

Stem Cell Research and Altered Nuclear Transfer: A Critique
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Human embryonic stem cells (hES) have been hailed as a possible salvation for hundreds of thousands of people suffering from a myriad of diseases. However, hES research is controversial, since producing such stem requires the destruction of human embryos, created either by reproductive technologies or by somatic cell nuclear transfer (cloning). The debate therefore centers on the moral status of embryos. Many scientists, who do not attribute personhood to a pre-implantation embryo, have no reservations about hES research. However, for those who hold that “the moral status of a human embryo is absolute at all stages and equals the status of a person,” embryo-destructive research is immoral (Mertes, Pennings, & Steirteghem, 2006, p. 2794). In order to overcome such qualms, biologists have been investigating some alternatives, in the hope that they may be morally permissible. One of these is Altered Nuclear Transfer (ANT). This paper will discuss the biology of ANT and the ethical concerns surrounding this technique. In this paper, I will contend that ANT is not a morally acceptable means of obtaining human embryonic stem cells.

ANT is based upon a modification of somatic cell nuclear transfer (SCNT), used to produce cloned embryos for destructive research (Presidents Council on Bioethics, 2005). The modification involves a technique called RNA interference to disable the Cdx2 gene in a somatic cell nucleus prior to its transfer to the oocyte (Cameron, 2005). The Cdx2 gene codes for the normal differentiation of the trophoctoderm, essential for embryogenesis. Without a functional trophoctoderm, the embryo cannot implant in the endometrial lining of the uterus (Hurlburt, 2005). Thus, the embryos produced by ANT lack the ability to implant and undergo normal embryogenesis. Because these embryos lack any potential for development past the blastocyst stage, some have suggested that ANT is an ethical alternative to SCNT. Stem cells can be harvested from these blastocysts, termed “biological artifacts” by the President’s Council on Bioethics, without destroying a human life. The cells obtained by this procedure could then have the Cdx2 gene reactivated, so that normal pluripotent stem cells could be derived from the biological artifacts (Presidents Council, 2005).

The key to the ANT approach is its preemptive nature. “This process does not involve the creation of an embryo that is then altered to transform it into a non-embryonic entity. Rather . . . the entity is brought into existence with a genetic structure insufficient to generate a human embryo” (Hurlbut, 2005, p. 226). If this assertion is true, the argument goes, these biological artifacts could be destroyed for medical research without violating the sanctity of life. However, despite their lack of biological potential, “the question for many remains whether they are fundamentally different from a human embryo or whether they are just some kind of defective embryo” (Mertes et al., 2006, p. 2753). In other words, which entities are embryos?

According to the Presidents Council, for an entity to have embryo status it must possess the capacity for self-directed development, integration, and self-maintained unity. It must display the characteristics of a developing organism with an “inherent potency” to develop into its mature form (2005, p. 85). Thus, the human embryo is, in part, defined by a potential for embryogenesis and fetal development. ANT assumes that because this potential is not present in the biological artifacts it produces, these entities are not worthy of embryo status. However, this is a functionalist view of human embryos. Traditionally, functionalist arguments have not lent moral credence to denying human personhood to unborn entities, be they embryos or fetuses.

There is simply “no clear distinction between non-viable embryos and non-embryonic entities mimicking embryogenesis” (Mertes et al., 2006, p. 2753). For example, zygotes that have a trisomy of the first chromosome will form a blastocyst but will never implant (Hurlbut, 2005). Such non-viable embryos lack developmental potential, in a similar way to the “biological artifacts” of ANT. In both cases, this lack of potential is due to genetic abnormalities. Whether the future zygote is genetically crippled by biologists during ANT, or naturally inherits a fatal genetic abnormality, it is still deserving of embryo status. The mode by which these severe genetic abnormalities occur has no bearing on the ontological personhood of the embryo.

Second, what if we grant that the genetic modifications of ANT can create a biological artifact with no potential and no moral significance? Could this same ethical reasoning be used to argue that “further developed

but still inherently defective entities are fetus-like but not actual fetuses?” Are fetuses that have no genetic potential for survival or development outside the womb somehow ethically suitable for destruction? (Presidents Council, 2005, p. 43) It is absurd to assume that the lack of biological potential or integrated development past a certain point can nullify the intrinsic worth of a human being.

Many individuals would cringe at the notion of cloning human life just to destroy it for research. Yet purposefully creating crippled embryos to destroy them for research purposes is equally immoral. Does the inactivation of one gene make the ANT product any less human than the embryos produced by SCNT? Should fallible biologists be entrusted with the task of pinpointing the exact gene that imparts moral significance upon human? Human life should be treated with more respect.

ANT is an interesting scientific attempt to assuage the moral conscience of those who see the evil of therapeutic cloning and destructive hES research. The ANT technique involves a modification of SCNT that eliminates any potential for embryogenesis past the blastocyst stage. However, we should be suspicious of the morality of ANT as a means of hES research. Biological potential is simply inadequate to determine the moral status of an embryo. When using “potential” as criteria for personhood, there is no clear distinction between a non-viable embryo and a non-embryonic entity. In view of the sanctity human life, no mortal should be entrusted with the task of determining which genes endow a human being with moral significance. Despite its accolades, Altered Nuclear Transfer should not be deemed a morally permissible method for embryonic stem cell research.

References

Cameron, D. (2005, October 17). Researchers offer proof-of-concept for altered nuclear transfer.

Whitehead Institute for Biomedical Research, online, available at

http://www.whitehead.mit.edu/news/archives/2005/rj_1016.html.

Hurlbut, W.B. (2005) Altered nuclear transfer as a morally acceptable means for the procurement of human embryonic stem cells. *Perspectives in Biology and Medicine*, volume 48, number 2: 211-228.

Mertes, H., Pennings, G., & Steirteghem, A.V. (2006). An ethical analysis of alternative methods to obtain pluripotent stem cells without destroying embryos. *Human Reproduction*, Vol.21, No.11 pp.2749-2755.

President's Council on Bioethics (2005) *White paper: Alternative sources of human pluripotent stem cells*. The President's Council on Bioethics, Washington, D.C.