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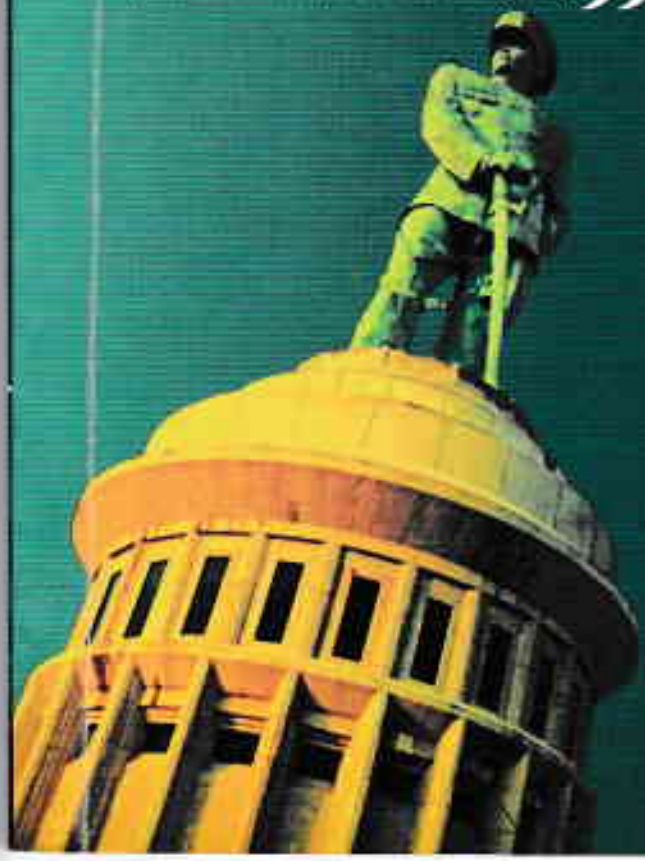
# International Symposium II CME and WS X Men's Health: Regerative Medicine, Reproduction, Sex, and Aging

"Regenerative Medicine in Men's Health, Reproduction, Sex and Aging"



Handbook

# SHOULD WE USE HUMAN EMBRYONIC STEM CELLS TO REPAIR OUR DAMAGED BODIES?
## *BIOLOGICAL FACTS AND ETHICAL CONSIDERATIONS*

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**Abstract**

Stem cell technology has developed rapidly. Among the developments occurred,several researches using human embryos have appeared. Spare embryos from in vitro fertilization clinics attract some scientists to use them as living biological materials for research. Prospects and promises of healing have been announced in mass media. But on the other side, the defenders of the human embryo raise critical questions opposing the use of embryo as the source of stem cells. This short paper describes biological facts on the derivation and usage of the human embryonic stem cells for therapy and some ethical considerations for the destruction of the early human embryos used in the research.

**Biological facts**

The term "stem cell" is a general explanation for "any cell that has the ability to divide, generating two progeny (or 'daughter cells'), one of which is destined to become something new and one of which replaces the original stem cell".[1] The term "stem" itself means origin, source or a central part of something from which other parts can develop or grow. Hence, in this sense, stem cells identify the cells as the source or origin of other, more specialized cells.

In discussing stem cells we need to know the sources. Geneticist Ricki Lewis explains that, "Many, if not all, of the organs in an adult human body harbor stem or progenitor cells that can begin to divide when injury or illness occurs and new cells are needed to replace damaged ones."[2] In stem cell research, scientists derive stem cells from different sources, such as: 2-16 cells stage embryo, blastocyst (inner cell mass), fetus (aborted fetus), umbilical cord (the blood from the umbilical cord of a newborn), placenta (from placenta and amniotic fluid of a newborn), adult stem cells (bone marrow, fat, etc.)[3]. These stem cells have different characteristics, namely, totipotent, pluripotent, and multipotent. Totipotent cells are cells that can be a new individual, as believed they source from 1 to 3 day early embryo. Pluripotent cells are cells that can develop into many (over 200) cell types, they source from blastocyst. Multipotent cells are cells that can develop into some cell types, they source from adult stem cells, e.g. bone marrow.

1. Maureen L. Condic, "The Basics about Stem Cells," *First Things* 119 (January 2002): 31. See also Ricki Lewis, *Human Genetics: Concepts and Applications*, 7th ed (Boston: McGraw Hill International Edition, 2007), 39. She says that the reason that the cells can stem is because bodies grow and heal, for this thanks to cells that retain the ability to divide, generating both new cells like themselves and cells that go on to specialize. A stem cell divides by mitosis to yield either two daughter cells that are stem cells like itself, or one that is a stem cell and one that is a partially specialized progenitor cell.
2. Lewis, *Human Genetics*, 39.
3. Cf. Genetic Science Learning Center, "What are Some Different Types of Stem Cells," *Learn Genetics*, sourced from the internet: http://learn.genetics.utah.edu/content/tech/stemcells/sctypes/, access date November 25, 2009.

The use of stem cells has been known since 1963 using bone marrow. "Using stem cells to heal is one type of 'regenerative medicine,' which replaces damaged tissues with materials that include cells that can divide".[4] However, stem cell research attracted public attention when in 1998 James Thompson first derived human embryonic stem cells[5]. Human embryonic stem cells (hereafter HES cells) are cells derived from an embryo that have the ability to continuously divide and differentiate into various other kinds of cells/tissues. They could be derived from the early embryos or the blastocysts. The derivation of these cells entails the destruction of the early human embryos. In the case of the 2 to 16 cell-stage, the embryos are destroyed so that the cells inside could be retrieved. The same procedure applied to the blastocysts, but in this case, it is only the inner cell mass (ICM) of the blastocyst that derived. Both derivation methods entail the destruction of the human embryos. These cells are then cultured in petri dishes with specific solutions to tell them to differentiate into intended cell types.

HES cells become *prime donna*, because of their plasticity, or in the more technical term, they are pluripotent, able to be many cell types. The use and success of these stem cells are not much known, and there are formidable challenges in using them for regenerative medicine. Those challenges are the patient's immune system, tumor formation, and the problem of differentiation. To this M.L. Condic explains,

> First, there was the concern that the cells and their derived tissues would be rejected by the patient's immune system, requiring the patient to undergo lifelong immune suppression. The three proposed solutions to this incompatibility problem (generating large banks of stem cell lines, cloning human embryos to provide a source of cells that perfectly match the patient, or genetically engineering stem cells to reduce immune rejections) were either socially, scientifically, or morally problematic (or all three). Second, there was the serious problem that embryonic stem cells form tumors when transplanted to adult tissues, and the tumorogenic capability of these cells is difficult if not impossible, to control. Finally, there was the disturbing fact that science had thus far provided essentially no convincing evidence that embryonic stem cells could be reliably differentiated into normal adult cell types, as well as the disturbing possibility that overcoming this barrier would prove a difficult scientific endeavor[6].

Another way of gaining the HES cells is by performing somatic cell nuclear transfer (SCNT). This method is developed to avoid the problem of the immune system discussed above. The method of harvesting HES cells involves: first the human ova must be emptied from their nuclei and then the nuclei from adult cells of a person/patient are introduced into those ova. Then these ova are chemically activated so that the cells inside divide, growing as embryos. Then, the embryos are destroyed to derive the ICM cells and culture them to form HES cells[7]. As a matter of

4. Lewis, *Human Genetics*, 39. See also Thomas B. Okarma, "Human Embryonic Stem Cells: A Primer on the Technology and Its Medical Applications," in *The Human Embryonic Stem Cells Debate: Science, Ethics, and Public Policy*, eds. Suzanne Holland, Karen Lebacqz, and Laurie Zoloth, (Cambridge, MA: The MIT Press, 2002), 3-13.
5. See James A. Thompson, "Human Embryonic Stem Cells," in *The Human Embryonic Stem Cells Debate: Science, Ethics, and Public Policy*, eds. Suzanne Holland, Karen Lebacqz, and Laurie Zoloth, (Cambridge, MA: The MIT Press, 2002), 15-28.
6. Maureen L. Condic, "What We Know about Embryonic Stem Cells," *First Things* 169 (January 2007): 28.
7. See Lewis, *Human Genetics*, 41. See Condic, "Embryonic Stem Cells," 27. She aptly observes that no clones are normal individuals, they are genetically abnormal. "The fact that most cloned embryos die at early stages of development is entirely consistent with the conclusion that somatic cell nuclear transfer does not generate normal

this method is a *therapeutic cloning* which involves human reproductive cloning. It involves ating human embryo to destroy them.

Above all this research, the debates are still going on regarding whether the HES cells l be less effective than adult stem cells to cure disease. It should be noted that "there is no idence that tissues derived from embryonic stem cells have produced a true cure of any human ease, even in animal model of human diseases."[9]

On another part, the use of adult/somatic stem cells has shown significant benefit and elopment. This kind of stem cell can be used and taken from an individual without any harm olved. There are no embryos destroyed either. One of the rich sources of stem cells is bone row. Lewis observes that stem cells derived from bone marrow are hematopoietic (blood ming) stem cells. They can form "not only blood cells, but also nerve, muscle, liver, and blood sel lining cells, under certain conditions."[10] Lewis reposts, "The heart transplant study inspired perimental treatment for a 16 year old who was shot in the chest with a nail gun. Physicians ve him a drug to coax his bone marrow to produce stem cells that could travel to the heart. The ung man improved and did not require the transplant. Apparently the stem cells induced blood ssel growth in and around the heart, rather than replacing heart muscle."[11] Lewis notes the od prospect of adult stem cells for the advancement of regenerative medicine for breast ncer, heart problems, spinal cord injuries, Parkinson disease, and multiple sclerosis; also for r conditions such as baldness, acne, or hair removal.[12]

## ical considerations

### he *Virtue of Honesty*

As usually happens, the market exaggerates the attractiveness of their business with op-science. It creates the hype for HES cells as effective regenerative medicine. This hype is o high for reality. Condic critically asserts that the most brilliant biologists in history worked for undred years to understand the mystery of the embryonic development, but scientists in this eld are hubristic and are basically confident that they can solve the serious scientific problems nvolving the HES cells to create effective regenerative medicine in the near future.[13] I think the arket should not employ pseudo-science, and that the scientists involved should exercise the irtue of honesty. As for us, we should not easily believe in pseudo-science without being critical.

Consequently, scientists need to give the public honest and precise information about eir researches. We also need to educate the public, especially young people who are ccustomed to the search engines on the internet, to do more serious studies, to distinguish

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embryos, even in the rare cases where clones survive to birth. Thus, the optimistic that 'therapeutic cloning' would fix the immune problem facing potential embryonic stem cell-based therapies for humans seems this far entirely unsupported by the scientific evidence."

9. Leon R. Kass, *Life, Liberty, and Defense of Dignity: Challenge for Bioethics* (San Francisco: Encounter Books, 2002), 113.
10. Lewis, *Human Genetics*, 39.
11. Ibid., 42.
12. Cf. ibid., 42-3. A. Vats and his colleagues observe that adult stem cells' proven therapeutical effects and have greater plasticity that it was thought before, for details see A. Vats, R.C. Bielby, N.S. Tolley, R. Nerem, and J.M. Polak, "Stem Cells," *The Lancet* 9465, vol. 366 (August 2005): 592-95.

between commercial sites based on pop-science and the scientific ones in order that they are not just poorly informed by pseudo-scientific websites."[13]

### *The Moral Status of the Human Embryo*

Good and balanced ethics do not oppose all types of stem cell research, but they only reject HES cells research. It is clear that HES cells research always entails the destruction of the embryos. The obtaining of stem cells from a living human embryo causes the death of the embryo and is consequently gravely illicit. It is this method that we should oppose,[14] but to the methods that do not entail the destruction of the embryonic humans, we could give ethical support.

Biologically speaking, the embryo is not just a cluster of cells or a fertilized egg. The embryo is a human individual, thus a person. Destroying the human individual simply means killing, a deliberate killing. The human individual has an inviolable right to life.

To discern the personhood of the human embryo we need to employ biology more carefully and thoroughly. A person is simply a member of our species. Let us now take a moment to pay very careful attention to the fertilization. It is a complex process divided in three stages: acrosome reaction, fusion of gametes, and fusion of pronuclei. Fertilization starts with the fusion of gametes, that is, when a sperm enters the ovum through acrosome reaction. This moment is *cell to organism transition*."[15] These gametes only respectively contain 23 chromosomes, in order to be able to form a new human individual with the new chromosomal combination by the fusion of pronuclei.[16] This fusion marks "an irreversible qualitative leap" and constitutes "a new system that works as a unity."[17] This unique and new living system is called zygote, a new cell that starts to operate as a *unique system* or a living being *ontologically one*. He is a new individual with new genetic identity, which is not identical with that either of the parents. If left alone, this self-driven process of molecular interactions will continue for nine months and beyond, transforming the living system called embryo into a baby. "Whereas the living system before fertilization only had a lifespan of twenty-four hours, the new living system after fertilization now has a span of seventy years or eighty for those who are strong."[18]

The early human embryo is, philosophically speaking, a person. He is generated by human parents, is able to assimilate nourishment from his environment, develop himself into his mature form, reproduce himself, and most of all, maintain the homeostasis upon which all of these other functions depend. The embryo, therefore, is already a human person, however early his age and primitive his appearance is. "*Person* is simply a specific name for a human being following from the form of a human being."[19] This person, although is dependent on his environment, primarily his mother's uterus, is capable of independent and self-sustaining

12. Condic, "Embryonic Stem Cells," 29. She even critically notes that "In June 2004, Ron McKay at the National Institutes of Health acknowledged in a Washington Post interview that scientists have not been quick to correct exaggerated claims of the medical potential of embryonic stem cells, yet McKay justified this dishonesty by stating: 'To start with, people need a fairy tale. May be that's unfair, but they need a story line that's relatively simple to understand.'"
13. See the research of websites on stem cell researches Denis Gallino, "Le staminali <nella rete>: indagine sui più significativi siti internet," in *Staminali: possibilità terapeuticherapporti tra scienza ed etica*, ed. Aldo Maccagni (Bologna: Edizioni Studio Domenicano), 149-79.
14. See TadeuszPacholczyk, *The Ten Great Myths in the Debate over Stem Cell* Research, sourced from the internet: http://www.ncbcenter.org/10Myths.pdf, access date November 27, 2009.
15. Nicanor Pier Giorgio Austriaco, "On Static Eggs and Dynamic Embryos: A Systems Perspective," NCBQ1, no. 4

...That there are changes in his appearance is an absolutely normal process of ...ment. Therefore, this person does not have to be able to exercise all of his rational ... since they are still developing. All these arguments focus on the idea of the personhood ... From this, we could build our ethical argument, "Since the development of the individual ...oth biological process, without radical discontinuity and clear continuity of identity, there ...assive biological reason which would deny the possession of the basic human rights to ...oping individual at *any* stage of the process."[19]

One, however, may insistently ask, "How could we are so certain that the early human ... already a person?" The biological facts presented above may answer this question, but ...doubt existed concerning whether the fruit of conception is already a human person, it is ... morally bad to dare to risk murder by jeopardizing his life. From the standpoint of ...gation, the mere probability that a human person is involved would suffice to justify an ... clear prohibition of any intervention aimed at destroying (killing) a human embryo."

### ...Manner

Some still pursue the moral justifiability of HES cells research, even though the early ...bryo is a person. They argue that the moral imperative of compassion compels HES ...rch, since the central moral issues in the research have to do with the criteria for moral ...of human life. In other words, why shouldn't we make the embryos into 'martyrs,' and ...nevitable death a medical benefit to others?"[21]

The use of HES cells is a utilitarian use of the early embryos to create regenerative ... In this research, the immoral acts involved are killing by destroying and using ... as if they are materials. The ethical principal that could be applied here is that the *good ... does not justify the unethical means*. The human embryos are human individuals that ... used as a means to cure other people. To use human embryos or fetuses as the object ...ent of experimentation constitutes a crime against their dignity as human beings ...ight to the same respect that is due to the child already born and to every human

The question above also considers the embryo as a living donor. The ethics of donating ...hen, should be applied here. First, donor is voluntary, it is never obligatory. We could ...sume that the embryo consents to donate his inner cell mass, which will destroy his life. ...ually make the embryo into martyr, it means that we presume or even force him to ...ssential parts of his body. Making martyrs of embryos would be a false compassion. ...e need to distinguish between anatomical and functional integrity in donating organs. It

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... 2002): 666.

... Maria Carbone, *L'embrione umano: qualcosa o qualcuno?* (Bologna: Edizioni Studio Domenicano, 2005),

..., "*On Static Egg*," 666.

... J. O'Rourke, "Embryo as Person," NCBQ 6, no. 2 (Summer 2006): 243.

...nedict M. Ashley and Albert S. Moraczewski, "Is the Biological Subject of Human Rights Present from ...ception?" in *The Fetal Tissue Issue: Medical and Ethical Aspects*, eds. Peter J. Cataldo and Albert S. ...aczewski (Braintree, MA: The Pope John XXIII Medical-Ethics Research and Education Center, 1994), 54.

... Cohen, "Of Embryos and Empire," *The New Atlantis: A Journal of Technology and Society*, no. 2(Summer,

is never allowed that we sacrifice functional integrity of the donor. HES cells derivationsalways entail the destruction of embryos. This would also be destruction of the functional integrity of the donor, in this case, the early human embryo.

The use of HES cells from SNCT method (therapeutic cloning) is more ethically serious. It involves creating, destroying, and using the human embryos. It is an absolute example of the utilitarian mentality towards the embryonic humans, thus it is unacceptable. To create embryos with the intention of destroying them, even with the intention of helping the sick, is completely incompatible with human dignity, because it makes the existence of a human being at the embryonic stage nothing more than a means to be used and destroyed. *Is itethicallyimaginable to sacrifice an innocent nascent human life for therapeutic ends of another human?*[24]

It would change, then, our nature as *homo hominisociusto homo homini lupus*. Men do not become fellows anymore to other men, but they become the devourers of their fellows. No radical equality is shown here, thus no respect and protection of the weak ones. "It is not easy to take seriously the language of respect when we bring an embryo into existence for the sole purpose of using and destroying it in research... In these circumstances it would be far more honest simply to drop the language of respect entirely."[25]

In closing, a society that refuses to take care of the weakest members is actually a weak society."No community, whether family, village or state, is really strong if it will not care for weak and even its very weakest members."[26]Are not the human embryos the weakest members of our society?

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2003): 3. See also, Glenn McGee and Arthur L. Caplan, "The Ethics and Politics of Small Sacrifices in Stem Cell Research," in *Contemporary Issues in Bioethics*, 6th ed., Tom L. Beauchamp and LeRoy Walters, eds. (Belmont, CA: Thomson Wadsworth, 2003), 646-47.

22. Utilitarianism focuses its ethical maxim in *doing the greatest good for the greatest number of people. In this principle*, the greatest good for more people is more important than the good of some people. The greater good for the greater number of persons trumps the individual pleasure.

23. *"Anatomical integrity refers to the material or physical integrity of the human body.* Functional integrity refers to the systematic efficiency of the human body." See Benedict M.Ashley, Jean Deblois, and Kevin D. O'Rourke, Health Care Ethics: A Catholic Theological Analysis,5th ed.,(Washington, D.C.:Georgetown University Press, 2006), 104-5.

24. Cf. Angelo Serra, "Identità e dignità dell'embrione umano," in *Staminali: possibilità terapeuticherapporti tra scienza ed etica, ed. Aldo Mazzoni* (Bologna: Edizioni Studio Domenicano, 2007), 48-52.

25. Gilbert Meilaender, Bioethics: *A Primer for Christians*, 2nd ed., (Grand Rapids, MI: William B. Eerdmans Publishing Company, 2005), 113.

26. Gilbert Meilaender, *"Some Protestant Reflections,"* in *The Human Embryonic Stem Cells Debate: Science, Ethics, and Public Policy*, eds. Suzanne Holland, Karen Lebacqz, and Laurie Zoloth, (Cambridge, MA: The MIT Press, 2002), 142.