that microscopic manipulation of a faulty genetic blueprint should be any different than surgical manipulation of a defective macroscopic—that is, visible to the unaided eye—tissue or organ. Normative *halachah* sanctions—nay, encourages—medical intervention to correct both congenital and acquired defects and makes no distinction between stem and somatic (body) cell tissues. The crucial distinction here is between the permissible act of correcting a defect (sanctioned by "*verapo yerapeh*") and the forbidden act of attempting to improve on God's creations (generally proscribed by the laws of *kilayim,* cross-breeding). For example, it would be permitted, were it possible, to correct the genetic defect which leads to Down's syndrome, but manipulating genes to produce a "perfect-bodied" six-footer with blue eyes would be prohibited.

There would, therefore, be no halachic problem with using stem cells derived from adult tissue. Similarly, it would appear that using cells from umbilical cord tissue would be permissible. A rather minor concern here might be the following: may one have umbilical tissue collected and frozen so that the cells will be available in case one requires stem cell therapy some time in the future? Is this degree of *hishtadlut*, effort, in trying to insure one's health appropriate or excessive?

While there are few halachic objections to deriving stem cells from adult or umbilical cord tissue, the problems arise, however, with deriving stem cells from embryonic tissue. Post-implantation embryonic tissue (that is an embryo already implanted into the uterine wall) is after all, an early fetus; clearly no sanction would be given to aborting a fetus in order to obtain stem cell tissue. Even were fetal tissue necessary to provide life-sustaining therapy for a patient, no sanction would be given to sacrifice an innocent fetus even in the interest of *pikuach nefesh* (saving a life). The only exception to this rule is the obligation to forfeit the life of the "non-innocent" fetus when its continued existence constitutes a danger to its mother by virtue of the

fetus's *rodef* "pursuer" status.

Even fetal life before the 40th day of gestation—which is considered "*maya b'alma*" ("mere water") could not be aborted in order to obtain stem cell tissue. Prior to 40 days, a miscarried fetus does not cause *tumat leidah* (*Niddah* 30a) and therefore is of lesser status than a more mature fetus (Rabbi Y.Y. Weinberg in *Seridei Aish*, III: 350,7 however cf. *Seridei Aish*: III:127). Though Chavot Yair argues that even pre-40th day feticide is prohibited because of the restriction of *hashchasat zera levatalah*, wastage of seminal seed, Rav Yaakov Emden (in *She'eilot Ya'avetz* 43) counters that *zera levatalah* cannot apply once implantation occurs. Rabbi I. Unterman (*Shevet Miyehudah* I:9) also holds that destruction of even the earliest embryo is feticide because the Shabbat may be violated for its welfare (based on Ramban's *Torat HaAdam* citing *Yoma* 85b). On the other hand, Rabbi Chaim Ozer Grodzinski (*Achiezer* III, 65:14), and others, argue for a less stringent status in embryos before 40 days of gestation.

The prime source of embryonic stem cell tissue is embryos that have not been implanted into the uterine wall. As discussed above, they are usually the "by-products," spare embryos left aside during in vitro fertilization in order not to dangerously overload the mother's uterus. The halachic status of these "spare," non-implanted embryos is somewhat unclear.

Some rabbinical opinions suggest that in addition to the 40-day milestone, an embryo doesn't reach fetal status until it is implanted into the uterus. Prior to that, while still in a petri dish, or other artificial medium, it cannot develop into a viable fetus. Therefore, such early embryos have no real life potential at all and are not considered alive. Consequently, there would be no halachic opposition to disposing of them, researching on them or deriving stem cell tissue from them.

The status of pre-implantation embryos has another potentially important halachic consequence. Pre-implantation genetic diagnosis (PGD) offers a promising approach to prevent the birth of genetically defective children. By studying embryos before implantation into the uterus, it is possible to identify those defective genes. By selecting only genetically intact embryos for implantation, the development of genetically defective fetuses would be avoided. Assuming the pre-implanted embryo has not reached the level of a fetus, halachic sanction may be possible.

The ethical issues raised by stem cell research and therapy are, of course, not only of interest to Jews. In an unprecedented national broadcast, shortly before and largely overshadowed by the events of September 11, President Bush defined some fairly restrictive regulations. Just recently the Administration argued strongly in favor of banning all research into human cloning. Evidently the crossroads of medical science and the generation of life itself raises fears and genuine concern in the minds of many thinking people.

It appears that halachic concerns may be more permissive than is generally understood. Clearly, it behooves us, as Jews, to avail ourselves of whatever Torah and scientific knowledge we can—not only as we try to find halachic guidance for ourselves, but perhaps equally importantly—as we strive to fulfill our national mandate to be an "*ohr lagoyim*"—to help shed light on these vexing issues for society at large. JA

Statement in Support of Federal Funding for Embryonic Stem Cell Research
Union of Orthodox Jewish Congregations of America/ Rabbinical Council of America

(Excerpted from a Letter to President George W. Bush)
July 26, 2001

…Our Torah tradition places great value upon human life; we are taught in the opening chapters of Genesis that each human was created in God'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 [in vitro fertilization] 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 urge you to…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.