The Stem Cell Debate: Are Parthenogenic Human Embryos a Solution?

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Under the "techno-jargon" title "Multilineage potential of homozygous stem cells derived from metaphase II oocytes," a group of researchers from the Stemron Corporation and Reproductive Biology Association have just reported on their creation--via a technique known as parthenogenesis--of human embryos for the purpose of obtaining stem cells (Stem Cells 2003:21:152-161).

What is parthenogenesis? Parthenogenesis is a process (sometimes referred to as a "virgin birth") in which an embryo is created solely from a female oocyte without any genetic contribution from a male. 1 Ultimately, the goal is to produce an embryo with a full genetic complement ("diploid," or having 46 chromosomes) either by stimulating eggs that are still diploid to divide or by inducing an egg with 23 chromosomes to replicate its genetic material. (Eggs halve their genetic complement [going from 46 to 23 chromosomes] relatively late in their maturation cycle, so if early activation is done, a full set of genes is retained. Alternatively, it is possible to stimulate a haploid egg to replicate its genetic material, resulting in a "full genetic complement.") The investigators in this article began with eggs that had halved their genetic complement and then doubled that single set of chromosomes.

The discoveries presented in this paper include initial experiments on mouse embryonic stem cells that were derived from parthenogenically created embryos and tested for their "stemness"--i.e., to see if they had similar qualities as typical embryonic stem cell lines. In all the ways that they were tested, they appeared to have the same characteristics. Second, they stimulated human oocytes to make human embryos from whom they derived a few embryonic stem cell lines. These cell lines have yet to be tested for "stemness" qualities.

Part of the rationale for creating embryos via parthenogenesis was the idea that embryonic stem cells derived from parthenogenic embryos would "match" the tissue of the egg donor, presumably allowing for a successful stem cell transplant. Another hope was that stem cells derived from
parthenogenic embryos might be "universal" donors due to the fact that only one set of the major histocompatibility antigens (HLA proteins) would be "inherited" and then duplicated during embryonic formation. The theory here is that it would seemingly be easier to match stem cells with fewer HLA combinations to the various tissue types of patients. An additional rationale given for deriving human embryonic stem cells from parthenogenic embryos was that destruction of these embryos allegedly raises fewer ethical concerns than does destruction of other human embryos. This last justification needs to be examined further, however, before we breathe a sigh of relief and endorse studies relying upon the parthenogenic creation of human embryos.

The ethical dilemma central to creating and destroying human embryos for their stem cells is rooted in questions regarding the moral status of human embryos. Christians hold that the embryo, although at an early stage of human development, is nevertheless a developing human being. Furthermore, they maintain that no stage of human development should be regarded as having more or less worth than another. The fact that Jesus became a human being at the moment of conception reinforces that all stages of human life have inherent value and dignity. (After all, Jesus, as God, could easily have begun His life at a later stage in development.) The conclusion is that human embryos should therefore be given the same moral status as more mature human beings.

But should parthenogenic embryos be considered human embryos? Some people have proposed that parthenogenic embryos should not be considered normal human embryos because parthenogenic embryos are not able to complete gestation nor be born as live offspring. What should we think about this?

It is true that human (as well as all mammalian) parthenogenic embryos presently would not complete gestation, unless they are given the opportunity to do so by combining them with normal trophoblast cells (the outer ring of cells in an early embryo, that ultimately form the placenta). This gestational incompetence (which currently is not capable of being reversed) seems to be due to the lack of paternal "imprinting" of genes, which directs normal placenta growth. How should we regard these embryos, who contain a full complement of human DNA but are unable to complete gestation? Should such embryos be defined as "lesser humans," "diseased humans," or "not humans at all?" What if a lack of viability was applied universally as a means of denying full humanity? For example, we know that many naturally conceived human embryos inherit genetic flaws that prevent their healthy development. All of these, then, would be viewed as "lesser humans," or "not humans at all." It is becoming increasingly possible to screen for embryos with genetic flaws of this nature. These labels could be used to morally absolve us of wrongdoing if we choose to abort, donate to research, or even create for research, embryos known to carry genetic flaws.

Currently, some researchers are working on methods to overcome some of the genetic deficiencies incurred via parthenogenesis, which may provide a way for a single female or even a female couple to procreate. If these research aims are realized, they may further enable non-traditional procreation, in addition to raising new questions regarding the morality of sacrificing such embryos to scientific experimentation.

Another concern is the trend among a growing number of scientists to move directly to experimentation on human embryonic material, without first conducting thorough testing in animal
systems. Though the fundamental question is whether society should be creating human embryos in the lab in the first place, it is important to recognize that throughout much of its history, human subject research has been permitted only after certain experimental protocols have been demonstrated to be both safe and effective in animals. Ethical guidelines demand that a minimal level of risk compared to the anticipated benefit for the subject should be established before research can be carried out on human beings. Society traditionally has not condoned research for the betterment of society if it comes at the cost of life for whom there is no hope of benefit.

One might ask, is the parthenogenesis issue similar to fetal tissue research? Some have condoned fetal tissue research if the research can be separated from the decision to have an abortion. In other words, if a woman has already decided--apart from any motivation connected to the donation of fetal tissue--to have an abortion, then the fetal tissue could be ear-marked for research, similar to cadaver tissue. However, we would not condone a woman's conceiving with the express purpose of aborting to create "tissue". It is this situation that is more akin to the parthenogenic creation of human embryos in the lab. If, on the other hand, a parthenogenic embryo (known as a "teratoma" or tumor) occurred naturally, we would not contest its destruction. Applying the "principle of double effect," we would assent to the surgical removal of such an entity because there is no available treatment to heal it and since removing it will save the mother's life. However, to specifically create an embryo fated for early death is ethically troublesome.

My final plea would be for the application of prudence to the parthenogenic creation of human embryos. Webster's Collegiate Dictionary (10th edition) defines prudence as "the ability to govern oneself with the use of reason, marked by wisdom or judiciousness, exercising caution or circumspection as to the danger or risk." Prudence demands a thorough evaluation of the rationale for parthenogenically creating human embryos. One question that we must ask is whether we can find an alternative, ethically praiseworthy way to achieve the same ends allegedly afforded by this method. The answer is most likely yes. Prudence should also cause us to ask about the danger or risk of an experimental protocol, as well as the purported benefits. In order to justify this research, scientists must designate parthenogenic embryos as being "less human" in nature because of their inability to complete gestation--a designation that I would regard as unwise, in addition to being unethical.

Prudence would also require us to assess longer-term dangers of this strategy. I am persuaded that there is a deeper concern intrinsic to the creation of embryos for destructive research. This deeper concern pertains to humankind's accountability for our genetic offspring and the very processes and "building blocks" of reproduction. Experimenting on parthenogenic human embryos will likely have far-reaching consequences for our ability to control the initial steps of procreation--potentially including those of non-traditional procreation, e.g., by enabling the creation of embryos who do not require paternal imprinting to develop normally. I am persuaded that our offspring has even far greater significance--borne out in the fact that they are created in the image of God--than that typically ascribed to them. Even the intrinsic design and function of sperm and eggs may be instructive to the parthenogenic issue. One question that is not often asked is whether our "seed" should be used for non-reproductive purposes, or, rather, reserved only for the realm of procreation of human beings created in the image of God. As scientists seek to manipulate and artificially stimulate human eggs in the parthenogenic process, they should
perhaps focus on what they are doing--and the implications of such--rather than on just what they are creating.


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