UNIVERSITY OF CALGARY

The Human Stem Cell Debate and the Commodification of Women: Ethical Considerations

by

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A THESIS

SUMBITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE

DEGREE OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF PHILOSOPHY

CALGARY, ALBERTA

APRIL, 2005

UNIVERSITY OF CALGARY

FACULTY OF GRADUATE STUDIES

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Abstract

My aim in this work is to demonstrate how stem cell research and therapy may morally harm women. I argue that the harm is the potential exploitation of women and the products of their reproductive labour, i.e. human embryos and fetal tissue, through the unfair commodification of women's bodily tissues and reproductive capacities.

I propose that the best way to disclose the specific harms to women in the stem cell controversy is to look at the relationship between the stem cell debate and the abortion debate. There are parallels between the ethics of abortion and stem cell research. I argue that there is one tempting way to maintain the parallels, one I address in the next paragraphs, which does not foster the proper moral consideration of women in either the abortion debate or the stem cell debate. However, I maintain that if we understand the abortion debate from women's perspective, we will be able to see the appropriate relationship between the abortion and stem cell debates. Further, unless we understand the abortion debate from women's perspective, not only will we miss important elements of the abortion debate, we will not have a good understanding of why it is that stem cell research and therapy pose specific moral harms to women.

TABLE OF CONTENTS

CHAPTER ONE: INTRODUCTION

I. Introduction to the Dissertation

My aim in this work is to demonstrate how stem cell research and therapy may morally harm women. I argue that the harm is the potential exploitation of women and the products of their reproductive labour, i.e. human embryos and fetal tissue, through the commodification of women's bodily tissues and reproductive capacities.

I propose that the best way to disclose the specific harms to women in the stem cell controversy is to look at the relationship between the stem cell debate and the abortion debate. There are parallels between the ethics of abortion and stem cell research. I argue that there is one tempting way to maintain the parallels, one I address in the next paragraphs, which does not foster the proper moral consideration of women in either the abortion debate or the stem cell debate. However, I maintain that if we understand the abortion debate from women's perspective, we will be able to see the appropriate relationship between the abortion and stem cell debates. Further, unless we understand the abortion debate from women's perspective, not only will we miss important elements of the abortion debate, we will not have a good understanding of why it is

that stem cell research and therapy pose specific moral harms to women.

One tempting way to understand the parallels between the stem cell controversy and the abortion controversy is the following: the moral center of each is the intentional destruction of an embryo or fetus and this intentional destruction is morally wrong. Each action, be it elective abortion, destructive embryo research, or using fetal tissues from elective abortions, is morally wrong for the same reason. It is held here that the interests of embryos and fetuses are considerable as moral patients with full (or potentially full) moral standing, that is, they carry considerable interests as moral persons. And they are innocents. Thus it is intrinsically wrong to kill them. Moreover, to value them just as sources of cells is to value them only instrumentally. And as it is morally unacceptable to treat a born person as a means only, so too is it morally unacceptable to treat an unborn person, either an aborted fetus or an embryo, as a means only.

Insofar as the concern over stem cell research is seen to rest with the determination of the moral status of the embryo or fetus, this debate seems like a simple variation of the moral debate over abortion. It is easy to see the

affinities. Should the embryo or fetus be determined to be an innocent person, it is wrong to kill it. Thus destroying embryos for medical research and therapy can be considered murder as is abortion. And there are arguments that may be developed from these assumptions for not mining aborted fetuses for stem cells because so doing would constitute a failure of respecting its personhood. For example, because in practice it is impossible for this person (i.e. the embryo or the fetus) to consent to have its tissue be used, it ought not to be used. Or, no person (including embryos and fetuses) should volunteer to be killed for their tissue to be used even if it is for the benefit of someone else. A person does not have property rights over themself or their bodily parts because this would would imply that a person can be valued as a means only and not as an ends.

If the only significant moral question about abortion is whether or not the fetus has intrinsic value, then to argue that abortion is permissible one has to demonstrate that there is no moral value to the fetus. The parallel with the stem cell debate includes the following: Should embryos and fetal tissue from aborted fetuses be the moral equivalent of a clump of human cells, there is nothing

intrinsically wrong with using them for stem cell research and therapy.

Let us consider these views on abortion, however, as not representing the entirety of the abortion debate. That is, while those against abortion and against stem cell research may use similar argumentation, namely, that destroying innocent persons is inherently wrong no matter what the consequences, one of the most important arguments in support of abortion concern a woman's right to terminate her pregnancy. And this justification does not seem to be relevant to the proposal that it is not morally right to use embryos and aborted fetuses in stem cell research and therapy. The embryos and fetal remains in question for stem cell research are outside a woman's body and thus there is no pregnancy to terminate. In addition there seems to be no room for the position that would support a woman's right to terminate her pregnancy while being morally opposed to using embryos and fetal material as sources of stem cells.

First, let us a look at the principle that a woman ought to be able to control her reproductive destiny and thus has a right to terminate her pregnancy. To be sure, one powerful justification for a woman's right to terminate her pregnancy is that the embryo or fetus has no value, and

therefore no moral harm is done to it if one deliberately destroys it. Accordingly, we would seem to have both sides of the stem cell debate, for and against, covered by arguments for and against abortion. Because the embryo or fetus has no moral value then using its remains for medical research and therapy is not morally wrong nor is killing it. In fact, some go so far as to argue that because embryos and fetuses have no intrinsic value, it is immoral not to use fetal material from elective abortions and leftover embryos from fertility clinics for stem cell research.

But the proposition that a woman has a right to terminate her pregnancy is not only justified by showing that the embryo or fetus has no absolute value. There are other arguments to support it, in particular, arguments that take women's perspectives and experiences in pregnancy, motherhood, and abortion seriously. If we consider: that abortion is permissible because a women's agency would not respected if it were not; the embryo and fetus is her tissue or the product of her reproductive labour; and, that a woman has special rights with regard to her embryos and fetuses; then we can understand two things. First, how there may be harm to women in stem cell

research: namely, if she is exploited for her tissue and the products of her reproductive labour. And, second, that one could have a consistent position where one promotes the permissibility of abortion but opposes destructive stem cell research: both views defensible on grounds of a respect for women's autonomy and agency.

In significant ways the abortion debate and stem cell debates echo each other. But it is necessary to rightly understand the ethics of abortion if we want to rightly understand the ethics of stem cell research and therapy.

II. Brief Summary of the Dissertation

It is important to have an understanding of what stem cells are, where they come from, and why they are of great interest to the medical community. A description of this will exhaust my second chapter. I have also included a glossary of terms in Appendix A to which the reader may refer. It is also necessary to review the major ethical concerns about stem cell research and therapy. An overview and critical discussion of the ethics of stem cell research exhausts my third chapter.

In the fourth chapter, I ask the reader to consider the basic assumption in arguments against destructive

embryo research that seem to be taken from the pages of classic articles presenting moral arguments against abortion. The classic arguments do not take as a starting point the experience of pregnant women. Here the moral status of the fetus or embryo and whether it has absolute value is regarded as the only moral question to resolve. I will show that the arguments to support the absolute value of the embryo/fetus are not successful. But I argue that arguments against destructive embryo or fetal research remain; ones that turn on the belief that the embryo or fetus has some moral status. Even if the embryo or fetus does not have value in itself, we still have obligations toward it. This obtains because we ought to value embryonic or fetal tissue as product of reproduction, that is, of women's labour, including volitional labour, and as women's bodily tissue.

In the fifth chapter I will argue that the potential harm in stem cell research is that involved in the commodification of women, their tissues and capacities. Even though there are many laws and strong moral arguments against the commodification of humans and their parts, the fact of the matter is that there are already significant commercial and non-commercial markets in human tissue, and

it is growing ever bigger because of the promises of biotechnology. We can see this, for example, in the vast amount of venture capital that exists for such projects. People may make a gift of their bodily tissue (or sale of some of them) and organs, and women in particular may make gifts of their embryos or aborted fetal material, but they may not sell it. In this way, proper respect for human being and their parts is seen to be upheld because the human parts and this human being are not being treated as mere commodities. But I maintain that because biotechnological companies make significant profit from human tissues, it is therefore already a commodity. And to have to give something away for free when others make significant profit from the gift is to exploit the giver. And this is wrong. In the final chapter I will draw conclusion regarding the nature of commodification, its relationship to exploitation, and the wrongness of the commodification of human body parts and processes.

CHAPTER TWO: WHAT STEM CELLS ARE AND WHY THEY ARE RECENTLY IMPORTANT

I. Introduction

Every somatic (body) cell possesses the full genetic code that makes up an individual organism and, as organisms grow, somatic cells specialize or "differentiate." This means that they shut down other parts of the DNA except for the genetic material relevant to some specific function. In other words, cells lose 'memory' of how to function as or become some tissues and become capable of fulfilling only one function. For example, somatic cells that make up the heart will function only as heart cells even though they contain the DNA for every other tissue in the organism. The precursor cells to any differentiated cells, the blank cells, are referred to as "stem cells" or, hSC, where "H" designates human. Stem cells can produce at least one type of specialized tissue and they are self-renewing. They are the biological building blocks of the human organism.

Stem cell research is part of an emerging area of research and potential therapy called "regenerative medicine." Stem cell research is unique and medically important for three reasons. First, stem cells have been

manipulated to be able to grow normally for a prolonged period; that is, they promise to supply a vast amount of tissue. Second, (some) stem cells are plastic, which means that they can become a number of different kinds of cells, tissues and (theoretically) organs in the body, while some stem cells have greater potency for plasticity than others. Third, stem cell plasticity can be manipulated; that is, there are ways to intervene and manipulate the cell differentiation process.

In this chapter I will explain what stem cells are and why they are recently important. I will describe the various kinds of stem cells, where they come from, and how they are derived. I will include the current dominant scientific rationale for preferring one type of stem cell. In so doing I will provide a quick overview of human embryo development and the techniques used in (potential) human reproductive and research cloning. I will outline the relationship between stem cell technology, new reproductive technologies, and gene therapy. This will be followed by a description of the current research on stem cells.

II. Stem Cells

a. What Stem Cells Are

Stem cells have been a news focus since November 1998 when two US research teams announced that they had been able not only to isolate human stem cells, in one case from embryos and another from fetal material, but cultivate them *in vitro*.[1] Stem cells come from three kinds of sources: Adult or somatic cells, germ or reproductive cells, and embryonic cells. In this section I will explain these three distinct kinds of stem cells. In so doing I will define a number of biological terms and give a brief overview of human embryology. This section will end with an explanation of an aspect of cell biology that has an important relationship with stem cell technology and hence is an important ingredient in one's understanding of the significance of stem cell technology and potential stem cell therapy. This aspect of cell biology is the cell telomere.

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[1]J. A. Thomson, et al., "Embryonic stem cell lines derived from human blastocysts," *Science* 282 (1998): 1145-1147; M. J. Shadblott, et al., " Derivation of pluripotent stem cells from cultured primordial germ cells," *Proceedings of the National Academy of Science of the USA* 95 (1998): 1145-1147; Geron Corporation, "The First Derivation Of Human Embryonic Stem Cells." On-line at: < http://www.eurekalert.org/pub_releases/1998-11/GC-FDOH-061198.php > Access date March 2005.

II. b. Embryonic Stem Cells or hES cells

Embryonic stem cells, or hES cells, are derived from early human embryos, either already existing or brought to existence through cloning technologies. In order to understand hES cells it is necessary to understand something about early embryo development.[2]

II. b. i. Early Embryo Development

Fertilization begins with the sperm's first contact with the egg's outer membrane, the "zona pellucida," and ends with the alignment on the mitotic-spindle of the chromosomes that come from the male and female pro-nuclei: this event is referred to as "syngami." The first double set of chromosomes, a "diploid" nucleus within its own nuclear membrane, occurs only after the first cell division or "cleavage", which comes hours after the first contact. Twelve or so hours later, the first activation of paternal genes occurs after the second cleavage.[3] Fertilization usually takes place in the ova, and over a few days the

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[2]James A Thomson, "Human Embryonic Stem Cells," in Suzanne Holland et al., eds., *The Human Embryonic Stem Cell Debate: Science, Ethics, and Public Policy* (Cambridge, MA: MIT Press, 2001): 15-26, 15.

[3]K. Moore, *The Developing Human: Clinically Oriented Embryology, Third Edition* (Philadelphia: Saunders, 1982).

early embryo travels down the oviduct into the uterus where, under certain conditions, it will implant usually 12-14 days after initial fertilization.[4] This is also the time when the "primitive streak" appears. This streak delineates the head and tail and the front and back of the embryo. It is upheld in most policy that only after the appearance of the primitive streak may an individual be

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[4]The term "pre-embryo" or "early embryo" is a scientific designation, which refers to the early stages that the fertilized egg goes through as it develops into an embryo proper. After fertilization, the one-celled *conceptus* develops into a zygote, then a morula stage and finally a blastocyst. Around the fourteenth day after conception, at the appearance of the primitive streak (the precursor to the spinal cord), the embryo stage is reached. Around the seventh or eight weeks following conception, the developing individual organism is referred to as a fetus. See: Andre E. Hellegers, "Fetal Development," in Thomas A. Mappes and Jane S. Zembatty, eds., *Biomedical Ethics* (New York: Macmillan, 1981); R. Suarez, "Hydatidiform Moles and Teratomas Confirm the Human Identity of the Preimplantation Embryo", *Journal of Medicine and Philosophy* 15(1990): 627-635; Thomas J. Bole, III, "Metaphysical Accounts of the Zygote as a Person and the Veto Power of Facts", *Journal of Medicine and Philosophy 14* (1989): 647-653; T. Bole, "Zygotes, Souls, Substances, and Persons", *Journal of Medicine and Philosophy* 15 (1990): 637-652; R. A. McCormick, "Who or what is the preembryo?" *Kennedy Institute of Ethics Journal* 1 (1991): 1-15; R. A. McCormick, "The preembryo as potential: a reply to John A. Robertson," *Kennedy Institute of Ethics Journal* 1 (1991): 303-5; G. Khushf, "Embryo research: the ethical geography of the debate," *Journal of Medicine and Philosophy* 22 (1997): 495-519. The term is not however uncontroversial and although once accepted, official Roman Catholic doctrine now rejects the term (Acceptance, *Donum Vitae (Congregation for the Doctrine of the Faith*) (St. Paul Books and Media, 1987), 4. Rejection, The Third Plenary Assembly of the Pontifical Academy for Life held in Vatican City, 14-16 February, 1997. On-line at: http://www.vatican.va/roman_curia/pontifical_academies/acdlife/documents/rc_pa_acdlife_doc_16021997_final-doc_en.html > Access date March 2005.

said to exist. Until this time, twinning can occur, and therefore the early embryo would yield two phenotypically identical individuals.

II. b. ii. Nomenclature

After fertilization occurs and a new genetic organism exists, the one-celled embryo is referred to as a "zygote." The zygote will divide about 30 hours after fertilization. After first cleavage, the cells themselves are referred to as "blastomeres." Blastomeres are completely undifferentiated and are referred to as "totipotent." A totipotent cell can turn into any cell in the human body; it is completely undifferentiated. In addition, should one blastomere become separated from the original mass, it would start to divide on its own and therefore it has the potential to turn into another organism. Both the origin and the twin may develop normally (relatively the same size and same life span). This is the second aspect of totipotency.[5]

This plasticity of the early human embryos also reveals itself in another phenomenon. Even if a blastomere

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[5]F. H. Gage, "Mammalian Neural Stem Cells," *Science* 287(2000): 1433-1438.

was to separate or twin, it may remerge back into one embryo that may then develop normally to term. Also, twins resulting from two fertilized eggs during one pregnancy may fuse at this early stage. The single person who may eventually result will have a body melded of two phenotypes, and for example, could have two different coloured eyes. At 14 days, with the emergence of the primitive streak, any possibility for twinning and fusion disappear.

After two to three days, the assemblage of 12 or more cells is referred to as a "morula." After five or six days of development, and many more cell divisions, the morula becomes a "blastocyst." This stage marks the first cellular differentiation. At first, the embryo's cells merely replicate, but after the blastocyst stage the cells start to differentiate. A blastocyst is a perfectly round hollow ball of cells with a fluid-filled core, and is 150 microns or one-seventh of a millimeter in size. Its outer layer is approximately a 70-celled "trophoblast," a feeding layer that will later become the placenta and associated membrane. After five or six days of development, and many more cell divisions, the morula becomes a "blastocyst." This stage marks the first cellular differentiation. At

first, the embryo's cells merely replicate, but after the blastocyst stage the cells start to differentiate. Its outer layer is approximately a 70-celled "trophoblast," a feeding layer that will later become the placenta and associated membranes.

The trophoblast is separate from the inner layer of cells referred to as the "inner cell mass" or "ICM", which is comprised of about 30 cells. ICM cells maintain the potential to form into any cell types of the major tissue layers of the embryo: the "ectoderm," which is the outermost layer that will give rise to skin, brain, and nerve tissue; the "mesoderm," which is the middle layer and will give rise to bone, muscle and connective tissue; and the "endoderm" which is the lowermost layer that will give rise to the lungs and digestive tissue. As such they are referred to as "pluripotent." It is from the ICM that hES cells, that is, embryonic stem cells, are derived.

II. b. iii. A Note on *In Utero* and *Ex Utero* Embryos

Today, *in vitro* fertilization (IVF) and related techniques allow for an early embryo to live up to 14 days *in vitro* after fertilization, that is, outside of a woman's body, after fertilization. Coincidentally, in most industrialized

countries, 14 days is legally the maximum age that an early embryo can be used in research, so long as other proper legal protocols met, e.g. donor consent. This is the same duration before which the primitive streak appears.

After fourteen days, in order for the early embryo to continue its development, it must be implanted in a woman's womb. It is also true, so far as we know, that in *in utero* fertilization and early embryo development, the early embryo attaches to the wall of a woman's uterus around the fourteenth day after fertilization. Therefore, with current technology, an *in vitro* embryo, the embryo not yet implanted in a womb, will be exactly the same age and will be at exactly the same stage of development as its counterpart *in utero*. This was not the case in the early days of IVF when the early embryo could only survive for approximately seven days before it needed to be placed back into a woman's body in order for it to have a chance at gestation. Consequently, there may be a time as IVF technology continues, that there will be two distinct kinds of entities, differentiated by different stages of development, that could be referred to as "pre-implantation embryos."

II. c. Embryonic Germ Stem Cells or hEG Stem Cells

A second kind of stem cell is the embryonic germ or hEG cell that is obtained from the gonadal ridge of fetal tissue.[6] These cells would have developed into germ cells, that is, reproductive cells, hence their designation as hEG cells. hEG cells are referred to as "multipotent" because they have fewer capacities to differentiate than pluripotent stem cells but they are still able to differentiate into more than one kind of somatic cell type.[7] Research thus far has been limited to neural stem cells,[8] hematopoietic stem cells,[9] and pancreatic islet cells.[10]

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[6]M. J. Shadblott, et al., " Derivation of pluripotent stem cells from cultured primordial germ cells," *Proceedings of he National Academy of Science of the USA* 95(1998): 1145-1147.

[7]Some insist that adult stem cells should be classified as multipotent, American Association for the Advancement of Science. 1999. AAAS/ICS Report on Stem Cell Research. On-line at: <http://www.aaas.org/spp/dspp/sfrl/projects/stem/main.htm > Access date March 2005.

[8]On fetal neural stem cells generating into three types of brain cells, See: O. Brustle, et al., "Chimeric brains generated by intraventrical transplantation of human brain cells into embryonic rats," *Nature, Biotechnology* 16 (1998): 1040-1044 and A. Villa et al., "Establishment and properties of a growth factor-dependent perpetual neural stem cell line from human CNS," *Explorations in Neurology* 161(2000): 67-84. Fetal neural stem cells have been used in rodent models of Parkinson's disease. See: K. Sawamoto et al., "Generation of dopaminergic neurons in the adult brain from mesencephalic precursor cells labeled with a nestin-GFP transgene," *Journal of Neuroscience* 21 (2001): 3895-3903; and L. Studer, et al., "Transplantation of extended mesencephalic precursors leads to recovery in Parkinsonian rats," *Nature, Neuroscience* 1(1998): 290-295.

[9]According to the American Academy of Sciences, while fetal liver and blood are rich sources of hematopoietic stem cells, there

II. d. Adult Stem Cells

Some organs in the body have their own stem cells and, when found in differentiated tissue or a fully developed individual, they are referred to as "adult stem cells" or "somatic stem cells." These are the third kind of stem cell. A well-known source is bone marrow (hematopoietic) stem cells that can be cultured and generated into blood cells. Stem cells are also being cultured from peripheral blood and umbilical cords. Blood, liver, skeletal muscle and connective tissue, the eye, dental pulp, skin, the lining of the gastro-intestinal tract, some nervous system cells, and the prostate gland are all known to have stem cells. When an adult stem cell divides, one of its "daughters" becomes a precursor of a differentiated, specialized cell able to replenish the pool of cells of that specialized tissue, which could need replenishment due to injury or long-term use, for example. The other cell

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have been no extensive investigations into their potential to do so. (Committee on the Biological and Biomedical Applications of Stem Cell Research, Board on Life Sciences, National Research Council, Board on Neuroscience and Behavioral Health, Institute of Medicine, *Report Stem Cells and the Future of Regenerative Medicine* (National Academy of Sciences, 2001): 12.

[10]G. M. Beattie, et al., "Functional beta-cell mass after transplantation of human fetal pancreatic cells: differentiation or proliferation? *Diabetes* 46(1997): 244-8.

remains a stem cell thus ensuring that the population of stem cells is never depleted.

Many isolated adult cells can generate only like-differentiated cells; hence stem cells found in the bone marrow can generate blood cells, stem cells found in the brain generate neurons, and so on for different kinds of cells. Until very recently, it was believed that stem cells from differentiated tissue could only generate like-differentiated tissue. Recent research in mice shows that there may be more potential for such cells to generate more than one kind of differentiated tissue.[11] [12] For example, the adult neural stem cell has a broad capacity for development into three types of cells found in the brain: "neurons," "glial cells," and "astrocytes."[13] It has been reported that

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[11]C. R. Bjornson, et al., "Turning brain into blood: A hematopoietic fate adopted by adult neural cells in vivo," *Science* 283 (1999): 534-536; D. L. Clarke, et al., "Generalized potential of adult neural stem cells," *Science* 288(2000): 1660-1663; E. Strauss, "Brain stem cells show their potential," *Science* 283(1999): 471; Gretchen Vogel, "Can old cells learn new tricks?" *Science* 287(2000): 1418-1419.

[12]See above and M. J. Shadblott, et al., "Derivation of pluripotent stem cells from cultured primordial germ cells," *Proceedings of the National Academy of Science of the USA* 95 (1998): 1145-1147.

[13]D. L. Clarke, et al., "Generalized potential of adult neural stem cells," *Science* 288 (2000): 1660-1663. As cited in Ted Peters, "Embryonic Stem Cells and the Theology of Dignity," in Suzanne Holland et al., eds., *The Human Embryonic Stem Cell Debate: Science, Ethics, and Public Policy* (Cambridge, MA: MIT Press, 2001): 127-139, 138.

stem cells from bone marrow, a "mesodermal" tissue, can give rise to these same three types of brain cells, which are "ectodermal" tissues.[14] [15] Another lab claims that stem cells from the brain can differentiate into blood and muscle tissue.[16]

This leads some to think there is an unspecialized kind of adult stem cell that generates precursor cells in many kinds of differentiated tissue. And this signals what looks to be an existing dogma in cell biology; namely, that once a cell has differentiated, that is, once it has become a specialized type of cell, it can never 'go back' into a precursor state or an undifferentiated stem cell state. In this way, adult cells could be 'reprogrammed' to become other kinds of cells. Because of this potential, some insist that adult stem cells should be classified as multipotent[17] or even pluripotent.[18] [19] However, it remains

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[14]E. Mezey et al., "Turning blood into brain: cells bearing neuronal antigens generated in vivo from bone marrow," *Science* 290(2000): 1779-1782.

[15]There are three major tissue layers of the embryo from which all human cells derive: the ectoderm, the mesoderm, and the endoderm.

[16]C. R. Bjornson, et al., "Turning Brain into Blood: a hematopoietic fate adopted by adult neural brain cells in vivo," *Science* 283(1999): 534-537.

[17]American Association for the Advancement of Science, AAAS/ICS Report on Stem Cell Research (AAAS: Washington, DC, 1999): vii. <http://www.aaas.org/spp/dspp/sfrl/projects/stem/main.htm > Access date March 2005.

very controversial that adult stem cells have the plasticity that would be necessary for them to be of great therapeutic value. Much of the work to support the claims for adult stem cell plasticity has used animal models that may or may not be applicable to humans. And almost all reports on experiments have yet to be confirmed. As publications announce this possibility, others emerge to deny it.[20] [21]

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[18]"Pluripotency" usually refers to the potential to form into any cell types of the major tissue layers of the embryo: ectodermic, mesodermic, and endodermic. Embryonic stem cells have this characteristic unequivocally.

[19]Ted Peters, "Embryonic Stem Cells and the Theology of Dignity," in Suzanne Holland et al., eds., *The Human Embryonic Stem Cell Debate: Science, Ethics, and Public Policy* (Cambridge, MA: MIT Press, 2001): 127-139, 131.

[20]"Naohiro Terada and his group at University of Florida grew bone-marrow cells from a mouse in the same dish with mouse embryonic stem cells, hoping the marrow cells would pick up some kind of chemical signal that would cause them to revert to a more primitive state. A new cell type arose in the dish that exhibited many of the surface characteristics of stem cells but a closer examination of the internal genetics of the cell revealed that they were not stem cells. Rather, the small numbers of bone marrow cells had fused with stem cells to produce strange, doubled-up cells with two or three times the normal complement of genetic material. Another independent lab at the University of Edinburgh led by Austin Smith arrived at similar findings. Mixing brain and embryonic cells, the group found that the two types could sometimes fuse into genetically abnormal double cells with a deceptive resemblance to stem cells. Both papers appeared in the journal *Nature* in March, 2002." (From: Justin Gillis, "Questions Raised on Stem Cells: Adult Cells Found Less Useful Than Embryonic Ones," *Washington Post* (March 14, 2002): A03).

[21]Natalie DeWitt and Jonathan Knight, "Biologists question adult stem-cell versatility," *Nature* 416 (28 March 2002).

II. e. Telomeres

The section of the cell's DNA that controls degeneration is the enzyme "telomerase." Repeated sequences of DNA that cap the ends of chromosomes are called "telomeres." Each time a cell divides the telomeres shorten and the enzyme telomerase expresses less and less. Thus telomeres shorten in cells with increased cell divisions.

There is an important relationship between telomeres and stem cells. In the human body some tissues regenerate themselves because they have stem cells (the cells in these tissues are called adult stem cells). Some examples are skin cells, blood cells, certain cells that line the intestinal track called "intestinal epithelium." These cells divide about fifty times. Other cells degenerate after differentiation and do not have the capacity to regenerate, (for example, heart tissue). In this way, the longevity of any of the cells of an organism, such as a human being, has a natural limit.[22] While it is generally held that the telomere plays a role in shortening the life span of a cell, there is still research needed to determine

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[22]Morgan Lyons,"The Paradox of Immortality, *Southwestern Medicine: Telomeres and Immortality,*" (1996). On-line at: <http://www.swmed.edu/home_pages/publish/magazine/immortal/paradox.html> Access date March 2005.

how this shortening plays a role in determining the actual process of human longevity.[23]

Because of the plasticity of the early human embryo where that there is not one rigid development of cell differentiation, scientists have been able to manipulate the telomerase expression in ICM, inner cells mass, cells. This manipulation has extended and maintained the telomeres as the cell divides. Modified ICM cells thus have the capacity to divide and grow over prolonged periods of time and have consequently been referred to as "immortal cells."[24] They also maintain their potential to form into almost any kind of human cell. This developed cell line seems to be normal in the sense that the cells have a

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[23]Telomeres shorten in human cells with more cell divisions and older people have shorter telomeres in their skin and blood than younger people. (C. B. Harley et al., Telomeres Shorten During Ageing of Human Fibroblasts," *Nature* 345(1990): 458-460; H. Vaziri et al., "Evidence for a Mitoitic Clock in Human Hematopoeitic Cells: Loss of telomeric DNA with age," Proceedings of the National Academy of Sciences of the USA 91(1994): 9857-9860.) However in other research involving non-human animals, long-lived species often have shorter telomeres than short-lived species. (M. T. Hermann, et al., "Wild-derived inbred mouse strains have short telomeres," *Nucleic Acids Research* 28(2000): 4474-4478; S. Kakuo, et al., "Human Species in Unique Among Primates in terms of Telomere Length," *Biochemistry and Biophysiology Research Communiques* 263(1999): 308-314; R. Holliday, "Endless Quest," *Bioessays* 18(1996): 3-5). See also: A. G. Bodnar et al., "Extention of life span by introduction of telomerase into normal human cells," *Science* 279(1998): 349-352.

[24]Geron Corporation, "The First Derivation of Human Embryonic Stem Cells," 2002. < http://www.eurekalert.org/pub_releases/1998-11/GC-FDOH-061198.php > Access date March 2005.

normal number of chromosomes. The pluripotent, normal, infinitely divisible cells derived from the ICM are hES cells. When people refer to a hES or stem cell line this is what they refer to.

III. Stem Cell Sources

III. a. hEG and hES Cells

hEG cells come from fetal tissue. The three primary sources of fetal tissue in the US are hospitals, abortion clinics, and the private practice offices of gynecologists and obstetricians. While tissue from spontaneous abortions, ectopic pregnancies, and stillbirths are potential sources they are neither plentiful nor as safe as that from elective abortions (of so-called "non-defective" fetuses). This is because spontaneous abortions occur most often in the first trimester of pregnancy, when at the fetal stage, spontaneous abortion involves the death of the fetus, its detachment from the uterine wall, and its expulsion from the uterus, which generally takes 2-3 weeks.[25] Consequently, anoxic conditions make most tissue from spontaneously aborted fetuses unusable.[26] Further, there is the problem that most spontaneous abortions take place outside of hospitals and doctors' offices. Live tissue must be

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[25]Daniel Garry, A. Kaplan, D. Vawter, and W. Kearny, "Sounding Board: Are There Really Alternatives to the Use of Fetal Tissue from Elective Abortions in Transplantation Research?" *New England Journal of Medicine* (April 1989): 1594.

[26]Jon P. Geisser, "Ethics and Human Fetal Retinal Pigment Epithelium Transplantation," *Archives of Opthamology* 116 (June 2001): 3.

transported or stored immediately to keep it from deteriorating.[27] Many women do not even know when very early spontaneous abortions have occurred since many had not yet known that they were pregnant.

hES cells typically come from embryos that have been donated by clients of fertility treatments. Other hES cells come from embryos that have been created *in vitro* from donated egg and sperm.[28] hEG cells and hES cells from the sources named have a similar disadvantage with regard to their therapeutic potential in regenerative medicine. Since these stem cells come from embryos and fetuses that have their own distinctive DNA, the recipient might well reject tissues produced from them. As with regular transplants, there is a high risk of patient rejection of cells, tissues, and organs that are not genetically similar to his or her own. To prevent this, clinicians could administer

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[27]Dorothy E. Vawter, et al., *The Use of Human Fetal Tissue: Scientific, ethical, and policy concerns* (Minneapolis: University of Minnesota Center of Biomedical Ethics, 1990).

[28]Researchers at the Jones Institute of Reproductive Medicine in Norfolk, Va. mixed egg and sperm *in vitro* to create embryos for research. S. Lazendorf, et al., *Fertility and Sterility* 76 (2001): 125-131. Altogether 162 oocytes from 12 women were extracted and inseminated with thawed donor sperm. The women were paid $1500-$2000 for each donation. After insemination, 110 oocytes were successfully fertilized, and 40 developed to the blastocyst stage. Three healthy stem cell lines were created. Deborah Josefson, "Embryos Created for Stem Cell Research," *British Medical Journal* 323 (July 21, 2001): 127.

powerful immuno-suppression drugs, but these drugs have their own risks, such as increased susceptibility to infections or cancer.

III. b. Adult Stem Cells

The issue of immunological intolerance supports adult stem as the best choice for the development of medical therapies, since they are an easily accessible source of non-rejectable transplant material. Indeed the tissues would provide a perfect genetic match. One adult stem cell transplant that is routinely practiced is the bone-marrow transplant. This is a therapy for certain cancers, anemias and immune deficiency disorders.[29] This therapy has been developed over thirty years with good success rates. Thus for reasons of accessibility, non-rejectability, proven success, and a long research corpus to draw on, adult stem cell research may be thought to be the most promising area of stem cell research.

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[29]There are three types of donor bone marrow: autologous, syngeneic, and allogeneic. Autologous transplantation uses the patient's own marrow, which had been previously removed and stored. Syngeneic transplantation uses genetically-identical bone marrow from an identical twin donor. Allogeneic transplantation uses bone marrow from a person who is not genetically identical to the recipient but matches sufficiently for the marrow graft to "take".

However, this may not always be ideal. First, not all tissues have stem cells. An important example is the heart, and heart disease is the greatest cause of death in the US and Canada. Second, even for the adult stem cell therapies that have good records of efficacy, for example, bone marrow transplants, there are a number of issues. The typical bone marrow transplant replaces 1-2% of the stem cells in the blood, and of these only a small number divide. Thus to repopulate the blood supply they have to do a lot of work. The chances of this happening successfully decrease or are non-existent given a number of other factors. For example, usually when one is at the point of having a bone marrow transplant, one's stem cells are already damaged through chemotherapy and radiation therapy and the cancer itself. Further, some patient's diseases are genetic in origin, and thus their cells would not have therapeutic value. Finally, regardless of the perfect bone marrow transplant, the adult stem cells that are transplanted are themselves already aged which means that they will only ever divide a few times before they degenerate. The telomeres of the adult stem cell have already shortened, and now they are called upon to propagate the entire blood supply, which means that they

have to divide a lot.[30] A concrete example may illustrate this point. A 40 or 50 year old person may have had a successful bone marrow transplant early in life to no ill effect but could now have the immune system of a 70 or 80 year old. This is because the cells transplanted into her at an earlier age have had now to divide many more times.[31] Thus even in the best circumstances, bone marrow transplants will not have long-lasting effects. For some patients the short effect it has is sufficient, but for the majority it is not.

IV. Why Researchers Promote the Use of hES Cells

hES cells are the most promising source of stem cells for both research into cell differentiation and potential tissue replacement therapy for three reasons. First, theoretically, hES cells, are capable of generating into tissues or organs of the approximately 210 kinds found in

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[30]For example, see: J. J. Lee, et al., "Telomere length changes in patients with aplastic anaemia," *British Journal of Haematology* 112 (2001):1025-1030; M. Akiyama , et al., "Shortening of telomeres in recipients of both autologous and allogeneic hematopoietic stem cell transplantation," *Bone Marrow Transplant* 25 (2000):441-4417; Sarah E. Ball, Frances M. Gibson, Siân Rizzo, Jennifer A. Tooze, Judith C.W. Marsh, and Edward C. Gordon-Smith, "Progressive Telomere Shortening in Aplastic Anemia," *Blood* 91 (May 1998): 3582-3592.

[31]As reported by Kyla Dunn, in "Cloning Trevor," *Atlantic Monthly* 289 (June 2002): 31-34; 36; 38-40; 42-44; 46; 48-50; 52: 48.

the human body, including germ cells. Unlike adult cells and the multipotent hEG cells, hES cells are pluripotent, they have the potential to turn into any kind of cell.[32] Second, unlike adult stem cells and hEG cells, hES cells are able to divide indefinitely without losing their genetic structure. Third, hES cells are malleable, which means that they can be manipulated. For example, they can be turned into a certain kind of specialized cell and not lose cell function.

While the primary source of hES cells has been embryos donated from fertility clinics, cloned embryos from the patient's tissue would be a better source for her own therapy. In the first place, a cloned cell would be an exact genetic match to the patient. Second, it has been found that a cell's telomere is completely restored through cloning. This means that one could have an unlimited supply (since they will always divide) of non-rejectable, (since

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[32]However, pluripotent cell lines that are similar to mouse ES cells have been derived from mouse EG cells. See: Y. Matusi, et al., "Derivation of pluripotential cells from murine primordial germ cells in culture. *Cell 70* (1992): 841-847: J. L. Resnick, et al., "Long-term proliferation of mouse primordial germ cells in culture," *Nature* 359 (1992): 550-551. As cited in James A. Thomson, "Human Embryonic Stem Cells," in Suzanne Holland et al., eds., *The Human Embryonic Stem Cell Debate: Science, Ethics, and Public Policy* (Cambridge, MA: MIT Press, 2001): 15-26: 18.

it is genetically identical) and completely malleable (since it is pluripotent) tissue.

The following section has two parts. In this first part, I will outline the technologies that produce human embryos outside of a woman's body and the motivations for the creation of these technologies. Through an understanding of these techniques, one will be able to grasp how and why the potential sources of embryos for stem cell research exist as they do and the hazards and costs of such sources. In the second part I will explain the technologies that have lead to the possibility of using cloning techniques to produce human embryos that could be available as a source of embryonic stem cells. Together, issues that have been raised in the first part and the second part will reveal why alternative sources of human embryos and a-nucleated ova for cloned human blastocysts are being sought out as well as the places where they are being sought. This section will end with a discussion about how new technologies are changing the facts of human embryology through the example of the question of embryonic stem cell totipotency.

IV. a. Embryos from *In Vitro* Fertilization Techniques

The embryos needed for stem cell therapy are available through techniques developed from reproductive technologies including the following. *In vitro* fertilization or IVF is when egg and sperm are combined in a lab to fertilize eggs outside the body. Embryos are then transferred back to a woman's womb 2-3 days after egg retrieval or they are frozen in liquid nitrogen. Immature oocyte retrieval or IOO is where immature eggs are collected and grown in the lab using fertility drugs. When mature, they are fertilized and replaced in the same manner as IVF.

IV. a. i. Cryopreservation

There is a practical point that needs to be underlined regarding the sources of hES cells and the process of IVF. Embryos are frozen in IVF because eggs cannot be. Success with unfertilized human oocyte cryopreservation remains limited, and until very recently was confined to mature oocytes using adaptations of the method developed for human zygotes.[33] The first successful birth using a thawed ovum was in 1997. To date there is one publication announcing

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[33]J. Shaw, A. Trounson et al., "Fundamental cryobiology of mammalian oocytes and ovarian tissue," *Theriogenology* 53(2000): 59-72.

the successful effort to transplant previously frozen ovarian tissue where it developed into follicles.[34] Attempts have been made to maintain spermatozoa and oocytes of various animals in a frozen state over the past 200 years. The earliest report is the attempt of Spallanzani in 1776. A more systematic and applied effort began in the late 1940's[35] with success coming quickly for the technique to cryopreserve sperm.[36] Progress to keep mammalian oocytes, embryos and ovarian tissue at low temperatures started in the 1970's with work on mouse embryos. [37] Freezing of mature mouse oocytes, however, took another 16 years to establish.[38] The first report of success with this technique on human embryos was in 1983.[39]

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[34]K. Oktay and G. Karlikaya, "Ovarian function after transplantation of frozen, banked autologous ovarian tissue," *New England Journal of Medicine* 342(2000): 1919.

[35]With the discovery of the cryoprotective effects of glycerol. (C. Polge, et al., "Revival of spermatozoa after vitrification and dehydration at low temperatures," *Nature* 164 (1949): 666.)

[36]C. Polge, "Functional survival of fowl spermatozoa after freezing at -79°C," *Nature* 167(1951): 949-950; C. Polge and J. E. Lovelock, "Preservation of bull semen at -79°C," *Veterinary Record 64*(1952): 396-397.

[37]First successfully frozen only in 1972. (See: D. G. Whittingham, et al., "Survival of mouse embryos frozen to -196 degrees and -269 degrees C," *Science* 178(1972): 411-414.)

[38]J. K. Critser, et al., "Factors affection the cryosurvival of mouse two-celled embryos," *Journal of Reproduction and Fertility* (1988) 82: 27-33.

[39]A. Trounson and L. Mohr, "Human pregnancy following cryopreservation, thawing and transfer of an eight-cell embryo," *Nature* 305 (1983): 707.

The difficulty with freezing is due to the particular status of the egg:

> The oocyte is the biggest cell of the whole human body, has a low surface/volume ratio, with a big cytoplasm whose microtubule and microfilaments organization is fragile, is rich of water and is in a delicate phase of meiosis. In the metaphase II of meiosis, the 23 chromosomes dichromatidic are aligned on the equatorial plain and bound to the microtubules of the fuse, very sensitive to temperature. Cryoprotectants and freezing-thawing can easily damage the chromosomes inducing aneuploidy. High solute concentrations, known as "solution effects," and intracellular ice are responsible for most damage to the eggs during cooling and rewarming. Both factors are often involved simultaneously, although intracellular ice is most likely to occur during rapid cooling and relatively slow rewarming. Conversely, solution effects are more evident during slow cooling, in that it is based on the attempt to induce ice formation extracellularly, raising solute concentration to allow water to be drawn out of the cell and preventing ice formation intracellularly. With slow cooling oocytes are exposed to high solute concentrations for prolonged times.[40]

Successful cryopreservation of early human embryos was extended to the zygote.[41] This is now the most common approach to human embryo cryopreservation.[42] The cryobiology

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[40]Francesco Fusi, "In Vitro Fertilization: oocyte cryopreservation as an alternative approach to embryo freezing," *Hot Topics March 2002.* Fertimagazine.net. On-line at: <http://www.fertimagazine.com/home/index.jsp. > Access date March 2005.

[41]J. Testart, et al., "High pregnancy rate after early human embryo freezing," *Fertility and Sterility* 46 (1986): 268-272.

[42]M. Damario, et al., "Embryo cryopreservation at the pronuclear stage and efficient embryo use optimizes the chance for a live-

of human embryos made possible the use of embryo freezing on a routine scale. The possibility of freezing embryos has several advantages for the medical practitioner and the paying client which make it the first choice in IVF: it allows the storage of surplus embryos and as a result it increases the overall pregnancy rate per cycle without the need of multiple (ova) stimulation.

IV. a. ii. Ova and Extra Embryos

The first necessary item in IVF is the egg or ovum, or oocyte. Ova may come from donations of women who undergo hysterectomy or abdominal surgery. They may also be found in the female fetus after elective abortion.[43] Most donations come from healthy fertile young women.

Healthy fertile women's bodies usually produce one mature egg a month. To retrieve eggs from a woman's body once a month would be time consuming, costly and would subject her to too much non-trivial surgery[44] because many eggs are needed in order for a successful IVF conception,

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born infant from single oocyte retrieval," *Fertility and Sterility* 73(2000): 767-773.

[43]For one of the few references on this topic see A. Shoshone, et al., "The use of oocytes obtained from aborted fetuses in egg donation programs." *Fertility and Sterility* 62 (1992): 118-123.

[44]The overall practice requires daily injections, ultrasounds, and blood tests. The surgery makes use of laproscopy or ultrasound.

embryo creation, embryo implantation and pregnancy. The drugs given to women to stimulate the cycle of egg maturation allow for the extraction of around 12 ova or oocytes.[45] These ova are fertilized with sperm, using a number of different techniques. The embryos are then incubated to encourage their growth. Tests determine which are the best candidates for implantation. Depending on the physician and the rules covering this procedure, between two and eight embryos are implanted in the woman's uterus. With cryopreservation technology, embryos can be frozen in liquid nitrogen. Given that most IVF treatments take more than one cycle, some embryos are preserved for future use. Some die in the freezing process. Three out of four embryos will die in the thawing process.

Estimates vary on how many extra embryos exist.[46] From the fact that the embryos from fertility clinics used for hES research are referred to as "excess," "spare," and "left-over," one gets the impression that there is an enormous number of them. There is reason to think that

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[45]See section on hormone treatment below.

[46]See the chart for the only US numbers (ff. 50). The Government of Canada has recently sponsored an effort to find out how many exist in Canada. This is to be undertaken by Francoise Bayliss, a professor of philosophy at Dalhousie University, who is on the (Federal) Department of Industry's Biotechnology Advisory Board.

there are fewer than imagined available for research, especially in light of the statistics given above concerning the rates of loss after thaw.

It is legal in the US for a woman to be financially compensated for this procedure; it is illegal however in Canada and Great Britain. In the US, the donor can be paid anywhere between $1,500-$3,000 US per session. The estimated cost for one egg retrieval session is $22,000 US.[47] [48]

A woman undergoing a fertility treatment has options regarding the fate of the extra embryos. Extra embryos may be donated to another IVF client/patient or they may be donated as objects of research and training. Most are immediately discarded. There was a survey conducted by the US Center for Disease Prevention and Control in an attempt

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[47]On-line at: <www.eggdonor.com> Access date March 2005.

[48]The American Society for Reproductive Medicine claims the average cost of an IVF cycle in the United States is $7,800. According to CNN, the average cost of an IVF treatment is $9,900. The breakdown: Screening lab, $300; Ultrasound labwork, $3,000; Egg recovery $1,500; Fertilization lab, $2,000; Embryo transfer, $1,000; Ovulation drugs $2,190. Roxanne Nelson, "Financing Infertility," CNN On-line. <http://www.cnn.com/HEALTH/women/9905/19/financing.infertility/>. Access date March 2005. The Canadian Regulatory Authority in Ottawa collects data on in vitro fertilization (IVF) on a voluntary basis. In 1995, 5,000 cycles of IVF were done in Canada at a cost of about $6,000-$6,500 per cycle started for a total of more than $30 million. (Report from Consultations on a Framework for Sexual and Reproductive Health. On-line at <http://www.hc-sc.gc.ca/hppb/srh/pubs/report/ch11.htm>) Access date March 2005.

to set up standards of practice for fertility clinics. Some 232 of 356 labs responded to it. Of these, 215 stated that they had equipment to preserve embryos in liquid nitrogen (cryopreservation). The options for excess embryo discard include: flushed down a sink drain, incinerated in a medical waste bin, exposed to air where they would die naturally in about four days.[49]

Chart[50]

	With Consent		Without Consent	
Handling Procedure	Number Labs	percent	Number Labs	percent
Immediately Discarded	115	49.6	15	6.5
Culture to Demise	107	46.1	28	12.1
Donated-Research	55	23.7	0	0
Donated-Diagnostic Purposes	27	11.6	0	0
Donated-Training	52	22.4	9	3.9
Donated-Another patient	43	18.5	0	0

[49]Final Report: Survey of the Assisted Reproductive Technology Embryo Laboratory Procedures and Practices," 1999-Jan-29. On-line at: <www.phppo.cdc.gov/DLS/pdf/art/ARTsurvey.pdf > Access date March 2005.

[50]Some percentages are over 100 percent because some labs use more than one method.

IV. a. iii. Hormone Treatments

Egg donors are young women who have undergone four weeks of hormone injections, regular visits to doctors, and a non-trivial surgical procedure.

For three weeks a donor injects herself with Lupron, which shuts down the ovaries so that no eggs ripen or are released. Taking this drug often produces menopause-like symptoms, such as hot flashes, difficulty with short-term memory, and insomnia. The donor then switches medication, injecting herself for a week with the follicle-stimulating hormones Pergonal and Metrodin. These injections hyperstimulate the ovary and cause the release of an abundance of eggs, often a dozen or more. Finally, the donor receives an injection of human chorionic gonadotropin (hGC). About thirty-four to thirty-six hours later, after hGC administration, eggs are retrieved by laproscopy or ultrasound.[51]

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[51]Mary Lyndon Shanley "Chapter Three: A Child of Our Own, " in *Making Babies, Making Families* (Boston: Beacon Press, 2001): 76-101, 84. Shanley notes that her description is drawn from: Patricia M. McShane, "In Vitro Fertilization, GIFT and Related Technologies: Hope in a Test Tube," in E.B. Hoffman, et al., eds., *Embryos, Ethics, and Women's Rights: Exploring New Reproductive Technologies* (New York and London: The Hawthorne Press, 1988): 31-46; and Rebecca Mead, "Eggs for Sale," *The New Yorker Magazine* (August 9, 1999): 56-65, 56.

In order to produce the number of eggs necessary for harvesting, women are given high doses of a hormone called FSH, follicle-stimulating hormone.[52] [53] No long-term research has been conducted to fully know the extent of all the risks involved, and hormone treatments associated with other procedures have proven dangerous to women in the past.[54]

There is evidence of a link between the usage of these hormones and the development of cancer in women who have undergone the IVF process.[55] Ovarian cancer has a multifactorial etiology (many contributing causes not just one) and is the most fatal gynecologic disease. Researchers have observed an increased risk of disease in women who never become pregnant.[56] The increased risk with infertility

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[52]W. Gifford-Jones, "Several Approaches to Deal with Infertility," *The Financial Post* (June 6/8, 1998): R14.

[53]The two most popular fertility drugs for women are clomiphene citrate (brand names Clomid and Serophene) and human menopausal gonadotropin or hMG, sold as Pergonal and Metrodin and used with human chorionic gonadotropin or hCG.

[54]Sue Rosser, "Re-visioning Clinical Research: Gender and Ethics of Experimental Design," in Helen Bequaert Holmes and Laura Purdy, eds., *Feminist Perspectives in Bioethics* (Bloomington: Indiana University Press,, 1992): 127-139, 131-132.

[55]E. Bartholet, "Adoption Rights and Reproductive Wrongs," in *Power and Decision: The Social Control of Reproduction* (Boston, Mass.: Harvard University Press, 1998): 177-203, 194.

[56]H. A. Risch, et al., "Parity, contraception, infertility, and the risk of epithelial ovarian cancer," *American Journal of Epidemiology* 140(1994): 585-597.

was suggested to be due to the use of fertility drugs.[57] This claim is yet unresolved because of contrary evidence suggested by other studies.[58]

In another recent study, it is claimed that women carrying multiple babies conceived with assisted reproductive technologies such as *in vitro* fertilization (IVF) are more likely to suffer from a serious high blood pressure condition than women who conceive a multiple pregnancy naturally.[59] In this study, the women who used assisted reproductive technology (ART) were more than twice as likely as those who had conceived naturally to suffer from pre-eclampsia, a condition which raises blood pressure to dangerous levels during pregnancy. They were almost five times as likely to have the severe form of pre-eclampsia, which is potentially life threatening.[60] While older women

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[57]A. S. Whittemore, et al., (Collaborative Ovarian Cancer Group), "Characteristics relating to ovarian cancer risk: collaborative analysis of 12 US case-control studies. II. Invasive epithelial ovarian cancers in white women," *Journal of Epidemiology* 136(1992): 1184-1203.

[58]For example see: B. J. Mosgaard, et al., "Infertility, fertility drugs, and invasive ovarian cancer: a case-control study," *Fertility and Sterility* 67(1997): 1005-1012. No association was found between the use of fertility drugs and ovarian cancer in this study.

[59]Anne Lynch, et al., *Obstetrics and Gynecology* 99(2002): 445-451.

[60]Pre-eclampsia can lead to eclampsia, in which a woman has convulsions towards the end of pregnancy or in the first week after delivery. Currently, almost 20% of deaths related to pregnancy stem from either pre-eclampsia or eclampsia. (Anne

and women having their first pregnancy tend towards this condition, and older women are more likely to use ART, the study revealed that the increased incidence among women who used ART was not related to those other risk factors. Although the exact cause is yet undermined, it is thought to be connected to ART. Some step in the procedure triggers a set of complex pathophysiologic events that result in pre-eclampsia. This could be the ova stimulation drugs, the procedure itself, the drugs that are used to assist the conception, or the drugs that are used after conception.[61] [62]

Lynch, et al., "Preeclampsia in Multiple Gestation: The Role of Assisted Reproductive Technologies," *Obstetrics and Gynecology* 99(2002): 445-451).

[61]Anne Lynch, et al., "Preeclampsia in Multiple Gestation: The Role of Assisted Reproductive Technologies," *Obstetrics and Gynecology* 99(2002): 445-451.

[62]There is also evidence that IVF produces higher than normal incidences of ectopic, or tubal, pregnancies. An ectopic pregnancy occurs when the embryo implants itself outside the uterus, usually in the fallopian tube. As the fetus grows, it ruptures the tube causing massive bleeding. An ectopic pregnancy can never be carried to full term. The rate of ectopic pregnancies, although still low in percentage, is still found to be 25 times more common in IVF patients than in the general population (*Proceed with Care: The Final Report of the Royal Commission on New Reproductive Technologies, 2 vols.* (Ottawa, Canada: Ministry of Supply and Services, 1993): 531). In addition to health risks and financial issues, there are psychological traumas that women and their partners may suffer due to IVF treatment. Instead of perhaps dealing with not being able to bare children and exploring other options, IVF offers what seems to be the only hope. The actual percentage of successful births resulting from IVF is low. The average success rate for both Canada and the United States is approximately 20%. For women between the ages of 21 and 34, this number rises to about 25%. However, for those women over the age of 47, the rate

IV. b. Cloning for Embryos

Cloning for stem cells is referred to as "research" cloning or "therapeutic" cloning. This is to be distinguished from "reproductive cloning." The difference between research cloning and reproductive cloning is not a difference of technique, but rather a difference in the intentions for using the technique. The initial steps of all research and reproductive cloning techniques are identical. The purpose of reproductive cloning is to make an individual. That is, to make it possible for this zygote-like entity to become an embryo, fetus, and then a baby. Research cloning is intended differently. It is meant to create a group of cells in a culture that can later be used for research and therapeutic purposes.

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falls dramatically. Almost all women undergoing IVF go through multiple treatments before pregnancy occurs, if ever it does. For these women, the sense of inadequacy and loss that makes the medical route so appealing in the first place is re-enforced with each failure. However, it is not possible to deal with this sense of loss and suffering if the woman (and her partner) is still fixated in attempting to undo the loss. And here lies one of the major issues with IVF; there is no logical stopping point. Failure does not provide any reason to believe that success will not occur with the next attempt. Not only do potential parent(s) have to deal with the initial shock of discovering that they are infertile, but with every successive IVF failure, they have to experience those emotions over again. (E. Bartholet, "Adoption Rights and Reproductive Wrongs," in *Power and Decision: The Social Control of Reproduction* (Boston, Mass.: Harvard University Press, 1997): 177-203, 193.)

IV. b. i. Somatic Cell Nuclear Transfer (SCNT)

In one technique called "somatic cell nuclear transfer (SCNT)," the same technique that was used for the first successful reproductive cloning of a mammal, i.e. Dolly, an egg is removed from a woman's body, then its nucleus is extracted and it thereby becomes an a-nucleated egg or an ovacyte. The nucleus of an adult somatic or body cell (that is, any non-reproductive or germ cell) or an undifferentiated stem cell is inserted into the ovacyte. Skin cells, "fibroblasts," have been used often because the skin cell is the first somatic cell to be differentiated during human development. However, there has been no confirmed example of cloning from human fibroblasts, although murine fibroblasts have been successful in cloning mice.

After a successful process involving electricity the cell will fuse to the egg. The electricity not only causes fusion but also activates cell division (which is the job of sperm in normal development). The genes of, for example, the skin cell would be "turned off" and the other genes that had been "silenced" since the early embryonic life of the individual would be reactivated. In another more

difficult technique, the nucleus of the patient's donor cell is injected directly into the egg.

This new cell is similar to a zygote but whereas the zygote is a product of sexual reproduction, cloning is a form of asexual reproduction. In SCNT, the new individual will be a virtually identical genetic copy of the donated nucleus, whereas genetic twinning is rare in sexual reproduction. Also with sexual reproduction both individuals will be virtually exactly the same age. Whereas with SCNT this would not be the case. A clone does not have a genetic mother or father as in sexual reproduction when an embryo gets half its genes from the woman's egg and half from the man's sperm. It has a "nuclear donor," and it also gains some genetic material called "mitochondrial DNA" from the egg.[63] This represents a tiny contribution, only a few dozen functioning genes, as opposed to the tens of thousands it receives from the nucleus.[64]

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[63]Mitochondrial DNA is passed exclusively from the mother to the child. All relatives with the same maternal lineage have the same mitochondrial DNA.

[64]However, studies in rats and mice show that incompatible mitochondrial proteins provoke immune rejection responses. See next section on Hybrid Cloning.

IV. b. ii. Parthenogenesis

Another cloning technique called "parthenogenesis" does not require the a-nucleation process. Rather, the egg is stimulated to divide on its own. In November 2001, the first primate parthenote (a monkey) was created in a lab of Advanced Cell Therapy (ACT), a biotechnology company in Worchester, Massachusetts. It survived until the six-cell stage, not reaching blastocyst-hood.[65]

IV. b. iii. Blastomere Separation

In a cloning technique called "blastomere separation," a new organism is created from a developing early embryo by separating a blastomere from the collection of blastomeres after the four-cell stage and before the blastocyst stage. This is not cloning in the sense of creating a genetically identical organism from one already existing, that is, one that is already born. Rather, it is more like creating twins or triplets. Indeed natural identical twinning etc. takes place precisely in this way and in the same time frame.

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[65]Scott Gottlieb, "Scientists 'grow' monkey stem cell lines from cloned embryos," *British Medical Journal* (December 15, 2001): 1386.

IV. iv. Cloning Challenges

The process of activation is the least understood aspect of cloning and accounts for the large number of cloning attempts in order to produce only one clone. Attempts are represented by the number of ova that are needed; for example, the researchers who created Dolly started off with 227 fused ova and somatic cells. Thirty of these began to develop to the blastocyst stage, twenty-nine were successfully implanted in surrogate wombs, and one of these pregnancies ended in a successful birth. Successful therapeutic cloning has taken place in mice. At the Rockefeller Institute in New York, 1016 cloning attempts required 398 blastomeres to produce 355 stem cell lines. At the Whitehead Institute for Biomedical Research in Massachusetts, 202 eggs were needed for one stem cell line. At Monash University in Australia, it took 926 eggs to create one stem cell line.[66]

The data from animal models indicate that there are hundreds of failed attempts to develop viable embryos. Further there is the great possibility of cruel failures in human cloning, where genetic abnormalities result in

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[66]As reported by Kyla Dunn, in "Cloning Trevor," *Atlantic Monthly* 289 (June 2002): 31-34 36; 38-40; 42-44; 46; 48-50; 52, 46.

grotesque fetuses unable to survive outside the womb and in neonatal mortality. The success rate with animal cloning is about one to two percent in the published results with no promising techniques on the horizon to better these numbers. There are many cases where the cloned animals die late in pregnancy or soon after birth. In addition, clones are spontaneously aborted because of genetic or physical abnormalities. These gestation problems put the health and lives of the surrogate mothers at risk.

Unlike reproductive cloning, however, research cloning is successful once a very early stage of embryo development is reached, namely, the blastocyst stage. This stage is reached *ex utero*. Therefore, this harm argument as it regards the early embryo, does not apply to research cloning.

IV. b. v. A Short History of Cloning Technology

The development of animal cloning has a long history, although it reached its apex in 1997 with the birth of Dolly the sheep, the first cloned mammal, at the Roslin Institute in Scotland.[67] [68] There is debate over whether or

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[67] I. Wilmut, et al., "Viable offspring derived from fetal and adult mammalian cells," *Nature* 385 (1997): 810-813; J. Wise,

not her telomeres (the material that caps the ends of each chromosome) are shorter than they should be for a sheep of her age. Ordinarily, telomeres shorten with each cell division toward the end of life when they can no longer protect the chromosomes adequately. Prematurely shortened telomeres could mean that Dolly was actually the biological age of her genetic mother (about six years) at the time of her birth and that she therefore has a shortened life expectancy. The question of telomere length remains unresolved and the role of telomeres in aging is incompletely understood. Dolly died in 2004.[69]

Britain has issued a patent for the cloning process that created Dolly. This patent also covers some products of SCNT, including the clones themselves, and, therefore,

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"Sheep Cloned from Mammary Gland Cells." *British Medical Journal* 314 (1997): 623.

[68]Companies (with accredited researchers and English-language press releases) working on mammal cloning include: Advanced Cell Technologies (ACT): One Innovation Drive, Biotech Three, Worcester, MA 01605; L'Alliance Boviteq (LAB) 1425, grand rang Saint-François, Saint-Hyacinthe (Québec), Canada J2S 7A9; Genetic Savings and Clone 3312 Longmire Dr., College Station, TX 77845-5812; Geron Corporation Menlo Park, CA; Infigen 1825 Infinity Drive, DeForest, WI 53532; Lazaron BioTechnologies LLC. Louisiana Business and Technology Center, South Stadium Drive, Baton Rouge LA 70803; Nexia Biotechnologies 21,025 Trans-Canada Highway Ste. Anne de Bellevue, QC H9X 3R2; PPL Therapeutics Scotland, U.K.; Roslin Institute Scotland, U.K ProBio Level 50 120 Collins Street Melbourne Victoria 3000, Australia.

[69]Ian Wilmut, Keith Campbell and Colin Tudge, *The Second Creation: Dolly and the Age of Biological Control* (New York: Farrar, Strauss and Giroux, 2000).

in theory, human embryos in the earliest stage of development. Geron Corporation of Menlo Park, California received the patent.[70] In January 1998, the University of Massachusetts at Amherst successfully cloned eight transgenic calves from the cells of one adult cow. [71] In July 1998, Teruhiko Wakayama, in the laboratory of Ryuzo Yanagimachi at the University of Hawaii, cloned 50 female mice over three generations.[72] From the Hawaiian research, it was estimated that two to three percent of the embryos produced from ovarian cells led to live offspring. In August 1998, an anonymous California couple announced

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[70]Geron Corporation Menlo Park, CA. Geron acquired Roslin Bio-Med (a company formed by the Roslin Institute) in 1999 and now owns their patents on the nuclear transfer process.

[71]ACT and the University of Massachusetts, Amherst Press Release on-line at: <http://www.umass.edu/newsoffice/archive/1998/073098clones.html> Access date March 2005; J. B. Cibelli, et al., "Cloned transgenic calves produced from nonquiescent fetal fibroblasts," Science 280(May 22, 1998): 1256-1258; J. B. Cibelli, et al., "Transgenic bovine chimeric offspring produced from somatic cell-derived stem-like cells," *Nature, Biotechnology* 16 (1998): 642-646; M. W. Zwada, et al., "Somatic cell cloning-produced transgenic bovine neurons for transplantation in Parkinsonian rats," *Nature, Medicine* 4(1998): 569-574.

[72] University of Hawaii Press Release on-line at : <http://www.hawaii.edu/ur/News_Releases/NR_July98/cloning.html> Access date March 2005; T. Wakayama, et al., "Full-term development of mice from enucleated oocytes injected with cumulus cell nuclei, " *Nature* 394 (July 23, 1998): 369-374; T. Wakayama, et al., "Cloning of mice to six generations," *Nature* 407 (September 21, 2000): 318-319; T. Wakayama, et al., "Mice cloned from embryonic stem cells," *Proceedings of the National Academy of Sciences USA* 96 (Dec 21, 1999):14984-14989. ProBio of Australia owns these patens as well as those from research at the Whitehead Institute.

donation of $2.3 million to clone their 11-year-old white-brown-black border collie-Siberian-husky mix, "Missy".[73] This research has started at Texas A and M University. They have however successfully cloned only a cat.[74] In March 2000 at a PPL Therapeutics research facility in Virginia, five piglets were cloned.[75] Stem cells used to produce these clones came from two different sows. ACT in Worchester successfully cloned an endangered guar, an ox native to Asia that was successfully gestated by a dairy cow.[76] In

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[73]Missyplicity Project On-line at < http://www.savingsandclone.com/about_us/missy.html > Access date March 2005.
Texas A and M University Press Release on-line at : <http://www.tamu.edu/aggiedaily/press/020214cc.html> Access date March 2005; D. Varner, Should You Clone Your Dog?" *Animal Welfare* 8(1999): 407-420. Professor Varner is a member of the Philosophy Department at Texas A and M. This article addresses particularly the Missyplicity Project; N. Boyce, "Pets of the Future," *US News World Report* 132 (Mar 11, 2002): 46-53.

[74]The "CopyCat project" funded the successful creation of a cat clone in February 2002. The company plans later to branch into cloning wildlife and endangered species.

[75]This company collaborated with the Roslin Institute in the original cloning of Dolly. They are particularly interested in creating cloned animals carrying new proteins in their milk for the purpose of curing human disease. They have cloned Polly, a sheep who carries a human gene to treat hemophilia B, and have also cloned cows and pigs. See: Akira Onishi, Masaki Iwamoto, Tomiji Akita, Satoshi Mikawa, Kumiko Takeda, Takashi Awata, Hirohumi Hanada, and Anthony C. F. Perry, "Pig Cloning by Microinjection of Fetal Fibroblast Nuclei," *Science* 289 (August 18, 2000): 1188-1190.

[76]It died within 48 hours of a common disease: dysentery. See: S. Milius, "Cloned gaur born healthy, then dies," *Science News* 159 (February 10, 2000): 95.

Italy an endangered mouflon sheep was successfully cloned and has lived though its childhood.[77]

The first reported attempt of human cloning came from the Advance Cell Technology labs in Worchester, Massachusetts, in the Fall of 2001.[78] An ovarian cumulus cell was stimulated to divide in a technique more like parthenogenesis than SCNT. The embryo created lasted until the 6-cell stage after being cultured for one week. This is not large enough to be a source of stem cells (which requires an embryo with around 60-64 cells). However the first human cloning that was successful to become a source of embryonic stem cells is attributable to Wook Suk Hwang and Shin Yong Moon of Seoul National University and was reported in February 2004.[79] This milestone and other subsequent attempts are now referred to as human *embryo* cloning.

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[77]P. Loi, et al., "Genetic rescue of an endangered mammal by cross-species nuclear transfer using post-mortem somatic cells," *Nature, Biotechnology* 19 (October 2001): 962-964.

[78]Alex Vass, "US Scientists Clone First Human Embryo," British Medical Journal 323 (December 1, 2001): 1267. Jose Cibelli of ACT first reported it on the Internet: *e-biomed: The Journal of Regenerative Medicine* on November 25, 2001. For an account of the perhaps premature announcement and the media surrounding this event see: Robert A. Weinberg, "Of Clones and Clowns: When hype meets science," *Atlantic Monthly Magazine* 289 (June 2002): 54-55; 57-59.

[79]Theresa Tamkins, "Human Embryos Cloned," *The Scientist* (February 12, 2004). < http://www.biomedcentral.com/news/20040212/02/ > Access date March 2005.

Successful cloning technology is bound to other technologies including assisted reproductive technologies, for example, ova extraction from women, genetic screening and testing, pre-implantation genetic diagnosis or genetic testing. Pre-implantation diagnosis (PID) is an experimental method designed to identify genetic defects or chromosome abnormalities at two different stages: either in an ovum (unfertilized egg) before fertilization or in an embryo before fertilization. PID is also bound to genetic engineering, both somatic and germ-line. Somatic genetic engineering is a gene alteration process occurring in specific organs and tissues of an individual's body without affecting genes in future generations. Germ-line genetic engineering is a gene alteration process occurring in reproductive cells such as eggs, sperm and zygotes which affect every cell in the individual's body and are passed on to future generations.

IV. b. vi. Hybrid Cloning

As cloned hES research and therapy develops, the search for alternatives to human eggs becomes more urgent given the increasing demands an adequate oocyte supply. If there are viable alternatives associated with that supply are great

costs, increasing practical difficulties, as well as harms and burdens to women donors. The most successful mammal cloning has been achieved with cow oocytes. In 1998, an unsuccessful attempt was made to fuse a human skin cell (fibroblast) to an a-nucleated cow egg.[80] The nuclear DNA of one species, in this case, a human, fused with the mitochondrial DNA of another species, in this case a cow, is referred to as "hybrid cloning."[81] The offspring of such a technique would be called a "chimera." Stem cell researchers do not seem interested in producing bi-species beings but rather only human embryonic stem cells.

It is now believed that success in hybrid cloning will depend on the non-human mitochondrial DNA being compatible enough to human DNA for the most basic function in fertilization, namely, "oxidative phosphorylation," to occur. Apparently, the DNA of chimpanzees, pigmy chimpanzees, and gorillas are compatible enough with human DNA. DAN from organutans, new-world monkeys and lemurs is not sufficiently compatible.[82]

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[80]E. Russo, "Cow-Human Cell News Raises Ethical Issues," *The Scientist* 12 (Nov. 23, 1998): 1.

[81]Cow cloning has been very successful. This is due to the relative ease in injecting donor DNA into the cow ova.

[82]L. Kenyon and C. T. Moraes, "Expanding the function of human mitochondrial DNA database by the establishment of primate

IV. c. Confusions over Pluripotency and Totipotency

There is some confusion as to whether any of the ICM cells that are derived from embryonic stem cells can be described as totipotent rather than pluripotent; that is, whether they can develop into a complete organism and not just into any one of the specific tissues. [83] [84] According to Paul Root Wolpe and Glenn McGee, some of this confusion comes as a result of the public thinking of hES stem cells derived from nuclear transfer technology rather than its thinking of hES cells which are not derived from nuclear transfer technology, but from an already existing embryo.[85] Alternatively we might attribute the confusion to people

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xenomitochondrial cybrids," *Proceedings of the National Academy of Sciences of the USA* 94 (1997): 9131-9135: as cited in Erik Parens, "Ethics and Politics of Human Stem Cell Research," in Suzanne Holland et al., eds., *The Human Embryonic Stem Cell Debate: Science, Ethics, and Public Policy* (Cambridge, MA: MIT Press, 2001): 37-50, 48.

[83]As cells divide after fertilization at the very early embryo stage, the cells are totipotent. This means that should one cell become separated from the original mass and start to divide on its own, it has the potential to turn into another individual.

[84]L. S. Cahill, "Social Ethics of Embryo and Stem Cell Research," *Women's Health Issues* 10(2000): 131-35.

[85]They report that the journal Science noted this public confusion between cloning and ES cells derived from an embryo that had been cloned. See: D. Solter and John Gearhart, "Putting Stem Cells to Work," *Science* 283 (1999): 1468-1470; Paul Root Wolpe and Glenn McGee, "'Expert Bioethics' as Professional Discourse," in Suzanne Holland et al., eds., *The Human Embryonic Stem Cell Debate: Science, Ethics, and Public Policy* (Cambridge, MA: MIT Press, 2001): 185-196, 188.

thinking of hES stem cells and a cloning technique called "blastomere separation." In this technique, a new organism is created from a developing early embryo by separating a blastomere from the collection of blastomeres after the four-cell stage and before the blastocyst stage. This is not cloning in the sense of creating a genetically identical organism from an already existing, that is, from one that has already been born. Rather, it is more like creating twins or triplets. Indeed natural identical twinning etc. takes place precisely in this way and in the same time frame.

Returning to the question of totipotency, according to James A. Thomson, because a stem cell from the ICM would lack the trophodermic layer, it cannot be considered totipotent. This layer mediates implantation into the wall of the uterus; thus there would be no way that this stem cell, if implanted into a woman's uterus, would be able to develop as a totipotent blastomere would.[86] This is the dominant scientific view of this issue.[87] However, the

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[86]James A Thomson, "Human Embryonic Stem Cells," in Suzanne Holland et al., eds., *The Human Embryonic Stem Cell Debate: Science, Ethics, and Public Policy* (Cambridge, MA: MIT Press, 2001): 15-26, 15.

[87]Paul Root Wolpe and Glenn McGee, "'Expert Bioethics' as Professional Discourse," in Suzanne Holland et al., eds., *The*

degree to which these cells are totipotent is uncertain. That is, under certain conditions they may be able to turn into complete individuals and not just into kinds of cells in a human being. Because of new technologies, in particular, somatic cell nuclear transfer, there are many cells that have the potential to turn into a new individual. Thus with the emergence of new technologies, terms like "totipotency" and "pluripotency" may cease to have a clear referent.

hES cells are found in the ICM of the blastocyst around the fifth or sixth day after fertilization. In the intact blastocyst, the ICM has the potential to form any type of cell but they grow and replace themselves for a short period of time. Once the early embryo has implanted itself in a women's uterus, between 12-14 days after fertilization, ICM cells have already begun to differentiate and will continue to have a limited developmental potential. In order for hES cells to be retrieved, the trophoblast has to be broken and the cells have to be cultured under certain conditions.

Human Embryonic Stem Cell Debate: Science, Ethics, and Public Policy (Cambridge, MA: MIT Press, 2001): 185-196, 189.

V. Stem Cell Research

V. a. Potential Therapies

Currently, research is underway to learn how to control the system of chemical messengers and receptors that regulate cell differentiation so that differentiation may be reversed. Research has also demonstrated that it is possible to improve the function of specific organs and tissue through injection of stem cells; thus future projects will involve developing stem cell therapies.

The potential use for such cells is obvious and truly worthy to be described as miraculous: unprecedented therapies could include the generation of cells, tissue and eventually organs for transplantation, the treatment and potential cure of all degenerative disease, and the restoration of all damaged tissue after accidents.[88] [89] It may be possible to repair or replace tissue, or replace diseased organs with tissues that would be derived from cells that will not age in the same way as regular cells.

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[88]Work on therapies for Parkinson's, juvenile diabetes, and Alzheimer's are well underway.

[89]Treatment for diabetes involves inducing the pancreas to incorporate insulin-producing islet cells developed from stem cells; treating Parkinson's involves injecting stem cells into the 'substantia nigra' in the brain to boost production of the neurotransmitter dopamine.

In this way, somatic cells may acquire properties once possessed only by (and only in a limited way by) embryonic stem cells.[90] Some believe that research may lead to the formation of tissue banks to repair or replace damaged body parts.[91] Should the promise of stem cell research and therapy be realized, it would, as Dr. Mark Nobel, a professor of biomedical genetics at the University of Rochester Medical Center, claims, rank with medical advances like vaccinations and antibiotics.[92]

The following chart shows the types of disease that this type of regenerative medicine promises to aid, and it shows the number of people in the USA who are currently afflicted with those diseases.[93]

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[90]Morgan Lyons, "The Paradox of Immortality," *Southwestern Medicine: Telomeres and Immortality,"* (1996) < http://www.swmed.edu/home_pages/publish/magazine/immortal/paradox.html> Access date March 2005.

[91]S. S. Hall, "The Recycled Generation," *New York Times Magazine* (January 2000): 30.

[92]"The Stem Cell Race: New York Region Opinion," *The New York Times* (March 20, 2005). On-line at <www.nytimes.com> Access date March 2005.

[93]Source is from: D. Perry, "Patient's Voices: The powerful sound in the stem cell debate," *Science* 287 (2000): 1423.

Medical Condition	Number of Patients (US)
Cardiovascular disease	58 million
Autoimmune disease	30 million
Diabetes	16 million
Osteoporosis	10 million
Cancer	8.2 million
Alzheimer's disease	5.5 million
Parkinson's disease	5.5 million
Burns (severe)	0.3 million
Spinal-cord injuries	0.25 million
Birth defects	0.15 million/year

Another important medical use for cultured stem cells is to test new and existing drugs.[94] Here normal lines of cells that would represent different tissues and organs (e.g. liver) could be tested directly for toxicity before the drug is introduced into clinical trials. This would greatly reduce the need for animal testing and has the potential to accelerate drug discovery.

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[94]Thomas B. Okarma, "The Technology and Its Medical Applications," in Suzanne Holland et al., eds., *The Human Embryonic Stem Cell Debate: Science, Ethics, and Public Policy* (Cambridge, MA: MIT Press, 2001): 3-13, 7.

Research cloning is distinguished from stem cell research in general because not all kinds of stem cell research involve cloning or the destruction of blastocysts. Research cloning is of interest to the stem cell researcher, however, because it promises to contribute to the solution of one of the basic problems in stem cell research. The problem is how to 'coax' a stem cell down a certain kind of cellular development, that is, how to understand and manipulate cell differentiation. It is also promising because stem cells may serve as a source of non-rejectable transplant material; or at least through studying them, they promise to provide important information about immunological intolerance. Since stem cells come from embryos that have their own distinctive DNA, the recipient might well reject tissues produced in this way.

V. b. Potential Stem Cell and Gene Therapy

Cloned hES cell lines that have been genetically engineered could provide a population of genetically modified cells that could be used for therapy. hES cells "grow tirelessly in culture…[and] they give researchers ample time to add or

delete DNA precisely." [95] This is a more promising way to modify cells that need treatment than the current method of gene therapy because it is easier.[96]

There are two kinds of gene therapy, somatic cell and germ-line. Somatic cell gene therapy modifies body cells and is performed after an organism's cells have completely differentiated. Currently, a modified virus (a retrovirus) is used as a vehicle to 'infect' a patient's cells with a modified version of his or her DNA. If successful, the modified version will 'overwrite' the disfunctional gene. Even if somatic gene therapy is successful, as the body produces new cells they will have the original unmodified DNA and thus more treatments will be needed. In addition, any biological children this individual might have would have the same DNA, depending on the genetic abnormality. Finally, the virus-vector delivery inserts itself in random cells. Thus it is difficult to modify only those cells that need treatment.

Germ-line therapy would have to be performed at the very early embryo stage before cell differentiation. There

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[95]A. Regaldo, "The Troubled Hunt for the Ultimate Cell," *Technology Review* 101 (1998): 4-41, 40.
[96]J. W. Gordon, "Genetic Enhancement in Humans," *Science* 283 (1999): 2023-2024.

is but a small window of time to do this. If successful it could, theoretically speaking, modify all of the cells in the organism, including the stem cells; thus as the individual grew and as her cells replenished, the cells would be the modified ones not the ones with the unmodified DNA. In addition, her germ cells would be affected, and thus, should she have offspring, the modified DNA would be passed on not the unmodified DNA.

Following either a cloning or a non-cloning procedure to derive a stem cell line, the gene causing the cellular dysfunction could be modified and then transplanted into the patient. Or an hES cell with a disfunctional gene could be modified and then therapeutically cloned to provide for a greater source of regenerative tissue. While there are many obstacles to gene therapy still existing, and little successful research combining hES research and gene therapy has taken place,[97] these obstacles are in theory not difficult to surmount.[98]

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[97]Two research teams at the Whitehead Institute for Biomedical Research in Massachusetts (Rudolf Jaenisch and George Daley) have used a mouse model to establish for the first time that a combination of nuclear transplantation, gene therapy, and embryonic stem cell differentiation can be used to create custom-tailored cellular therapies for genetic disorders. See "Press

CHAPTER THREE: STEM CELL CONTROVERSIES

I. Introduction

This chapter has two main purposes. The first is to provide an overview of the central ethical issues underlying the main debates over stem cell research and therapy. In so doing I will present and critically assess arguments used to support moral positions. The main debates I discuss are over the source of the stem cells for research and therapy. I will focus particularly on the arguments that deny support for stem cell research on the basis that the embryos have intrinsic moral value and thus should not be destroyed for research purposes. Because the chapter aims to be more or less comprehensive, the presentation and analysis of each individual argument will be brief.

Release: Scientists Combine Therapeutic Cloning, Embryonic Stem Cells, and Gene Therapy to Correct a Genetic Defect in Mice." On-line at <http://www.wi.mit.edu/nap/ > Access date March 2005. See also: D. Solter and John Gearhart, "Putting Stem Cells to Work," *Science* 283 (1999): 1468-1470; J. W. Gordon, "Genetic Enhancement in Humans," *Science* 283 (1999): 2023-2024.

[98]Erik Parens, "Ethics and Politics of Human Stem Cell research," in Suzanne Holland et al., eds., *The Human Embryonic Stem Cell Debate: Science, Ethics, and Public Policy* (Cambridge, MA: MIT Press, 2001): 37-50, 39. "[I]t is at least theoretically possible that in the future, practical obstacles that now exist [in germ line alteration therapy] will be overcome. A comprehensive analysis of hES cell research should acknowledge this theoretical possibility."

The second purpose is to present what is regarded in the literature as the most pressing moral concern over the sources of stem cells, namely, those coming from destroyed embryos and fetal tissue from elective abortions.[99] I hope to convince the reader that the reason for the great concern over embryo destruction for stem cells is due to its perceived similarity to the abortion debate. This view is mirrored in the concerns over the use of fetal material from elective abortions as sources of stem cells. The important lesson from this chapter is that there is similar argumentation in the abortion debate and the stem cell research and therapy debate.

II. The Scientific Background of Stem Cell Controversies

For almost all researchers, the better sources of stem cells are those that promise the least cell differentiation or the most cell plasticity, namely, embryonic stem cells and germ stem cells. The best source would be that which has the greatest plasticity, the longest telomere, the best chance of being genetically normal, and the least chance of being rejected after transplantation. Cloned embryonic stem

[99] The debates on the ethics and stem cell research and therapy are concerned foremost with the source of stem cells.

cells that may or may not be genetically modified appear to meet these criteria.

Research into cell differentiation and immunological intolerance in tissue transplant is necessary for any stem cell therapy, whether with adult, fetal or embryonic cells. And this research is best carried out on embryonic tissue. Therefore, while hES research and research cloning is distinguished from stem cell research in general (because not all kinds of stem cell research involve cloning or the destruction of blastocysts) they are of necessary interest to the stem cell researcher in general because such inquiries promise to contribute to the solution of these two basic problems in stem cell research: namely, cell differentiation and immunological intolerance in tissue transplant.[100]

III. The Ethical Issues in Stem Cell Research

Stem cell research promises new ways to fight and even cure degenerative and infectious diseases: for example, successful stem cell regeneration therapy would be able to

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[100]Since stem cells come from embryos that have their own distinctive DNA, the recipient might well reject tissues produced in this way. To prevent this, clinicians could administer powerful immuno-suppression drugs. But these drugs have their own risks, such as increased susceptibility to infections and cancer.

replace transplant therapies of any organ and tissue.[101] And since they can divide infinitely in the laboratory, stem cells are immediately available for research and treatment purposes.[102] In January 2004, for example, 76,115 Americans who are in want of an organ transplant have been registered on UNOS (United Network for Organ Sharing). It is estimated that in the US thousands of people die each year for want of a transplant.[103]

Thus this new therapy meets an important demand in itself, and consequently brings about important medical benefits as it relieves great pain and suffering and could increase human longevity. In addition, its application would prevent what some believe to be great harms to others, given existing protocols for transplant research and therapy. With the consistent success of stem cell therapies other morally dubious practices would be replaced

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[101]See testimony of Dr. Darwin Prockop, Director of the Tulane University Center for Gene Therapy given to the Senate Appropriations Sub-Committee on Labor, Health and Human Service, and Education, Sept 15, 2000.

[102]National Institutes of Health (USA), "NIH Fact Sheet on Human Pluripotent Stem Cell Research Guidelines, 2001," On-line at < http://www.hhs.gov/news/press/2001pres/01fsstemcell.html > Access date March 2005; S. Lee, "Human Stem Cell Research: NIH Releases Draft Guidelines for Comment," *Journal of Law, Medicine, and Ethics* 28(2000): 81-83.

[103]United Network of Organ Sharing, a US non-profit organization and clearing house. On-line at: <http://www.unos.org> Access date March 2005.

and the development of still other dubious practices would not be pursued. These include the (potential) cloning of human beings for organ transplant and the cultivating of animals, either genetically modified and/or cloned, for the purpose of providing organs for humans (i.e. xenotransplantation). In addition, it would greatly diminish if not obliterate the demand for traffic in organs and thus the questionable means of appropriating human organs which have been documented in China and India.[104]

Further, the ethical and legal debate about the sale of organs is potentially abated. Therefore the harms and potential harms to non-human animals, human clones, and socially and politically vulnerable human beings, in the service of providing a market for safe and efficacious organ transplant, are all potentially avoided with stem cell therapy success. Moreover, stem cell therapy would only not be a better choice among alternatives. All things being equal, it is a better therapy because it is

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[104]D. Rothman, "The International Organ Traffic," in *Moral Issues in a Global Perspective*, ed., Christine Koggel (Peterborough: Broadview, 1999), 611-618; Nancy Scheper-Hughes, "The Global Traffic in Human Organs," *Current Anthropology* 41 (April 2000): 2-19. The Bellagio Task Force Report on Transplantation, Bodily Integrity, and the International Traffic in Organs. On-line at: <http://www.icrc.org/Web/eng/siteeng0.nsf/iwpList302/87DC95FCA3C3D63EC1256B66005B3F6C> Access date March 2005.

potentially able to be more successful with a better opportunity for the donor's body to accept the new tissue.[105]

Many issues in biomedical ethics and organ and tissue replacement therapy dissolve with the development of therapies using stem cells. In addition, research and use of stem cells helps us understand how tissues regenerate and this importantly increases our knowledge of cell biology. Further, stem cell technology can be used to screen and test drugs. Such screening and testing is usually performed on non-human animals. Those who oppose these practices point to the suffering of animals this entails and to the questionable medical benefit to humans as the physiology, especially the metabolism, of most animals used in testing is very different than that of humans.

Those who maintain that abortion is morally wrong, and that no "right" can come from a "wrong," may argue that one is complicit with abortion should one use or permit the use

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[105]Greater acceptability may require fewer t-cell inhibitors that may in turn decrease the risk of infection and disease following the transplant.

of an aborted fetuses' tissue.[106] In addition, there is concern that this research will cause a greater incentive to abort. Aside from the obvious harm to what some might consider a morally worthy being, there are fears that this would lead to or represent a commercialization of human being and reproduction. Fetuses, who some perceive as the moral equivalent of human beings, would be valued instrumentally instead of intrinsically, and from their perspective this is morally egregious.[107] These kinds of arguments have already been developed in the debate over the use of fetal tissue in other kinds of research and therapy.

The greatest source of hES cells is embryos that have been donated by clients of fertility treatments. Other research embryos are created *in vitro* from donated egg and sperm.[108] In order for the stem cells to be retrieved the embryo has to be dismantled so that the IMC may be

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[106]G. J. Boer, "Ethical Issues in Neurografting of Human Embryonic Cells" *Theoretical Medicine and Bioethics* 5 (1999): 461-475.
[107]L. S. Cahill, "Social Ethics of Embryo and Stem Cell Research," *Women's Health Issues* 10(2000): 131-135; D. Resnik, "Debunking the Slippery Slope Argument against Human Germ-line Gene Therapy," *Journal of Medicine and Philosophy* 19(1994): 23-40; P. H. Silverman, "Commerce and Genetic Diagnostics," *Hastings Center Report* 25 Special Supplement 3(1995): S15-S18, S15.
[108]See Sheryl Gay Stolberg, "Bioethicists Fall under Familiar Scrutiny," *New York Times* (August 1, 2001). Report on the Jones Institute of Reproductive Medicine in Norfolk, Va. This facility mixed egg and sperm *in vitro* to create embryos for research.

accessed. Further, in order to develop therapies and cell lines, more research on embryos is needed, research that would involve their destruction.[109]

The most popular objection to hES stem cell research extends from a religious or other moral view that claims that human life begins at conception and that destroying an embryo is the moral equivalent of destroying an innocent adult person. This discussion about the personhood of the embryo, or even about whether or not the embryo is the kind of thing that should not be destroyed, is not new. Philosophers have long debated whether or not personhood is the kind of property that can be extended to fetuses, embryos, blastocysts or fertilized eggs. And they have further examined whether personhood itself is a necessary or sufficient criterion for moral standing.

How embryos are procured invites controversy as well. The sources of embryos include those: 1) left over from

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[109]US President G. W. Bush in his speech to the nation on August 9, 2001 on the federal funding for embryonic stem cell research held a middle ground position by allowing funding only for the hES cell lines that had already been developed. In other words, no new embryos would have to be destroyed. He (or whoever wrote the speech) reasoned that there should already be enough lines in existence for researchers to be able to tell whether or not hES stem cells might have the great therapeutic properties they are thought to have. Whether such a policy is scientifically sound remains to be seen since those lines that have been developed are themselves experimental.

fertility treatments; 2) created in the lab from donated gametes; and 3) those that have been cloned. Issues involved in the first two cases include the consent of the gamete donors; and in the third case, the morality of human cloning.

Some who debate this topic believe that the intention of the creation of the embryo is morally relevant.[110] The difference between creating embryos that are at first intended to develop into human beings, through *in vitro* fertilization (IVF), is held to be morally different from creating embryos with the intention of harvesting them for stem cells. There are embryos created for the purpose of becoming children and embryos created for the purpose of research only,[111] and some understand this as morally significant. We can imagine a position where it is permissible to use embryos created for the former but not the latter. Indeed, this is the view expressed in the recent changes to the Canadian policy on funding stem cell

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[110]A. Suarez, "Hydatidiform Moles and Teratomas Confirm the Human Identity of the Preimplantation Embryo," *Journal of Medicine and Philosophy* (1990): 627- 635. D. S. Davis, "Embryos Created for Research *Purposes" Kennedy Institute of Ethics Journal* 5(1990): 343-354; J. A. Robertson, "Ethics and Policy in Embryonic Stem Cell Research," *Kennedy Institute of Ethics Journal* 9(1999): 109-136.

research involving the destruction and creation of human embryos. Stem cells from experiments involving embryos created for research purposes only will not be funded, although those already existing from fertility clinics, where both gamete donors have consented to the donations, will be eligible for funding.[112]

Another controversial source of hES cells is the human cloned embryo. Such cloning is referred to as "research cloning" or "therapeutic cloning." It is controversial for a number of reasons. The most prevalent concern is that of a slippery slope. Should cloning for cells be allowed, it would lead to cloning for reproductive purposes and cloning for reproductive purposes is held by some to be both intrinsically and instrumentally wrong.

Debate exists as to whether the stem cells themselves have moral status, if they ought to be considered as a special kind of tissue, or if they are simply the moral equivalent of a clump of human cells. Here the idea of natural development is relevant, where "natural" means development without human intervention. Are stem cells to be considered naturally like an embryo, or are they to be

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[112]See CIHR Guidelines for Stem Cell Research and Funding. On-line at: < http://www.cihr-irsc.gc.ca/e/1487.html > Access date March 2005.

considered contrived, where contrived means that there needs to be an intervention in order for the embryo to exist, such as the case in cloning? This distinction needs to be made or else we seem to commit ourselves to the idea that every human cell is a potential human being.[113]

Lastly, there is a concern regarding the morality of stem cells and germ-line DNA modification. Undifferentiated hES stem cell lines dividing in vivo for indefinite periods of time provide the best practical opportunities for germ-line DNA modification. The greatest moral concern here is eugenics.[114]

To clone a child is to determine the genetic makeup of that child. Determining the genetic makeup of a child is thought to be morally identical to or, at least, the first step on the road to, the determination of the child's genetic endowment. Embryonic stem cell (hES) technology combined with cloning invites eugenic concern because of

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[113]Lee Silver, "Cloning, Ethics, and Religion," *Cambridge Quarterly of Healthcare Ethics* 7(1998): 168-172.

[114]Eugenics is a term that was coined by William Galton at the end of the nineteenth century in Europe. An influential eugenics movement arose in the United States in the 20th century. It led to the forced sterilization of criminals and people with low IQs and traits that were considered undesirable, like being a person of colour.

the question of what the desirable traits will be thought to be.

Genetic alteration in combination with cloning raises more concerns. There have been very few successes with genetic therapies in human and other animals. There is no success in human germ-line engineering, and but a few successes and more failures in somatic cell engineering. Further, as practices in agricultural cloning have demonstrated, we need to be cautious about eliminating specific genes or diseases when we do not know the full biological story of these genes and diseases. One problem is that we might risk failing to adequately account for complex relationships between disease and health; for example, in Africa and India, it is believed that sickle cell anemia offers protection against malaria.[115]

III. a. Observations of the Ethics of Stem Cell Research

Stem cell research and therapy has the potential for enormous health benefits to humans, and indirectly will eliminate a lot of the motivation for the exploitation of

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[115]See "Sickle Cell Anemia," at *Medline's Medical Encyclopedia*: On-line at: <http://www.nlm.nih.gov/medlineplus/sicklecellanemia.html > Access date March 2005.

non-human animals for research. It would, in addition, end the need for vulnerable human populations, like the poor and prisoners, to be used as organ sources. But there is no way around the use of embryonic and fetal stem cells in the initial stages of stem cell research. Thus so many different kinds of lives have the potential to be helped or at least protected from harm, but the cost of this is a great deal of ova, embryo, and fetal tissue experimentation and whatever harm to vulnerable human beings, and general social implications, that might issue from this use.

IV. A Critical Elaboration of the Objections Concerning the Destructive Use of Embryos and Fetuses

The destruction of embryos and fetuses is regarded by just about everyone in the popular media and in the research world as the virtually the only pressing ethical issue in stem cell technology. It is widely held that, if there were a way around the destruction of embryos, that is, some technological fix that would allow an early embryo not to have to go through the totipotent stage, all ethical issues, or at least the most pressing and controversial

ones, would dissolve.[116] In this section I will offer a critical evaluation of the prevailing objections to stem cell research which come from the belief that to destroy an embryo or fetus is, under almost all circumstances, morally wrong, because of the inherent value of the embryo or fetus. If it is correct that the only significant moral issues in stem cell technology come from embryo and fetus destruction, then there would seem to be no philosophically viable moral position against stem cell technology. I shall end this chapter, however, by arguing that, even if the anti-destruction position can be successfully defeated, and I believe that it can, there remain serious, distinct, ethical issues to be addressed in the stem cell debate.

IV. a. Destructive hES Research

Exclusive attention to hES and hEG cells in the moral debate over stem cell technology is due to a perceived similarity between the stem cell debate and the abortion debate. John Harris writes that the heart of human

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[116]For example, in a public radio discussion of the main ethical issues in biotechnology, researcher Dr. Gregory Stock and Dr. Leon Kass, Chairman of President Bush's Council on Bioethics make such claims. On-line at: < http://www.npr.org/features/feature.php?wfId=1476660 > Access date March 2005.

biotechnology, and hence the ethical debate over human biotechnology, is the embryo.[117] [118] Wherever the embryo has been discussed, there have been significant controversy over its moral standing and what constitute legitimate reasons for putting embryos at risk.

The issue of the destruction of embryos and fetuses already dominates debate about some forms of birth control, reproductive technology, research and practice, prenatal genetic screening and, of course, abortion.

IV. a. i. Arguments that Life Begins at Conception

The most popular objection to hES research extends from a religious or other moral view claiming that human life begins at early embryo development and that intentionally

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[117]John Harris, *Clones, Genes, and Immortality* (Oxford: Oxford University Press, 1998), 43.

[118]The development of IVF technology in the 1970's by Edwards, Steptoe, and Purdy, and the subsequent birth of Louise Brown (the first child conceived *in vitro*) sparked the interest in and provided the condition of the possibility for study of live developing human embryos. The development of IVF technology in the 1978 by Edwards, Steptoe and Purdy, and the subsequent birth of Louise Brown (the first child conceived *in vitro*) sparked the interest in and provided the condition of the possibility for study of live developing human embryos. For a good account read: Jennifer Gunning and Veronica English, *Human In-Vitro Fertilization: A Case Study in the Regulation of Medical Innovation* (London: Ashgate, 1993). Because of how IVF works, more fertilized eggs would be created than would be needed for implantation.

destroying an embryo is the moral equivalent of murdering a born fetus, that is, an infant, and this is understood to be the equivalent of murdering an innocent adult person. Prenatal human life is seen to have the same moral status as postnatal human life. Reasons articulated in support of the position that an early embryo is morally equivalent to an adult person are: 1) The moment of conception because it is the tiniest of humans;[119] 2) the moment it has a unique human DNA because it is uniquely a human individual;[120] and 3) at either of these times because it will develop to possess morally relevant features like sentience, rationality, or the ability to empathize, and thus it has potential to be a human being just like one whose moral

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[119]This is like the animalcule view, with the little person in the sperm. The rhetorical assertion that to dismantle early embryos for hES cells is "using little embryonic boys and girls, little children, as experimental material" Judie Brown, spokesperson for American Life League, as cited in CNN.com Health Column, "Subcommittee Hears Testimony on Stem Cell Research," (September 14, 2000). On-line at: <http://www.cnn.com/2000/HEALTH/09/14/stemcell.hearing/>. Access date March 2005. "[Defending the non-destruction of embryos is] the earliest possible protection of the weakest link in the chain of human species." (Dominique Folshied, "The Status of the Embryo from a Christian Perspective," *Studies in Christian Ethics* 9 (1996): 1-21, 21.

[120] "[I]t possesses a double set of chromosomes [diploid human genome] and the capacity to commence cell-division and start embryonic development oriented towards the making of a child." Sutton, 58. R. G. White, "Testimony before the National Institutes of Health Human Embryo Research Panel," (June 21, 1994) reprinted in *America* (September 14, 1996); H. Watt, *Journal of Medical Ethics 22* (1996): 222-226.

status is not in question.[121] Just as the intentional, unjustified killing of an adult human being or a child is murder,[122]analogously when the intentional killing an embryo is unjustified it is murder.[123] But while the entity is a (potential) biological human being, it still needs to be shown that its destruction in hES research and therapy is unjustified.

To be sure, the implicit claim in this view against embryo destruction is that all intentional killing of embryos is unjustified. (Potential) human life is regarded as inherently or intrinsically valuable. And if an embryo is morally regarded as holding such dignity it cannot be destroyed even in the most serious circumstances. Perhaps the only justification for killing it would be cases of self-defense.

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[121]"[I]t has all of the dispositions for later realizations within itself: it is a potential marked by an identity on a genetic basis and by continuity both temporally and substantially." Maureen Junker-Kenny, "The Moral Status of the Embryo," in Maureen Junker-Kenny and Lisa Sowle Cahill, eds., *The Ethics of Genetic Engineering* (London: Concilium Press, 1998): 43-53, 48.

[122]Conceptually, murder is an intentional and morally wrong killing.

[123]"[I]t is wrong to kill humans, however, poor, weak, defenseless, and lacking in opportunity to develop their potential they may be. It is therefore morally wrong to kill Biafrans. Similarly it is morally wrong to kill embryos." (John Noonan, "Deciding who is Human," *Natural Law Forum* 13 (1968): 134.)

It is usually taken as the simplest of self-evident propositions that human lives (or potential human lives) are more valuable than, for example, those of cats or cabbages. Take for example an assertion that has the force of argument in a representative sample of the literature on this topic:

> The human embryo is decidedly different from any other type of tissue, or that of animal or plant. This difference includes the potential that human embryonic tissue has to become a human being [in its relevantly moral sense, ed.]. It is true that other tissues have the potential to become, for example, trees or dogs, but it is generally accepted that a human being is of greater importance than a tree.[124]

It is true that most believe that humans are more important than trees. It is true that most would not think that it is wrong to experiment on live non-human animal embryos *just* because they are non-human. And it is true that most would think that it is wrong to experiment on human embryos *just* because they are human. But the facts that: 1) a human embryo is not a non-human embryo; and, 2) that many think it is not immoral to experiment on non-human embryos, does not conclusively make the case against experimenting on human embryos. It needs to be shown what humans have that

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[124]Kathleen Ganss Gibson and Joe Massey, "Ethical Considerations in the Multiplication of Embryos," in James Humber and Robert Almeda, eds. *Reproduction, Technology, and Rights* (Totowa, NJ: Humana Press, 1996): 55-74, 63.

non-humans do not which gives the former moral status over the latter.

The answer to this is that human beings are persons and embryos and fetuses are thus persons too or potential persons. But no non-human entity is a person. And this claim is one that cannot be taken for granted. Further, if one regards 'person' as something other than another word for 'biologically human,' it is not obvious that prenatal human beings are persons.[125] A case has to be made for this. And before such a baptism, the kinds of characteristics a being has to have in order to count as a person have to be determined. Yet such characteristics are always contentious. Moreover, even if a paradigmatic case of personhood were put forward as a way to determine the characteristics of what a person is, early prenatal human life would not be a good candidate.[126]

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[125]Prenatal human beings certainly would not count as persons on many philosophical definitions. See for example, Harry Frankfurt, "Freedom of the Will and the Concept of a Person," *Journal of Philosophy* (1968): 5-20.

[126]Joan Callahan and James Knight," Women, Fetuses, Medicine, and the Law," in Helen Bequaert Holmes and Laura Purdy, eds. *Feminist Perspectives in Medical Ethics* (Bloomington: Indiana University Press, 1992): 224-239, 225.

IV. a. ii. Potential Persons

Another line of reasoning would have it that embryos or fetuses are perhaps not persons yet, but that they have the potential to be persons. And as such they ought to be considered as having the same moral status as persons. People who hold this view try to justify it by the fact that all human persons were once embryos, that part of life-story of a human person is that it was once an embryo. But this only goes to show that all human beings were once human embryos. For this argument, what gives moral status is personhood and whatever gives an entity personhood needs to be addressed.

Further, if one wants to appeal to the fact that all embryos have potential to develop into adult human beings to make the case for embryos having moral personhood, one faces a logical problem. It is true that all human beings and all human persons were once early embryos, but not all early embryos will be human persons or human beings. The early embryo is distinct from any other clump of cells because of its potential to become a human being. But at least one condition of realizing this potential is that the early embryo is in a woman's womb. Further, "for every

successful pregnancy that results in a live birth many, perhaps as many as five early embryos will be lost."[127]

We can certainly reject this reasoning to support the claim that embryos have the same moral status as human beings because of their potential to become human persons. Because a high percentage of them do not become human beings we cannot base potentiality on that basis. Further, many other things and events are relevant to the potential of an embryo to become an infant. For example, even if an embryo has the biological potential to become an infant, this potential cannot be realized without its gestating in a woman's womb. Thus there is more to potentially being an infant than genetics and cell division.

Clearly, in-vivo early embryos do not meet the potentiality criterion and neither do pre-implantation embryos in a woman's womb. Moreover, if the criterion is broadened to include something-else-that-has-to-happen-to-the-embryo-in-order-for-its-potential-person-hood-to-be-perhaps-realized, then egg and sperm themselves have this

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[127]John Harris, "Ethics of the Embryo," *The New Humanist* 116 (2001): On-line at: http://www.newhumanist.org.uk/volume116issue1_more.php?id=123_0_18_0_C >Access date March 2005.

same kind of property,[128] and SCNT (somatic cell nuclear transfer) allows this same status for any cell in the human body. Left on its own, the *ex utero* embryo will die. Thus even though there is a stronger case for this argument to be used with respect to developing embryos and fetuses that are in a woman's womb, it does not make the case for embryos that exist outside of wombs.

This is not to say that if something needs something else for its survival, if it is not fully self-sufficient, then in some ontological way is not morally autonomous or does not have moral value or is not a person. Human beings as such are never self-sufficient in the sense that they do not produce within themselves the means for their own development and survival. It is to recognize that, in order

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[128]"To say that the egg and sperm cannot by themselves become human, but only if bound together, does not seem to differentiate them from the early embryo which by itself will not become human either, unless it is implanted." Mary Warnock quoted in John Harris, *Clones, Genes, and Immortality* (Oxford. Oxford University Press, 1998), 12. To say that a fertilized egg is potentially a human being [i.e. person] is just to say that if certain things happen to it (like implantation) and certain other things do not (like spontaneous abortion), it will eventually become a human being [i.e. person]. But the same is also true of unfertilized egg and sperm. If certain things happen to an egg (like meeting a sperm) and certain things happen to a sperm (like meeting an egg) and thereafter certain things do not happen to it (like meeting a contraceptive), then they may eventually become human beings." (John Harris, *The Value of Life: An Introduction to Medical Ethics* (London/New York: Routledge, 1985), 11-12.)

to flourish, one (anyone) must be provided with the right conditions by others.

IV. a. iii. Human Rights Argument

Another argument for the position that embryos have the same moral standing as adult human persons draws upon the idea of human rights. It is held that an embryo is a person or potential person (where "person" here is taken to be the equivalent of a human being) and as such is entitled to basic human rights. Among these rights are those not to be killed intentionally for no reason, not to be tortured, and not to be the subject of risky medical research without one's consent.[129] To be sure, there is no way that the appropriate consent could be obtained (ever) from the subject of research in this case. With fetuses, children, and those for whom autonomy conditions do not obtain, another principle along the following lines is often appealed to: "The risk to a subject…should be outweighed by a related non-pecuniary benefit to the subject. Any medical risk, for example, should be outweighed by the probability

[129]The Nuremberg Code, the Belmont Report, and the Declaration of Helsinki deal with the ethics of using human subjects in research.

and degree of a therapeutic advantage."[130] Those who support this view with regard to human embryos thereby oppose any experimentation on the embryo where the harm to the individual embryo itself would outweigh potential benefits.[131] This principle obviously implies that it is morally wrong to conduct human research where it is a sure outcome that the subject will die. Even if such research were to promote the well being of many others, the individual subject as a human being with basic moral rights cannot be sacrificed for the (potential) good of the whole. But again, the view that an embryo or fetus is a person and thus a subject with human rights needs to be defended independently of the kinds of claims it could morally and legally make as a person or whatever.

IV. b. Stem Cells from Dead Fetuses

Fetal tissue as a source of stem cells is unlike the tissue from embryos because it is already available after

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[130]I take this paradigmatic example from B. M. Dickens, ed. *Guidelines on the Use of Human Subjects* (Toronto: Office of Research Administration, 1979), 37.

[131]Nancy L. Jones, "Human Cloning Embryo Style: Deliverance or Captivity," Dignity (November 28, 2001). On-line at The Center for Bioethics and Human Dignity Internet site: http://www.cbhd.org/resources/cloning/jones_2001-11-28.htm > Access date March 2005.

spontaneous or induced abortion. Embryonic tissue must be cultivated: either an embryo has to be destroyed or, as in the case of therapeutic cloning, an embryo is created and then destroyed. Thus the derivation of hEG cells in a way unlike hES cells does not cause the death of the fetus, while the derivation of hES cells causes the death of the early embryo.

IV. b. i. Ethical Issues

There is concern that some women will become pregnant with the goal of destroying their fetuses for hEG cells. In this case the derivation of hEG cells would cause the death of a fetus. As with the objection to the destruction of embryos for stem cells, the use of fetal tissue is regarded by almost everyone to be controversial, because "[e]thical objections to the use of human fetal tissues center around the issue of elective abortion."[132]

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[132]Patricia Schrock, "Fetal Tissue Transplantation," (Winter 1997), On-line at < http://www.muhealth.org/~shrp/radsci/fetal/fetal1.html > Access date March 2005. p 2 of 12. C. Strong, "Fetal Tissue Transplantation: Can It Be Morally Insulated From Abortion?" *Journal of Medical Ethics 17* (1991): 70-76.

That there would be more abortions if hEG cells from elective abortions were publicly accepted is an empirical claim. Further, if this would happen it would mean that the pregnancy would be initiated only to terminate the fetus for stem cells. There are cases where children have been conceived in order to be donors for an already existing individual, usually a sibling.[133] While there is some controversy about this kind of conception, it is pointed out, usually by the parents, that the new child is not only valued as a means to an end but for his or her own sake as well. Thus the conception in this kind of case could be morally acceptable insofar as its human outcome is valued also intrinsically and not only instrumentally. But in the case of deriving hEG cells from the fetus, the pregnancy would never result in the birth of child.

It is more complex in similar cases where a fertile couple goes through an IVF procedure (artificial stimulation of ova, surgical extraction of ova, in-vitro-fertilization) and the subsequent fertilized eggs are tested to see if one would be a suitable tissue donor for

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[133]N. Alby, "The Child Conceived to Give Life," *Bone Marrow Transplant* 9 (Supplement One): S95-S96; G.S. Schaison, "The Child Conceived to Give Life: The Point of View of a Hematologist," *Bone Marrow Transplant* 9 (Supplement One): 93-94.

another existing individual. The concern regards the intention behind the creation of embryos and the basis of the selection of the embryos that will (be attempted to) be brought to term and those that will be destroyed or cyro-preserved. The original intention of this diagnostic procedure was to assist those who faced a high risk of conceiving children with terrible genetic diseases, like Tay-Sacks and CF, in bringing healthy embryos to term. Thus there is precedent and argumentation for the idea that at least in some cases it may be desirable and morally justifiable to conceive for needed tissue and for some instrumentally valued purpose. Although again once the child was born one would assume that as an individual it would be valued for itself and not only because it was free of some terrible disease.

While there are examples of selecting embryos for certain traits and of valuing the embryo or fetus for instrumental reasons, there would need to be a stronger reason to be worried that women would get pregnant only to abort the fetus for cells. In the US there are approximately one and one half million elective abortions

yearly.[134] Because of this number, people like John Robertson think it is safe to assert:

> there is no strong basis for the claim that ES cell research using primordial germ cells would cause many women faced with unwanted pregnancy to have abortions that would not otherwise have occurred simply because of the chance to donate fetal tissue for research.[135]

It is believed that there is already a sufficient supply of fetal material to meet the demands for stem-cell research and therapy.[136] Thus, Robertson and others think that there is no reasonable basis for thinking that the goal of donating fetal material would cause an abortion to come about. Therefore, neither the derivation of, nor the later use of, fetal material from abortions, that would have otherwise occurred, would make one morally complicit in abortion.

This argument holds so long as hEG cells from any fetus are regarded as equally efficacious. Since it is factually true that any fetal tissue has the same chance of

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[134]Number cited in Robert E. Hurdy," Ethical Issues Surrounding the Transplantation of Human Fetal Tissue," *Clinical Research* (December 1992), 661. Robertson puts the number closer to a million: John Robertson, "Ethics and Policy in Embryonic Stem Cell Research," *Kennedy Institute of Ethics Journal* 9 (1999): 109-136, 114.

[135]Ibid.

[136]In addition to its being a good source, that is, there is little risk of tissue anoxia because (legal) abortion procedures take place in a medical setting.

being a source of stem cells (in the sense that would work equally well with most any recipient), then there is no reason to be worried that women would have abortions only to provide stem cells. But should it be perceived (or misperceived) that it was markedly better to recruit and use as a stem cell donor one who was the most genetically similar to the patient needing the therapy, then such a worry is not excluded. Of course, with this consideration we are evaluating practices on the basis of what people might mistakenly think.[137]

If one understands "being complicit with" to mean that an act is causally complicit with another, then retrieving stem cells from fetal material will be complicit with abortion when a fetus is created only for the purpose of destroying it for stem cells. The cases where such complicity would be an issue would be where: 1) a pregnancy was early enough for it to be legally terminated and also for it to be a good source of hEG cells (that is in the span of the first trimester); and, 2) the woman would not

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[137]It is empirically true that desperate people will take on great odds when the life of a loved one, especially a child, is at stake. This holds also when the normalcy of a child is at stake. (See esp. literature regarding surgery and therapy decisions by parents for inter-sexed children)

have thought of terminating the pregnancy for any other reason. Such cases will be rare. First, it is recognized that hES cells are potentially more efficacious than hEG cells. If it is held that hEG cells from a genetic sibling would be better than any other hEG stem cells, it would stand that the best source would be cells derived from a conceptus that has the identical genotype. This would be a conceptus derived from somatic cell nuclear transfer (or what is sometimes referred to as "therapeutic cloning") or parthenogenesis, assuming that these technologies would work.[138] In this scenario, with all things being equal, such as cost and availability of technology, the hES cells would be the best option medically and probably psychologically. If one is willing to initiate a pregnancy only to terminate it for stem cells, one would think that one would be willing to initiate an *in vitro* fertilization procedure and perhaps somatic cell nuclear transfer.

But the moral debate about fetal tissue as a source of stem cells does not fully dissolve into the debate on

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[138]In another technique, similar to somatic cell nuclear transfer, a-nucleated eggs are given a haploid nucleus from a donor to make an "artificial egg" and a fertilization attempt could then be made with donor sperm. This technique is being experimented with at the Weille Medical College at Cornell University.

therapeutic cloning even if hES cells are a better source. The remaining issue centers on the notion of complicity.

IV. b. ii. Complicity and Arguments from Analogy

As I have just argued, under a causative theory of complicity those who think that induced abortion is immoral could support the use of fetal tissue to derive hEG cells in circumstances where the abortion would have otherwise occurred. In this section I will discuss a number of analogies that have been offered by people writing in the field that try to clarify the issue of whether there is a morally culpable sense in which people could be said to be complicit in a morally reprehensible way when they support the use of certain by-products. In this section I will be considering kinds of complicity which do not involve causing extra abortions to be performed.

John Robertson introduces an analogy with homicide victims. The reasoning in our present case, he suggests, is just like that which allows us to support the use of transplant organs from a homicide victim without morally

condoning the homicide.[139] But presumably those victims from whom the organs would be taken would have already consented to donate their organs. And consent is a relevant issue to many who oppose the use of fetal tissue for stem cells. Thus Robertson's analogy does not address important aspects of the objection. Mahowald, Silver, and Ratcheson suggest that we look at the US nuclear attack on Hiroshima and Nagasaki as an example of this.[140] While many consider this bombing immoral, they argue that probably no one would deny the permissibility of using the information on radiation exposure to humans that was obtained by studying the victims of this attack.[141] According to this view, the (supposed) immorality of a by-product can be distinguished from the morality of its use in research. That is, it should be understood that one is not complicit with the action simply if one can derive benefit from it.

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[139]John Robertson, "Ethics and Policy in Embryonic Stem Cell Research," *Kennedy Institute of Ethics Journal* 9 (1999): 109-136, 114.

[140]The fact that the best of bioethics theorists deal with this issue by arguing from analogy has been the subject of at least one substantial journal article. See: L. Gillam, "Arguing By Analogy in the Fetal Tissue Debate," *Bioethics* 11(5): 397-412.

[141]Mary Mahowald, Jerry Silver, and Robert Ratcheson, " The Ethical Options in Transplanting Fetal Tissue," *Hastings Center Report* (February 1987): 9-15, 14.

Other people deny the analogies just mentioned and think that the complicity of researchers, surgeons, subjects of research and patients is more like that of those who use organs from dead prisoners who have not given their consent for their remains to be donated for research or transplantation.[142] One assumes that the relevant difference is taken to be one of consent. The subject whose bodily remains are used has not consented to having his remains used. Without consent, it is morally wrong to use his body parts. But such an argument presupposes that the fetus is in principle, because it could never in practice, be something whose will should be respected, that is, that the fetus is a person. And that the fetus should be regarded as a person is far from obvious. Even if a fetus would be regarded such, as in cases with children who cannot consent to being organ donors, their parents may serve in the role as proxy. And in the case of fetal material, the mother's consent would count as proxy consent.

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[142]Jon Geiser, "Ethics and Human Fetal Retinal Pigment Epithelium Transplantation," *Archives of Opthamology* 119 (June 2001): 4. See also: P. McCullagh, *The Foetus as Transplant Donor: Scientific, Social and Ethical Perspectives* (New York, NY: John Wiley and Sons, 1987); P. Ramsey, *The Ethics of Fetal Research* (New Haven, Conn: Yale University Press, 1975).

While some claim that a pregnant woman gives up any parental rights over the fetus when she decides to abort it, this is not obvious. There are assumptions about the personhood of women, and the fetuses that live in women's bodies, that must be dealt with. Further, there are metaphysical issues to address concerning what and who a person is and how a person's identity is determined.

James T. Burtchaell, however, thinks that another analogy is more appropriate. According to him, the researchers and physicians who use fetal material from abortions are like a banker who launders funds from illegal drug transactions.[143] While the drug deals have already taken place between other people at other places and times, we would want to say that a banker who launders these funds is complicit in the drug trade.

This analogy is unsound however, if only because laundering money is illegal and thus anyone who so acts is liable to the charge of acting wrongly in that he or she breaks the law. Should it be determined that using fetal material in research and therapy is an illegal practice

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[143]James T. Burtchaell, "Statement of James T. Burtchaell," *Report of the Advisory Committee to the Director, NIH, Human Fetal Tissue Transplantation Research* (December 14, 1988), C24.

then there would be an analogy to this extent. However this would speak only to the legality issue which is quite distinct from moral evaluation.

However, there is one way in which the legality of an issue can be relevant to our moral evaluation of that issue. It has to be acknowledged that it is difficult, and perhaps even hazardous to one's life or that of others, to act against the law, even if one is justified in believing that the law is immoral. One need only think of doing so in some non-democratic country to imagine the potential danger I am referring to. Analyzing this point then leads us to another issue, which is beyond the scope of the present discussion, namely: How much ought we to be expected to sacrifice our morality?

Nevertheless, returning to Burtchaell's analogy, without the money laundering there is no great profit incentive in the drug business. Assuming that profit is the end at which drug lords and dealers aim, the laundering of the money is a necessary condition toward this end, regardless of who does the laundering. However, the activity of those who utilize fetal material is not a necessary condition of the decision to abort since as I

have argued: 1) the decision has already been made; and 2) there are enough dead fetuses already.

Bonnie Steinbock considers the appropriateness of another pair of analogies.[144] First, suppose everyone would agree that factory farming practices are immoral because of the pain and suffering caused to the animals, and yet some would still think that eating the meat of animals who were raised and slaughtered on a factory farm is acceptable because the animals are dead anyway. Maybe moral complicity between those who use and benefit from fetal material from abortions is complicit in the same sort of way. People say that doctors and researchers who use material from aborted fetuses are just making use of what is already dead anyway and thus they themselves cannot be held morally accountable for abortion since the fetuses were not killed by their hands or as a result of their influence.[145]

Steinbock herself dismisses this factory farm analogy because, as in the money laundering case, there is a relationship of dependence between the two actors. Factory

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[144]Bonnie Steinbock, *Life Before Birth: The Moral and Legal Status of Embryos and Fetuses* (Oxford: Oxford University Press, 1996), 181.

[145]A note on "one's own hand". Policies are in place in the US and Canada that prohibits the physician who performs abortions from having interests in fetal tissue research.

farming exists because there is a market, a demand, for its products; and if there were no market, there would be few (if any) factory farms.[146] And so, like the money laundering analogy, the analogy between using fetal tissue and eating meat from factory-farmed animals fails because abortion would exist regardless of a market for fetal material.

To 'be complicit with' may have a broader meaning than the causal interpretation would have it. It rings false for thinkers like Steinbock that only those directly involved in a practice should be considered complicit with it. The analogy she thinks solves the complicity puzzle is the following.[147]

Consider again that everyone would agree that factory-farming practices are immoral. The purpose of these practices is to meet a demand for animal flesh to eat. But there are extra animal bits that are available as by-products of slaughter for flesh, for example, animal skins that can be made into shoes and clothes. Here is the question: Is it inconsistent to hold that eating meat is

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[146]I am allowing for the existence of poor business practices and that there is not a strict symmetry in the world between supply and demand even though it exists in theory.

[147]Bonnie Steinbock, Life *Before Birth: The Moral and Legal Status of Embryos and Fetuses* (Oxford: Oxford University Press, 1996), 181-182.

wrong because of the immorality of factory farming practices and yet hold that wearing leather shoes made from these same animals is a morally distinct issue? Steinbock thinks it might be. She thinks that the reasoning demonstrated here represents the complicity involved in the fetal tissue issue. And she leaves the question at that.

I propose that we ought to step away from what seems to be taken for granted for the sake of argument in this chapter, namely, that abortion is morally problematic and that the question of complicity is whether fetal tissue research is in some way or other morally complicit with abortion. Consider as representative of the previous discussion the last scenario that Steinbock entertains. It is analogous to the complicity involved with the use of fetal tissue *only if* one thinks of an abortion as a moral wrong. If we do not think it is wrong, or if we think it is not always or necessarily wrong, the analogy leaves us in the same place we were at the beginning: namely, there is no sense in which one is complicit in a morally egregious way. I will return to this point at the end of the critical presentations of the analogies, of which there is one remaining.

IV. b. ii. 1. The Nazi Analogy

The most controversial analogy made in the moral complicity debate refers to the Nazi physicians.[148] Fetal tissue research is considered analogous to the Nazi physicians' use of children and adults for medical experimentation, which caused those subject to the experimentation great suffering and death. That Nazi analogies are ubiquitously popular is due to the universal condemnation of the Nazi regime in general and to the Nazi physician experiments on concentration-camp inmates in particular. If there has ever been an example of something unquestionably morally reprehensible, repugnant or deserving to be called 'evil', it is widely held that it is this. Thinkers like George Annas and Sherman Elias think that most complicity arguments in bioethics are "primarily emotional appeal[s]

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[148]For argumentation regarding the moral complicity involved with the use of data obtained from the Nazi doctors' experiments on concentration camp victims see: Henry K. Beecher, "Ethics and Clinical Research, "*The New England Journal of Medicine* 274 (June 16, 1966): 1354-1360; Kristine Moe, "Should the Nazi Research Data be Cited?" *Hastings Center Report* 14 (December 1984); Willard Gaylin, "Nazi Data: Dissociation from Evil," *Hastings Center Report* 19(July/August 1989): 16; Arthur L. Caplan, ed., *When Medicine Went Mad: Bioethics and the Holocaust* (Totowa, N.J.: Humana Press, 1992).

based on the analogy to Nazi experimentation."[149] It is probably true that most people do think of Nazi doctors, when they consider complicity in contexts of immoral practices by medical researchers. But it is difficult to know how one could ever tell that all complicity arguments, which are not explicitly based on the Nazi analogy, are nevertheless implicitly based on it. Perhaps the point we ought to take from Annas and Elias is that at least some analogies that are meant to show complicity are intended to operate by eliciting feelings of disgust and repugnance.

I think that this does account for the effectiveness of the kinds of analogies that are used in stem cell debate. But I would caution that this strategy could backfire. If analogies to Nazi doctors are powerful for no other reason than that these doctors' actions are popularly understood to be the most evil in human history and they thereby elicit repugnance, the analogy might well fail because the heinous events that took place were uniquely horrifying. There never has been anything quite like the Nazi treatment of Jews in Western memory. Should any

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[149]George Annas and Sherman Elias, "Sounding Board: The Politics of Transplantation of Human Fetal Material," *New England Journal of Medicine* 320 (April 20, 1989): 1081.

analogy be made to these events, they may cease to affect us in the way that they should. This may not simply have the result of forcing people who use analogies to find new rhetorical tools, it may well cause a kind of real moral damage. The damage could be that the overuse or misuse of these analogies may make it difficult for humans to see what is truly evil or to have a proper moral response to evil.

People describe the moral wrongs done by Nazi doctors in the following ways: 1) those who were subjects of the research were forced to be so against their will; 2) the experiments were the moral equivalent of torture; and, 3) the subjects were usually experimented on or tortured to death. (Indeed, how much one's body could endure, e.g. freezing cold temperatures or blows to the skull, before one died were among the experiments to which the prisoners were subjected.) The prisoners were at best the moral equivalents of laboratory animals. Treating a person "like an animal" means (in this context) that he or she was objectified so that his or her recognized worth was only that of a diagnostic indicator: the persons literally held only instrumental value.

In contemporary language we would say that the subjects' basic human rights were violated. The acts committed on the prisoners represent their captors' complete denial of their personhood; that is, as people they have the moral right to decide for themselves what is to be done to them, and thus they are acknowledged as autonomous. The first article of the Nuremberg Code regarding the treatment of human subjects of research, that followed the prosecution of the Nazi doctors, states that it is morally wrong for experiments to be conducted on a person without his or her informed consent.[150] The recognition of a subject as a person is to recognize his or her autonomy with regard to decisions concerning, among other things, his or her own body and ultimately physical life. This is indicated by his or her consent (or lack of consent) to be the subject of a medical experiment.

The same critical comments arise here as those regarding the analogy to using tissues from dead prisoners (or any other persons for that matter) where there is no consent to do this. To make such an analogy there is an

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[150]"The Nuremberg Code," from *Trials of War Criminals before the Nuremberg Military Tribunals under Control Council Law No. 10.* Nuremberg, October 1946-April 1949. Washington, D.C.: U.S. G.P.O, 1949-1953.

assumption that the fetus is in principle something whose will should be respected, that is, in effect a person. And that the fetus should be regarded as a person is far from obvious.

IV. b. iii. Conclusion on Complicity

If one takes the complicity to mean "directly bring about one particular act of abortion," then the answer to the question of complicity seems to be "no;" if one did not decide to abort or to induce an abortion or even to coerce an abortion only for the reason of obtaining fetal material. And the answer is obviously "yes" if one made a decision to abort, became pregnant in order to abort, induced an abortion or forced someone to have abortion only for the reason of recruiting fetal material.

If one regards complicity as "causally complicit with," then to maintain that support of the use of fetal material does not make one complicit with abortion will require one to say that the two events are not related in any morally relevant way. How the material is procured, so long as it is legal, is a separate and different act than using the material for some research or therapy.

In this way, the specter of abortion is removed from the issue of fetal tissue transplant, so that those who are morally against abortion have no reason to object to it on those grounds. Indeed, in the standard argumentation regarding fetal tissue use, which has been described in this chapter, there is no consideration of a position that supports abortion but is opposed to the use of fetal material from abortions. The standard argumentation is interested to make the connection between abortion and fetal tissue use, where abortion is understood as morally wrong, and so if fetal tissue use were complicit with abortion it would be morally wrong too. The other publicly available position counters this view by showing that one can be against abortion and nevertheless not oppose the use of aborted fetal remains. The price of this is to hold that the two acts are distinct from one another. As distinct acts, they are executed with distinct intentions. Insofar as there is no intention to induce an abortion only in order to procure hEG cells, they are not the same acts. Each may be morally evaluated according to its own intention.

IV. b. iv. Counter Argument

Dennis Turner and Warren Kearney advocate another strategy to argue against the complicity position. They argue that it is wrong not to use fetal tissue from elective abortion.[151] They point to the wastage of tissue when it is discarded and to the fact that this fetal tissue can provide, directly or indirectly, therapeutic benefits to suffering people. According to Turner and Kearney, fetal tissue is "too valuable not to use in research or a therapeutic setting because of the large number of persons suffering from various neuro-degenerative conditions."[152] This position does not necessarily deny that abortion is wrong or that fetuses may have some kind of interests that need to be protected. It is a position which balances the needs of each individual, the person suffering who could use fetal tissue transplantation, the mother who wants to have an abortion, the suffering of the fetus, etc.[153]

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[151]Dennis Turner and Warren Kearney, "Scientific and Ethical Concerns in Neural Fetal Tissue Transplantation," *Neurosurgery* (December 1993): 1031- 1037, 1034.
[152]Ibid.
[153]Jon Geiser, "Ethics and Human Fetal Retinal Pigment Epithelium Transplantation," *Archives of Opthamology* 119 (June 2001): 4; S. Maynard-Moody, *The Dilemma of the Fetus: Fetal Research, Medical Progress and Moral Politics* (New York: St. Martin's Press, 1995).

This kind of utilitarian argument is often put forward for using leftover embryos from fertility treatments as stem cell sources. As they exist, and as they would be destroyed anyway, it is wrong not to use them in research and potential therapy that promises to ease the suffering of so many.

This argument is ruthlessly efficient. If the issue were simply one of a process having a by-product that would be of great benefit to all, there would little to no moral debate. The significance of fetal tissue as a by-product of a process is that it is human tissue. And, as I will later consider, it has a great potential financial value in some quarters as well.

V. Conclusion

In Chapter Two I begin to set up the argument that there are important connections between the abortion controversy and the stem cell controversy. Through a critical analysis of the arguments against embryo destruction and the use of fetal material from abortions I have maintained that no arguments based the intrinsic value of the embryo or fetus are convincing. But I have left it open as to whether I

think that these arguments motivated by anti-abortion concerns exhaust the ethical debate over the source of human stem cells and whether there is a point to referring to the ethics of abortion in the attempt to determine the morality of stem cell research and therapy.

In the next chapter I will argue that there are important affinities as well as dissonances between the ethics of stem cell research and abortion. It is important to get a proper understanding of the ethical issues in abortion in order to understand what I argue to be the most substantive ethical issues in the stem cell debate, namely the potential for the exploitation of women and the products of their reproductive labour, i.e. human embryos.

CHAPTER FOUR: EMBRYONIC STEM CELL RESEARCH AND ABORTION

I. Introduction

The concern of this chapter is the question of the relationship between arguments over the morality of abortion and destructive embryonic stem cell research. In the last chapter the arguments against destructive embryonic research, on the basis of the embryo having full moral status, were addressed and found to be unconvincing. But it was also affirmed that there are parallels between the abortion debate and that over the embryonic stem cell research. In this chapter I will argue that there is a proper relationship between the stem cell debate and the abortion debate. If we understand this relationship, we will come to understand how one can maintain a consistent position that is unquestionably pro-choice while questioning the morality of destructive embryo and fetal stem cell research and therapy.

II. The Abortion Debate and the Stem Cell Debate: Strange Bedfellows? [154]

Early in the debates over embryonic stem cell research, during the US Senate Hearings on human cloning in 2001, something novel appeared, namely, a policy alliance between pro-life and pro-choice advocates, all of whom morally opposed destructive embryo research and embryo cloning. This alliance became a media event and was reported as something impossible and unnatural: "Strange Bedfellows" was the unfortunate popular headline.[155] From the articles

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[154]This seems to be in evidence with reports like the following. Nigel Cameron and Lori Andrews, "Cloning and the Debate on Abortion," *Chicago Tribune* (August 8, 2001), 17. Reprinted with permission at Chritianity.Com: <http://www.christianity.com/partner/Article_Display_Page/0,,PTID1000%7CCHID10%7CCIID1184532,00.html> Access date March 2005. "Most striking of all was testimony from Judy Norsigian of the Boston Women's Health Book Collective (current editor of the benchmark feminist text Our Bodies, Ourselves). To describe her as pro-choice would be akin to describing the pope as Roman Catholic. Yet she, too, spoke, in her case vehemently, against all cloning."

[155]Hugh Downs, "There is a Clone in Your Future," ABC News Online < http://www.catholic.net/rcc/Periodicals/Faith/11-12-98/Morality3.html > Access date March 2005; Ted Olsen, "Tempering Expectations for 'Ultimate Stem Cell," *Christianity Today*(January 25, 2002): <http://www.christianitytoday.com/ct/2002/102/51.0.html > Access date: March 2005; Kristen Philipkoski, "Cloning Makes Strange Bedfellows," *Wired Magazine* (March 25, 2002): <http://www.wired.com/news/medtech/0,1286,51247,00.html> Access date March 2005; David Ridenour,, "Cloning Politics Makes for Strange Bedfellows," *National Policy Analysis* (May 1999): <http://www.nationalcenter.org/NPA196.html> Access date March 2005; Wesley J. Smith. "Strange Clonefellows: The left-right anti-cloning coalition," *The Weekly Standard* 7(February 11, 2002): <http://www.weeklystandard.com/Content/Public/Articles/000/000/00

and reports, the newsworthy event did not seem to be the alliance itself but rather the fact that feminists admitted it was wrong to kill a human embryo. From the tenor of most commentators, one got the impression that the policy convergence on this matter showed that the feminists who advocated an anti-human cloning stance had forfeited their pro-choice positions on abortion; or if they had not, that they were hypocrites. Here is one such report:

> Most striking of all was testimony from Judy Norsigian of the Boston Women's Health Book Collective (current editor of the benchmark feminist text _Our Bodies, Ourselves_). To describe her as pro-choice would be akin to describing the pope as Roman Catholic. Yet she, too, spoke, in her case vehemently, against all cloning."[156]

There is an explanation of why it would have seemed to be strange and newsworthy that there should be an alliance between the two sides over embryo destruction.

In the standard debate over abortion, what bioethicists refer to as 'abortion politics,' two sides emerge. There is

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0/869vvfqt.asp > Access date March 2005; Dean Snyder. "United Methodist joins other leaders to protest human cloning " (November 27, 2002); Sheryl Gay Stolberg, "Some for Abortion Rights Lean Right in Cloning Fight," *The New York Times* (January 24, 2002); Rick Weiss. "In Senate, Findings Intensify Arguments on Human Cloning," *The Washington Post* (January 25, 2002), A08; Richard Willing, "Odd Mix of Activists Stands Together," *USA Today* (July 16, 2001).

[156]Nigel Cameron and Lori Andrews, "Cloning and the Debate on Abortion," *Chicago Tribune* (August 8, 2001), 17.

the pro-life position defending the absolute value of the embryo or fetus over any decision of the pregnant woman to abort it. To terminate the life of an embryo or fetus is the moral equivalent of pre-meditated murder of a completely defenseless innocent. And there is the pro-choice position which defends a woman's autonomy and her right to control her body and to decide whether she wants to be pregnant or not. The value defended is usually portrayed as the value of having property rights over one's body, or having absolute integrity of the body so that any non-consensual interference with it is a gross violation of personal freedom and autonomy. If a woman is forced to carry a fetus to term when she would rather terminate the pregnancy, this is like subjecting her to invasive, nine-month long, medical experiments against her will, a nine-month torture.

There is an assumption in this debate: that the morality of abortion turns on the question of whether the moral status of the developing embryo or fetus is absolute or whether it has no value at all.

If the fetus is a person this is sufficient to establish the wrongness of abortion. One of the pioneering voices in the bioethical debate over abortion, construed in

this way, is John Noonan. If a fetus has full rights, he argues, it is not possible to defend the permissibility of abortion.[157] Therefore, the debate over the morality of abortion just is the debate over the moral status of the fetus. From the time of the publication of Noonan's seminal article, "An Almost Absolute Value in Human History,"[158] until today, the standard presentation of the abortion debate in applied ethics textbooks starts with this article (or one making the same assumptions regarding the debate). This way of dealing with the morality of abortion is standard. Any pro-choice argument must meet its challenge. And any article about the morality of abortion that does not weigh in on this issue is regarded as eccentric.

Pro-choice positions tend to see the task of affirming a woman's right to terminate her pregnancy if she wants to as synonymous with refuting the Noonan-type anti-abortion argument. That is, these pro-choice advocates accept the terms of the abortion debate as established by anti-abortion advocates: if a developing embryo or fetus can be shown to have full or absolute value then the moral

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[157]John T. Noonan, Jr., "An Almost Absolute Value in History," in John T. Noonan, Jr., ed., *The Morality of Abortion: Legal and Historical Perspectives* (Cambridge, MA: Harvard University Press, 1970), 46-50.
[158]Ibid.

permissibility of abortion is difficult if not impossible to maintain. Consequently, pro-choicers argue that the developing embryo or fetus has no significant value;[159] or that it lacks value at the early stages of pregnancy but become valuable in later development.[160]

Insofar as the concern over stem cell research is seen to depend on the determination of the moral status of the embryo or fetus, this debate seems like a variation on the theme of the moral debate over abortion. It is easy to see the affinities. Should the embryo or fetus be determined to be an innocent person, it is wrong to kill it. Thus abortion may be considered murder, and so may the destruction of embryos. And there is an argument that may be developed from these assumptions for not mining aborted fetuses for stem cells. Since there is no way for this (unborn) person to consent to have its tissue used, it ought not to be used.

On the other hand, if the embryo or fetus has the moral status of any clump of cells in the human body and

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[159]For example: Michael Tooley, "Abortion and Infanticide," *Philosophy and Public Affairs* 2 (1972): 37-65. Mary Anne Warren, "On the Moral and Legal Status of Abortion," *The Monist* 57 (1973): 43-61.

[160]For example: L. Wayne Sumner, *Abortion and Moral Theory* (Princeton: University Press, 1981).

has no moral value in itself, then there is no intrinsic wrong in having it extracted from a woman's body or using the tissue for research purposes.

When the question of the morality of abortion is taken to be an answer to question of whether the embryo or fetus has absolute value, and two sides emerge, pro and con, one can understand the perplexity that some feminist responses to the embryonic stem cell debate caused.

III. Parallels between the Abortion Debate and the Stem Cell Debate

There are a number of bioethicists who have been concerned with the perceived and real relationship between the ethics of abortion and stem cell research, especially insofar as this relationship extends to pubic policy concerning stem cell research.[161] Robert Wachbroit in particular addresses the legacy of the abortion debate in moral disagreements over stem cell research. Both Wachbroit and I agree that one part of this legacy, namely the claim that the crucial moral issue in the stem cell research, like abortion, is

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[161]Suzanne Holland et al., eds., *The Human Embryonic Stem Cell Debate: Science, Ethics, and Public Policy* (Cambridge, Massachusetts: MIT Press, 2001); Robert Wachbroit, "Stem Cell Research and the Legacy of Abortion," in *Genetic Prospects: Essays on Biotechnology, Ethics and Pubic Policy*, ed. Verna Gehring (Oxford: Rowman and Littlefield, 2003), 75-84.

the moral status of the embryo, is misleading. He claims that the analogy drawn between the two debates is inaccurate and even false. In the end, he concludes that we should not depend on any arguments from the abortion debate in order to determine the significant moral issues in stem cell research. I, on the other hand, hold that there are compelling analogies between the two debates and that some arguments in the abortion debate are relevant to the significant moral issues in stem cell research. But these analogies are valid only if we give up the assumption that the morality of abortion, and therefore of stem cell research, hangs on the question of whether the embryo has moral personhood, answered either in the affirmative or the negative. I believe that once the moral issues in abortion are properly understood we will also understand what is morally significant in the stem cell debate. In addition, we will see how it is that women can be harmed by stem cell research and therapy.

Before I analyze and evaluate Wachbroit's position, let us remember an analogy between the two debates that was discussed in the last chapter; namely, that abortion and stem cell research are both morally wrong because an embryo or fetus is a moral patient with full (or potentially full)

moral standing, that is, it is morally considerable as a person. And it is innocent. Thus it is intrinsically wrong to kill it. Moreover, to value it just as a source of cells is to value it only instrumentally. And as it is morally unacceptable to treat a person as a means only, so too is it morally unacceptable to treat an aborted fetus or an embryo as a means only.

My criticism is that this construal of the analogy considers only one side of each of the abortion and stem cell debates. That is, while those against abortion and against stem cell research may use similar arguments, one of the most important arguments in support of abortion concern a woman's right to terminate her pregnancy. And this justification does not seem to be relevant to the proposal that it is not morally wrong to use embryos and aborted fetuses in stem cell research and therapy. In addition, the analogy between the ethics of the two issues will necessarily be incomplete as long as only one side is being taken into account.

To be sure, one justification for a woman's right to terminate her pregnancy is that the embryo or fetus has no inherent value, therefore no moral harm is done to it if one deliberately destroys it. In this way we might seem to

have both sides of the stem cell debate, for and against, covered by the arguments for and against abortion. Because the embryo or fetus has no intrinsic moral value using its remains for medical research and therapy is not morally wrong, nor is killing it. So the analogy between the issues and arguments of the two debates will be complete.

However, if we assume that the significant moral question in the abortion debate is not simply that of whether the embryo or fetus is a moral person, but rather we see the abortion debate as a dilemma involving the competing rights of an embryo or fetus and a pregnant woman, two points will emerge. First, we represent the abortion debate in fairer terms, which is a good thing to do if one is interested in the truth and/or women's rights. Second, we will see that the moral debate over stem cell research and abortion are not parallel.

Wachbroit reminds us that in abortion a pregnancy, an event in a woman's body, is terminated. By contrast, in embryonic stem cell research, an embryo, not inside a woman's body but developing in a petri dish, is destroyed. We should not see the latter as parallel to the abortion debate because there are no autonomy issues regarding women's rights over their own bodies to consider. There is

no challenge to a woman's authority over her body in stem cell research.[162] So the location of the growing embryo is relevant to the claim that stem cell research should not be seen through the lens of the abortion debate.

According to Wachbroit, the location of the growing embryo is central to understanding why the two debates are not like each other. And this point is key to the claim that the difference between destructive embryonic research and the abortion debates is that only the latter involves a conflict with the autonomy rights of the rights of women. But it also leads to another reason why the two debates ought not to be considered analogous.

Another argument for the anti-choice position is that once a pregnancy has begun, it is wrong to interfere with the embryo's natural process of growth. But the fact that a developing embryo is in a petri dish and not in a woman's body shifts the ontology of the embryo from being a potential human being to that of being a possible human being.[163] The petri dish embryo, left on its own, will "go nowhere"[164], it is impossible for it to become a baby without serious technological intervention; whereas a

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[162] Ibid., 78.
[163] Ibid., 77.
[164] Ibid.

developing embryo in a woman's body has the potential to turn into a baby. In embryonic stem cell research, there is no natural process to interfere with. Left on its own the petri embryo will wither and die. But in abortion there is interference in a natural process, a pregnancy in a woman's body.

Wachbroit's argument against there being a parallel between the two debates seems to move us away from the idea that it is important to consider the question of whether the embryo or fetus has intrinsic value. It construes the abortion debate as a conflict between the following propositions. First, it is a woman's right to control her body. Second, it is wrong to interfere with a natural process once it has started. Since it seems that neither of these propositions is relevant in the stem cell debate, one's abortion views do not necessarily determine one's views on fetal/embryonic stem cell research and therapy.

Wachbroit makes a further point to support the idea that the supposed intrinsic value of embryos plays no part in the ethics of stem cell research. He observes that almost all of the embryos under consideration to become stem cells are surplus embryos from IVF. For him, "[t]he

current tolerance of IVF would make no sense if the moral status of the embryo were crucial."[165]

III a. Criticism of Wachbroit's View

Wachbroit's strategy is not only to show that there is one side of the abortion debate that has no parallel in the stem cell debate, namely the right of a woman to make her own reproductive choices. Thus he does not merely claim that the analogy between the two debates is misleading because it is incomplete. He makes the stronger claim that there are *no* parallels between the ethics of abortion and stem cell research. He is able to do so by reinterpreting what is at issue for pro-life advocates in abortion. Instead of a concern for the intrinsic value of the embryo, he sees the main pro-life position as underpinned by the assumption that any interference in the natural process of pregnancy is wrong. One sees the point of this strategy. He wants to persuade us that the essential difference in the two debates is the location of the embryo in question: either in a woman's womb or outside of a woman's womb. Arguments used by pro-life abortion advocates are thus irrelevant to the ethics of destructive *ex utero* embryonic

[165]Ibid., 79.

stem cell research since there is no natural process of pregnancy that risks being interfered with. Analogously, arguments used by pro-choice advocates are also irrelevant since there are no women's autonomy issues in *ex utero* destructive embryo research. But what is his purpose in including the observation that extra embryos from IVF are the main source of embryonic stem cell research in his case? One may infer that the reason is pragmatic. This case makes it possible for those who are against abortion to be able to support destructive embryo research. It provides an argument for a popular position; namely, that while abortion may be considered immoral, and most destructive embryo research may be considered immoral, it may nevertheless be considered not immoral to use extra embryos from IVF for destructive embryonic stem cell research.

That one can interpret Wachbroit's position in this way is not in itself a reason for regarding his view as problematic, although I think it is revealing. However, there are two problems that I do find in his view. The first problem is with his suggestion that the pro-life position is underpinned by the principle that to interfere in a pregnancy is wrong, and that consequently one need not refer to the moral value of the fetus. Second, I will argue

against Wachbroit that it is wrong in principle to separate issues of women's autonomy and agency from the products of their reproductive labour, for example, their embryos.

Wachbroit thinks the pro-life abortion position is one that is best understood as being based on the principle that it is wrong to interfere with the embryo's natural process of growing once it has begun. He maintains that the moral personhood of the embryo is not or should not be the basis of the pro-life position. Regardless of whether his claim is normative--that is, he thinks the pro-life position would be better served by this principle-- or descriptive—that is, he thinks this is what the people who hold the pro-life position actually believe -- it nevertheless remains the case that the absolute value of the fetus must still be accepted for Wachbroit's interference principle itself to make sense.

The general principle that it is wrong in itself to interfere in a natural process cannot reasonably be maintained. Consider for example, the *telos* of a human cancer. If we are able to stop the growth of this cancer, we ought to do it. Here we have an example of a natural thing whose growth we should interfere with on the grounds that its nature would result in the suffering and perhaps

the death of a human being. Therefore the anti-abortion position cannot be framed by the principle that it is inherently wrong to interfere with the natural growth of something. What is most relevant in the anti-abortion position is not that there is a *telos* unfolding in pregnancy and a *telos* as such cannot be interfered with. Rather, it is the particular end goal of this process that is morally relevant, namely, a human baby. Thus the normative force comes from what the moral status of the successful endpoint of a pregnancy is held to be. Because a baby has uncontroversial intrinsic value and there is a developmental process that a baby has to grow through, it can be held that the moral status of any developing embryo or fetus rests with its potential to become a being with intrinsic value. It is the absolute moral status of the baby, growing fetus, and embryo that makes the potential terminal interference in pregnancy impermissible, not simply the fact that it is a process that has its own end.

The second problem with Wachbroit's position emerges when one reflects on his observations on IVF. Before I offer my own positive position as an alternative to his view, I will critically evaluate his comments on IVF.

Wachbroit assumes that since IVF is more or less universally accepted then so too are all of the processes and products that emerge with this technology. But this has to be false. The technology of IVF is relevant to the stem cell debate because it is the surplus embryos from this procedure that has enabled stem cell research to get started and to continue. However, just because IVF technology seems to be accepted does not mean that it ought to be or that everything associated with the technology is morally acceptable. Perhaps we now wish that we had done some things diferently since the technology first started to be effective thirty years ago. In addition, it is generally held that the acceptability of creating embryos in IVF depends on the fact that the intention behind it is the creation of a child.[166] And if this is granted then it might be thought that these extra embryos are babies waiting to be born, not leftover tissue from a previous and altogether different surgical procedure.

We must not assume that embryos in petri dishes are givens, just things that we bump into in the world. In the context of IVF, for example, how the embryos came to be in

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[166]George Annas and Sherman Elias, "The Politics of Human Embryo Research: Avoiding ethical gridlock," *New England Journal of Medicine* 554 (1996): 1329-1332, 1331.

the first place ought to be considered relevant to the stem cell debate. And if we consider where these embryos come from, the rights of women may not seem as irrelevant to the moral debate over destructive embryo research as thinkers like Wachbroit assume them to be. Embryos that lie in petri dishes are created by human beings through a considerable amount of technological intervention, and it is important that this involves the agency and bodies of women.

II. b. Women's Involvement in Stem Cell Line Development

A woman's involvement in EG and ES stem cell research and therapy includes both her volitional and biological labour. In addition, the tissues that are used come from her body, and to a lesser extent, the body of the biological father. These may be thought of as products of her reproductive labour, which is both biological and volitional.

Most hES research and therapy is conducted using non-cloned embryos in petri dishes. These embryos are leftover embryos from IVF therapy. Because of the way IVF works, there are more fertilized eggs *in vitro* than would be needed by one potential gestating mother at one time. Because of the existence of embryo freezing techniques and

the difficulties of freezing ova, embryos that are not immediately needed for treatment are frozen. Although it is unclear exactly how many embryos are in frozen storage, the continual reference to them as 'excess', 'spare', and 'left over' embryos that 'would be destroyed anyway' suggests that they are abundant. At last report, there are over 400,000 in the US.

Women's involvement in hEs research is thus similar to their involvement in IVF. There are both psychological and physical risks that a woman undergoes in IVF. During the initial stage of IVF women are given high doses of a hormone called FSH, follicle-stimulating hormone.[167] Later, more hormones are induced into the woman's system in order to encourage implantation. No long-term research has been conducted to determine the extent of all the risks involved, and hormone treatments associated with other procedures have proven dangerous to women in the past.

There is evidence of a link between the use of these hormones and the development of cancer in women who have

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[167]W. Gifford-Jones, "Several Approaches to Deal with Infertility," *The Financial Post* (June 6/8, 1998), R14.

undergone the IVF process.[168] Ovarian cancer has a multifactor etiology (many contributing causes not just one) and is the most fatal gynecologic disease. Researchers have observed an increased risk of disease in women who never become pregnant.[169] The increased risk with infertility was suggested to be due to the use of fertility drugs.[170] This claim is yet unresolved because of contrary evidence suggested by other studies.[171]

In addition to health risks, there are psychological traumas women and their partners may suffer due to IVF treatment. Instead of dealing with not being able to bear children and exploring other options, IVF offers what seems to be the only hope. The actual percentage of successful births resulting from IVF is low. The average success rate for both Canada and the United States is approximately 20

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[168]E. Bartholet, "Adoption Rights and Reproductive Wrongs," in *Power and Decision: The Social Control of Reproduction* (Cambridge, MA.: Harvard University Press), 194.

[169]H. A. Risch, et al., "Parity, Contraception, Infertility, and the Risk of Epithelial Ovarian Cancer," *American Journal of Epidemiology* 140(1994): 585-97.

[170]A. S. Whittemore, et al., (Collaborative Ovarian Cancer Group) "Characteristics Relating to Ovarian Cancer Risk: Collaborative analysis of 12 US case-control studies. II. Invasive epithelial ovarian cancers in white women," *Journal of Epidemiology* 136(1992): 1184-1203.

[171]For example see: B. J. Mosgaard, et al., "Infertility, Fertility Drugs, and Invasive Ovarian Cancer: A case-control study," *Fertility and Sterility* 67(1997): 1005-12. No association was found between the use of fertility drugs and ovarian cancer in this study.

percent. For women between the ages of 21 and 34, this number rises to about 25 percent. However, for those women over the age of 47, the rate falls dramatically. Almost all women undergoing IVF go through multiple treatments before pregnancy occurs, if it ever does. For these women, the sense of inadequacy and loss that makes the medical route so appealing in the first place is re-enforced with each failure. However, it is not possible to deal with this sense of loss and suffering if the woman still desires to "undo the loss." And here lies one of the major issues with IVF: there is no logical stopping point. Failure does not provide any reason to believe that success will not occur with the next attempt.[172]

In hEG research and therapy, cells from the gonadal ridge of aborted fetuses are used. Thus women are involved with hEG stem cell lines in a similar way to their involvement in abortion decisions and abortion. This includes a number of bodily, social, and personal changes involved in early pregnancy, the decision to have an

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[172]E. Bertholet, "Adoption Rights and Reproductive Wrongs," in G. Sen et al., eds., *Power and Decision: The Social Control of Reproduction* (Cambridge, Mass.: Harvard University Press, 1994), 193.

abortion, the abortion surgery, and the decision to donate the fetus remains for research.

III. c. Conclusion

One can agree with Wachbroit that the proposition that a woman has a right to terminate her pregnancy is not only justified by showing that the embryo or fetus has no absolute value. It is perhaps better to look at the abortion debate in terms of a dilemma: that between a woman's right to terminate her pregnancy and an embryo or fetus's right to life. In this way at least one sees two sides to the debate. However, there are other arguments to support a woman's right to abort.

The focus on the possible harm stem cell research and therapy may cause women necessitates a reexamination of women centered arguments supporting the permissibility of abortion. I believe it is difficult to understand what specific harms to women are involved in stem cell research without them, as we have seen in positions like Wachbroit's. In important ways the abortion debate and stem cell debates echo each other. And it is necessary to rightly understand the ethics of abortion if we want to

rightly understand the ethics of destructive embryo stem cell research.

IV. Women Centered Views of the Ethics of Abortion

We need to be reminded that the view that abortion should be permitted on the grounds that woman has a right to control her pregnancy does not do not exhaust woman-centered positions on abortion. Nor does it completely capture the normative force of a position that is representative of women's experience in pregnancy, abortion, and childbirth. This defense of abortion rights "does not meet the needs, interests, and intuitions of many of the women concerned . . . a [better] ethics demands that moral discussions of abortion be more broadly defined than they have been in most philosophic discussions."[173] For example, while almost all women-centered positions are pro-choice, not all feminists think that pregnancy should be avoided or that there is no authentic personal value to being pregnant.

Women's voices in the abortion debate initiate three important discussions. First, feminist scholarship broadens

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[173]Susan Sherwin, "Abortion through a Feminist Ethics Lens," *Dialogue 30*(1991): 327-42, 327.

the ethics of abortion to include normative evaluations of pregnancy and motherhood and the social contexts of motherhood and childhood. Second, it provides a criticism of the language of rights in debating the issue of abortion. And third, it is concerned to draw out the implications of taking the rights of fetuses more seriously than born humans, in particular, those of pregnant woman.[174] I will characterize the pro-life position in this way: embryos have their own interests from the time of conception or fertilization or very soon after this. To protect these interests, the language of rights is used. Thus embryos have rights and fetuses have rights where the minimal right is the right to life. The pro-choice advocate may recognize the existence of embryo or fetus interests. Accordingly, the abortion debate is construed as one where the interests and rights of the embryo or fetus and the interests and rights of the woman conflict and that one set of interests or rights is held to prevail over the other. For the pro-choice advocate who holds that a fetus has no

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[174]This characterization of the feminist contribution is offered by Jennifer Mather Saul, "Abortion," in *Feminism: Issues and Arguments* (Oxford: Oxford University Press, 2003), 110-1.

interests and hence no need of rights, the debate will not be one that involves a conflict of interests.

But to frame the debate in terms of conflicting rights is deficient for a number of reasons. First, because philosophy has dealt with moral rights in terms of the rights and obligations of separate individuals it may be ill-equipped to deal with the phenomenon of pregnancy where there is a relationship of profound intimacy between the developing embryo or fetus and the woman who gestates it.[175] One has another inside of oneself that is gestating, and whose very life depends on one's body and actions. There are many situations where moral obligation is best described in terms of rights. But feminist thinkers believe that pregnancy is perhaps alone in not being one of them. As Mary Ann Warren writes, "[p]regnancy is not just one of innumerable situations in which the rights of one individual come into conflict with those of another; it is probably the only case [my italics] in which the legal personhood of one human being is necessarily incompatible with that of another."[176]

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[175]Margaret Olivia Little, "Abortion, Intimacy, and the Duty to Gestate," *Ethical Theory and Moral Practice 2* (1999): 295-312.
[176]Mary Ann Warren, "The Moral Significance of Birth," in Helen Bequaert Holmes and Laura M. Purdy, eds. *Feminist Perspectives in*

Let us suppose that there is something inherently wrong in reducing the abortion debate to one of competing individual interests. The lives of embryos and fetuses are irreducibly bound, and related, to the lives of the women who gestate them. Therefore, when embryonic or fetal interests are referred to in either pro-life or pro-choice rights- discourse, it is not an interest in life or right to life per se that they could metaphorically or actually be said to have but rather an interest or right in being in a gestating womb, that is, in a woman's body. The developing embryo or fetus' mere existence, as well as its capacity/potential to be independently valuable, is completely dependent on the body and agency of a woman.

We should consider that it is better to think about abortion starting from the experiences and perspectives of pregnant women. Given that the life of the gestating fetus depends utterly and totally on exactly one woman's body, it grows in her and depends on her for sustaining its life, the fetus' life may not be considered to be absolute. Even if a fetus is assumed to have a right to life (it is a member of the human moral community) the pregnant woman may

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Medical Ethics (Bloomington, Indiana: Indiana University Press, 1992), 198-215.

have special rights in relation to it. These could include the right not to gestate it in her body, that is, to terminate the pregnancy that would result in the death of the fetus.

Second, fetuses are not simply happened upon in the world. One does not bump into a fetus unless one bumps into a pregnant woman. In standard pro-life positions, it is enough to show that a fetus has a right to life to establish the immorality of abortion. But to maintain a fetus' life does not only mean that one does not kill it, as in not aborting it, it means that it has to be in the body of another person who has to sustain it for a number of months. To gestate a fetus requires considerable emotional and psychological investments and potentially large sacrifices on the part of the woman who gestates it. And it is not that the gestating woman is a fetal container or a mother machine, one whose value to the pregnancy is to keep the fetus growing.[177] (This view reminds one of

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[177]Mary Mahowald argues that this view constitutes the fallacy of considering an object as if it exists without a context. As women's bodies are not acknowledged as belonging to female subjects and agents, then women's being in the discussion is that of mute matter. But as the life of a developing embryo or fetus cannot be divorced from the life a pregnant woman, a consideration of the former can never take place in the absence of consideration of the latter. (Mary B. Mahowald, "Fetal Tissue

Aristotle's view of women as flowerpots. According to him, women were passive vessels meant to take and gestate a man's seed, like a flowerpot. It was the man's seed that contained the important inheritable traits.[178]) In a pregnancy, the woman herself experiences the growing of the fetus in her body. And this relationship requires a high degree of intimacy for a number of months.

For a foetus, to be alive is to be occupying someone else's body, to be using it, to be living in a particular physical relationship with another. Even assuming fetal personhood, that is, we have here a person in extraordinary physical enmeshment with another— a person whose blood is oxygenated by another, a person whose hormonal activity affects that other's brain and metabolism, a person whose

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Transplantation and Women," in *The Beginning of Human Life,* eds., Fritz K. Beller and Robert F. Weir (Dordrecht, The Netherlands: Kluwer Academic Publishers, 1994), 225-32.)

[178]For a discussion of the flowerpot view see: Carolyn Whitbeck. Theories of Sex Difference," *The Philosophical Forum 5* (Fall Winter 1973-4): 540-80; Lynda Lange, "Women is not a Rational Animal: On Aristotle's Biology of Reproduction," in *Discovering Reality: Feminist Perspectives on Epistemology, Metaphysics, Methodology and Philosophy of Science,* eds., S. Harding and M. B. Hintikka (Dordrecht: Holland, 1983); Nancy Tuana, "The Weaker Seed: The Sexist Bias of Reproductive Theory," *Hypatia* 3 (Spring 1988): 35-60.

growing physical size enlarges another's physical boundaries.[179]

Third, philosophers point out that even if one has a right to life that cashes out into a right not to be killed, a right to life that involves the intimate support of another is an obligation beyond this right. The abortion decision is better not thought of as a conflict of rights between two separate individuals, but rather, a question of whether the pregnant women's pregnancy is a voluntary or involuntary intimacy. In this way, the moral harm in not allowing a woman to have an abortion if she wants it is that she would be in a situation of forced intimacy and no one should be forced into unwilling intimacy.

In abortion, women are harmed when their autonomy is not respected with regard to their reproductive capacities, and if their agency is not recognized in their pregnancy.

IV a. Tensions Revealed

There is a philosophical tension over what it is to be a human person that is brought out in the discussion of the morality of abortion through the lens of women's

[179]Margaret Olivia Little, Abortion, Intimacy, and the Duty to Gestate," *Ethical Theory and Moral Practice* 2 (1999): 295-312, 296.

experience. It is the tension between a person's volitional capacity and her bodily existence. On the one hand, pregnancy involves a number of decisions made by the pregnant woman. The embryo or fetus may flourish more or less or die as a result of the pregnant woman's decisions, i.e. her agency. There is thus volitional work in pregnancy. On the other hand, pregnancy involves biological processes over which the pregnant woman has no control. Philosophically, we regard biological processes as being ontologically and morally distinct from volitional processes; we can be held morally responsible for the latter but not the former. But the morality of abortion when looked at from women's perspective reveals that what is done naturally, that is, biologically, may be falsely distinguished from what is done volitionally. While the concept and philosophical implications of embodied agency needs to be worked out to general philosophical satisfaction it will not become the subject of argument or speculation in this dissertation.[180] My claim here is only

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[180]One such attempt is: Margaret Urban Walker, *Moral Understandings: A Feminist Study in Ethics* (New York: Routledge, 1998). She notes the tension in the two projects of woman-centered ethics and describes it as a conflict between need to improve the lot of the oppressed (justice issue) as well as the interest to mine women's experiences for an understanding of a

that viewing the ethics of abortion through a women-centered lens puts into focus the tensions involved in embodied agency and the need to address some basic philosophical assumptions about personhood and agency. Furthermore, new ethical debates over a number of biotechnologies are asking us to address the embodied nature of our personhood. And perhaps another way of

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better model of ethics (embodiment). She suggests an alternative moral epistemology, that is, a model of how we can know, justify or understand how one should act. There are three central points to Walker's view. First, she says that we must focus our ethical attention on the concrete and particular. We have to have an acute and unimpeded perception of particular human beings in order to be able to respond to them in a morally adequate way. This requires a certain kind of moral understanding rather than an impersonal view of the good or the right. The kind of moral understanding we need is a narrative that extends over time tracking the individual's life in some way. This requires an understanding of context and an attention to concrete details of a particular person's life. And there is a special context of this understanding: namely, the relationship that one has with the other. The second central point is that the ideas of context and concreteness are linked together in the concept of narrative. The understanding of feelings, states, needs and understanding a person is a story, or an intersection of stories, that has already begun and will extend into the future. Conceptually, this means that we cannot identify a person's feelings and other states except in the "embroidery" of the stories told by and about that person. This suggests that we might view persons metaphysically as relational beings, not autonomous beings. A person is fundamentally a set of relations to other persons. The last main element of Walker's moral epistemology is that communication not judgement is more central to the solution of moral problems. The elements of attention, contextualization, narrative appreciation and communication in moral deliberation provide an alternative to traditional moral epistemology. It offers, against universalism another ideal of moral objectivity, "that of an unimpeded, undistorted and flexible appreciation of unrepeatable individuals in what are often distinctive situations and relationships." (145)

looking at the ethics of abortion may be of assistance when dealing with these new questions. For example, consider the following. Almost all of our somatic cells contain our unique phenotype. And because we have learned how to extract the DNA molecule, sequence the amino acids that make up DNA, and identify unique individual genetic markers for traits and diseases, the ethics of issues that have seemed to be relatively unproblematic, like blood donation, now emerge as questions involving metaphysical positions about personal identity and human nature.[181]

V. Women, Abortion and Stem Cells

There are women's issues that are relevant to the ethics of destructive embryo stem cell research and therapy and the use of fetal stem cells from elective abortion for stem cell research and therapy. The fact that women may be particularly affected by this research is analogous to the harms that they may be subject to in abortion. In either case a woman is wronged if her autonomy and agency is not respected with regard to: 1) her reproductive capacities,

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[181]For example see: the following collections: Verna Gehring, ed., *Genetic Prospects: Essays on Biotechnology, Ethics and Pubic Policy* (Oxford: Rowman and Littlefield, 2003); Robert Weir et al., eds., *Genes and Human Self Knowledge* (Iowa City: University of Iowa Press, 1994).

which include volitional activities; or 2) the products of her reproductive labour, namely, her embryos or the tissue from her dead fetuses. Women are involved in stem cell research because embryo and fetal stem cell lines are made from parts of her body that are subject to her control (e.g. ova stimulation). So she as a female agent must consent to their being used. In the following chapter I will argue that women may be specifically harmed in stem cell research if they are exploited for their embryos and fetal tissues.

CHAPTER FIVE: ETHICAL PROBLEMS REGARDING THE COMMODIFICATION OF WOMEN'S REPRODUCTIVE TISSUES AND CAPACITIES

I. Introduction

The main concerns in recent debate over the ethics of destructive embryo stem cell research derive from the perception of strong overlaps between the ethics of abortion and stem cell research. On the one hand, there is an assumption that destroying an embryo in any circumstance is morally wrong, hence abortion and destructive embryo research is wrong. And on the other hand, there is a perception that should one believe that a woman has a moral right to abort, one has forfeited any consistent argument that would support the claim that there is moral harm in destructive embryo research. In addition to the presentation, analysis, and evaluation of these positions and the arguments that sustain them, I have considered the argument that we ought not to perceive an overlap between the two debates and that there is a consistent position that is morally opposed to abortion while supportive of destructive embryonic research. First, I confronted the arguments that defend the claim of overlap and those that defend the claim of non-overlap, and found them to be

wanting. In addition, I addressed the implications of these arguments: that there is no consistent position that defends a woman's right to abortion while having moral reservations about destructive embryo research. This implication only follows if the experience of pregnant women on the one hand, and a female gamete donor on the other, is not morally relevant. The positions I have criticized are only concerned with the intrinsic value of the embryo and do not recognize the relationship between the embryo or fetus and women's reproductive labour. They do not recognize that the embryo might be morally significant because it can be considered as the bodily tissue of a woman. If these connections are recognized we see that there are parallels between the ethics of abortion and destructive embryo research and that one can have a consistent position that supports a woman's right to an abortion while being morally concerned about destructive embryo research.

In this final chapter, I argue that the potential harm that ought to be recognized in destructive embryo research is the potential exploitation of women and the products of their reproductive labour, i.e. human embryos

and fetal tissue, through the one-sided commodification of women's bodily tissues and reproductive capacities.

II. Moral Concerns about Commodification

"Commodification" refers to the association of a thing or a practice with attitudes and behaviours that accompany typical market transactions.[182] Today there are commercial and non-commercial markets for human blood, sperm, organs, and other body parts. But for reasons that will be examined in this chapter, the idea of there being a market for human embryos and fetal material is repugnant to many. This reaction is supported by a belief that there are certain kinds of things that should never be commodities or be treated like commodities. I will not uphold this kind of argument, however. I will maintain that the harm in the commodification of ova and embryos is that of the exploitation of the woman from whose body such tissue issues.

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[182]Scott Altman, "(Com)modifying experience," *Southern California Law Review* 65 (1991): 293-340, 293. See also: Margaret Raddin, ""Reflections on Objectification," *Southern California Law Review* 65(1991): 341-354 and "Justice and the Market Domain," in Roland Pennock and John Chapman, eds. *Markets and Justice* (New York: New York University Press, 1989): 165-197.

The potential market for human parts, tissues, or capacities has not just arisen in the field of biotechnology. The practice of commodifying human beings in whole or part is not new. The historical and present day existence of slavery is well documented. Human corpses have been used, bought, and sold for medical research and training. And until issues of confidentiality emerged given the technology to extract DNA accurately, easily, and cost-effectively, there had been a relatively non-controversial market for human blood and sperm.

The ethical concerns over commodification in stem cell research and therapy arise over embryos and fetal material. Unlike other kinds of human tissue, it is argued, to commodify these is to lack respect for human dignity or to diminish respect for human life. There are those who object to this commodification and hold that the person to be worried about is the embryo or fetus or the potential person the ovum will turn into. I maintain that the embryo or fetus is not a person and should be understood primarily in relation to the woman whose reproductive labour and body creates and sustains it. The concern about commodification position should extend not to the embryo or fetus, but

rather to the woman. The question that this chapter will consider is the nature of the harm involved in commodifying women's reproductive labour and tissue. I maintain that the harm is in the unjust treatment of women in the commodification process as it is practiced.

Commodification of women in the form of commodifying embryos and fetal remains has the potential to involve a number of morally unacceptable acts, which, according to Scott Altman, could:

> 1) violate a duty of respect for persons by treating the person as a thing that can be sold; (2) alter a person's moral status so that the person becomes a thing without a will; (3) alter the sensibilities of people directly involved in market transactions by causing them to regard each other as objects with prices rather than as persons; and (4) alter the sensibilities of people who learn about or live in a society that permits the sale of persons but who do not participate in such transactions themselves.[183]

Those who worry about the commodification of human tissues and parts worry that this commerialization reduces the value of a human being to use and exchange value. The issue is not a quibble about price, but the worry that putting a price on human bodily materials and capacities gives it a direct equivalent in some other kind of value, e.g.

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[183]Scott Altman, "(Com)modifying experience," *Southern California Law Review* 65 (1991): 293-340, 295-296.

monetary value, such that human beings are implicitly treated as objects or things, not as subjects. Fundamentally, the idea is that if we put a price on some part or process of a human being that this act would be degrading. Following Kant's distinction, there are goods that should be available on the market and those that should not: "everything has either a price or a dignity. Whatever has a price can be replaced by something else as its equivalent; on the other hand, whatever is above all price, and therefore admits of no equivalent, has a dignity."[184] Following this distinction, some believe that there is something disturbing about commodification of the human body and human capacities, for example, those involved in ES and EG stem cell research. Because women are autonomous subjects, and because subjects should not be treated as objects, if a woman's value is only seen in terms of use and exchange value then she is not being respected as a moral agent with autonomy and dignity. In assisted reproductive technologies (ARTs), reproduction is sometimes treated as an activity that can be bought, manipulated and contracted for. Most of the techniques and

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[184]I. Kant, *Groundwork for the Metaphysics of Morals* [1785], paragraph 434.

protocols that have been developed, and the ways in which they are conceptualized and communicated (e.g. wombs as reproductive vehicles, take-home baby rates, fetuses as patients), represent and foster an attitude that women are instruments for reproduction, while embryos, fetuses and children are the products.[185]

The moral objections to the commodification of women's reproductive material echo the most vocal moral objections people have to human cloning, the patenting of organisms or organic processes in whole or in part, surrogacy, and eugenics. In these activities, it is acceptable to treat some human bodies, some body parts, and some non-human living things in the same manner that manufactured objects are treated. The ethos that accepts such commodification risks fostering the view that the value of some living things, like fertile women, is the same as that of laundry detergent and toasters.[186] This objection combines deontological and consequentialist concerns. On the one

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[185]Christine Overall, *Ethics and Human Reproduction: A Feminist Analysis* (Boston: Allen and Unwin, 1987), 149.

[186]Statement of the American Humane Association, on behalf of American Society for the Prevention of Cruelty to Animals, Animal Protection Institute, Committee for Humane Legislation, and Massachusetts Society for the Prevention of Cruelty to Animals: "It troubles us that animal patenting reduces the animal kingdom to the same level as laundry detergent and toasters. Animals are not objects." *TAPRA '89 Hearings*, 288.

hand, there is something inherently valuable about a living thing such that it is wrong to instrumentalize it. On the other hand, there is worry over the kind of cognitive orientation that would allow for such commodification: it may be likely to effect how we treat humans and non-human animals in other contexts.

The view that commodification itself, that is, putting a price on human body parts, tissues and processes, is wrong is not the view that I will defend. I maintain that the harm in commodification is not that commercialization is inherently wrong but that the unjust treatment of the vendors of human tissues is wrong under certain conditions, conditions that make the transactions unjust.

II. a. Commodification and Respect for Persons

The first conclusion to be drawn is that the commodification of women's tissue and reproductive labour is wrong because it violates the deontological ethical principle of respect for persons: a woman is not being properly respected as a human agent if her parts and capacities are commodified. However, there are two ways in

which the disrespect for persons can be cashed out here. In one interpretation of the principle, which John Harris calls the "broad" interpretation,[187] the conclusion to be drawn is that commodification of the things and activities we are interested in is inherently wrong. On the other hand, if the principle is interpreted according to what Harris refers to as the "narrow" interpretation, the commodification in question may well be understood as not immoral. Let us explore this distinction and the conclusions that derive from it.

First, we must be careful to understand the Kantian idea behind the principle of respect for persons: a person must never be treated as a means only but also always as an end in herself. This does not mean that a person can never be treated as means to someone else's end, rather, one must not be treated as a means *only*. If we were obliged to never treat a person as a means to another's end, we would be obliged not to share, nor would we be permitted to ask others for their help. This understanding of the version of Kant's Categorical Imperative helps us to understand the

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[187]John Harris, *Wonderwoman and Superman* (Oxford: Oxford University Press, 1992), 121.

narrow interpretation of the principle of respect for persons.

What are the conditions under which one could be morally treated as a means to another's end? One condition that would guarantee that the treatment is not immoral is that the person who is being treated in this way should agree to the treatment. In the medical or research context, this would mean that a person has given her informed voluntary consent to a procedure or a donation. Accordingly, the person is acting autonomously and thus she is being respected.

To be sure, there have been cases where embryos have been sold for research and implantation without the consent of the women whose bodily tissue and reproductive capacities created them. These actions are not only morally wrong, they are illegal. For example, in 1994, a whistleblower complaint was lodged against the Center for Reproductive Health at the University of California, Irvine. Drs. Ricardo Asch, Jose Balmaceda, and Sergio Stone were accused of selling frozen embryos without the consent of those who had contributed the gametes used to create them. The embryos came from women undergoing fertility

treatments from the late 1980s through the early 1990s and sold to others undergoing fertility treatments and to researchers.[188] It is believed that these sales were extremely lucrative for the physicians.[189] In 1995, following an investigation, the University sued the clinic. That same year patients brought 113 civil law suits against the University.[190] In 1999, a University attorney publicly confirmed that "46 eggs and two embryos were transferred without the donors' consent," adding that there had been "a dozen births to couples using pirated eggs."[191] After the original lawsuits were settled, costing the University nearly $15 million, additional lawsuits were filed, claiming that as many as 500 embryos had been sold.[192]

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[188]Raizel Liebler, "Are You My Parent? Are You My Child? The Role of Genetics and Race in Defining Relationships after Reproductive Technologies Mistakes, *DePaul Journal of Health Care Law* 15(Summer 2002): 15-56; Fertility Clinic Issues: Chronology <http://www.uci.edu/fc/chronology.html> (Accessed November 2004).
[189]Cynthia Sanz, "A Fertility Nightmare," People Weekly 44 (July 24, 1995), 36.
[190]Raizel Liebler, "Are you my parent? Are you my child? The role of genetics and race in defining relationships after reproductive technological mistakes," *DePaul Journal of Health Care Law 5* (Summer, 2002): 15-56.
[191] Ibid.
[192] Ibid.

Although no criminal charges were ever filed against them, the accused doctors fled the country.[193]

So we may claim that the commodification of a woman is wrong if she is treated as a means only, and this occurs when she does not give her consent to the use of her embryos. In this way we can find an instance of the immorality of commodification of reproductive material, but the use of tissue and labour for research would not violate a respect for persons if women give voluntary informed consent to have their embryos used.

According to the narrow interpretation of respect for persons, buying and selling embryos and fetal tissue from abortions is not inherently wrong. It is wrong only if the donor, the woman, has been coerced or in some other way her autonomy, as a rational, voluntary agent has been violated. This would be to treat her as a slave. That embryos and fetal tissues have an exchange value is not at issue.

According to the broad interpretation of the principle of respect for persons, the existence of a market exchange value for reproductive material and labour may be

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[193]Dr. Asch is reportedly practicing reproductive medicine in Mexico, as is Dr. Balmaceda in Chile.

considered inherently wrong. Here the issue of human dignity is not settled if the donor has made a free and informed voluntary choice. Rather, the issue is whether the the donation is the product of human reproductive labour. That human beings are uniquely valuable makes them above all price. And so to treat human capacities and human tissues as things that have a price is to fundamentally disrespect the person who is the source of the embryos and fetal tissues. It would be to regard the donor's body and hence the donor, the human being, as a natural resource, as property, or in Kass's view, as "mere meat."[194] In this view, there are some things that cannot ever be commodified and embryos and fetal tissue from abortion are two such things.

The question that immediately arises is whether the broad interpretation covers all human tissue and uniquely human capacities. As Hoff points out, it is the case that academics sell their mental capacity, athletes sell their physical capacities, and models sell their bodies as 'mannequins'. There is no controversy about these kinds of

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[194]Leon Kass, "'Making Babies'" Revisited," *The Public Interest* 54 (1979): 32-60.

exchanges and uses.[195] But even if we side with Hoff, it is not the case that all human tissues and capacities have to be regarded as the equivalent with respect to this argument. It can be argued that things like embryos, fetal tissues from abortion, sperm and ova, surrogacy, and sex may be considered as inalienable because these tissues and capacity have a connection to sexuality. Since sex is regarded as a private and personal matter, we tend to treat reproductive material differently from other kinds of bodily tissue. Risk and time factors being equal, donating sperm is regarded quite differently than donating blood. While ova, embryo, and fetal tissue donations require invasive procedures, and so may be thought to differ in kind from sperm donation, fetal tissue donation may be comparable to the donation of other bodily tissues after surgery. Yet it is regarded differently. Fetal tissue, embryos, and gametes, etc. seem deserving of different treatment than other human bodily tissues and capacities.

Although I will not look at this argument at length, I offer it as one possible reply to Hoff. I will not rest any

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[195]John Hoff as cited in Ruth Macklin, "What is Wrong with Commodification?" in *New Ways of Making Babies: The Case of Egg Donation,"* ed. Cynthia B. Cohen (Bloomington: Indiana University Press, 1996), 106-121.

of my claims concerning the commodification of women's reproductive material on it. It serves to meet the concern about the possible implausible implications of the general claim that the commodification of human tissue and capacities is inherently wrong because they are human. [196]I think that with the possibility of somatic cell nuclear transfer and effective techniques for determining the phenotype from a person's cells, and thus learning the person's genetic identity, there might be an argument based on privacy that could be extended to the commodification of all human tissue. But this is beyond the scope of the present discussion.

II. a. i. Commodification and Proper Exchanges

Whether we consider the commodification of embryos and fetal tissue as intrinsically wrong or not, we do not have to suppose that this kind of commodification is a necessary outgrowth of the capitalist system. While capitalist

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[196] Indeed, the idea that reproductive tissue is more special compared to other tissue is a double-edged sword for thinkers concerned with ethics and women. The harm to women because of being positively or negatively identified with their reproductive capacities is well-known, for example, often the idea that tissues and activities associated with sexuality are sacred, serves as support for views that do not acknowledge women's sexuality.

societies maintain and foster many types of commercial transactions, it is not the case that no transaction may be prohibited or regulated. For example, in the US and Canada, those of voting age may vote or not as they please, but it is prohibited to sell votes or to vote in a certain way for a price.[197] There are copyright and patent laws to protect individual authorship and design. These laws respect human uniqueness and restrict what other people may do with these singular creations.

In addition, even if one may buy and sell something, it is not the case that this good or service may be treated in any way whatsoever simply because it is subject to exchange. It may be argued that there are some goods and services that are partially but not fully commodified. According to Margaret Jane Radin, there exist "incomplete commodities", which means that their value is not fully transformable into market value. They might be better understood as "contested commodities." These are things like human tissues, capacities, and human reproductive labour which might be thought to have use value and therefore exchange value, *in addition to* other significant

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[197]Richard Arneson, "Commodity and Commercial Surrogacy," *Philosophy and Public Affairs* 21 (1992): 132-164, 133.

values that cannot be captured by use value or exchange value. Other examples would include land, which may be used according to government regulations having to do with public health and local planning, and historical artifacts, which may be subject to regulations involving preservation and viewing access.

II. a. ii. Neither Person nor Property

The idea of there being partial or incomplete commodities would support a third way of thinking of embryos and fetal material. Indeed many writers present this third kind of valuation, regarding them as neither person nor property, but nevertheless as being something that is worthy of a *profound respect*. They see this view as a way of maintaining the practice of regarding the products of women's reproductive capacities as having use and exchange value, while at the same time recognizing that these products are not like other things. They are special and

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one cannot do anything one wants with them, such as buying and selling them.[198]

The claim that there is a third way to value human tissue, as neither person nor property but something in between, is meant to reflect common intuitions about what *ex utero* embryos are. In my opinion this move is suspect. I will briefly explain my reservations.

This intermediary ontological and moral evaluation would seem to cover not only embryos but all of those products and capacities that we have had some concern over because of the highly personal nature of human sexuality; for example, surrogacy and sexual acts. It would seem that such intermediary ground could be occupied by human corpses as well as any other human tissue. We cannot properly

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[198]See: Ronald M. Green, *The Human Embryo Research Debates: Bioethics in the Vortex of Controversy* (New York: Oxford University Press, 2001); Bonnie Steinbeck, *Life Before Birth: The Moral and Legal Status of Embryos and Fetuses* (New York: Oxford University Press, 1996); Paul Lauritzen, "Neither Person Nor Property: Embryo research and the status of the early embryo," *America* (March 26, 2001). On-line at <http://www.americamagazine.org/gettext.cfm?articleTypeID=1&textID=1781&issueID=332> Access date March 2005; Laura Shanner, "Stem Cell Terminology: Practical, Theological and Ethical Implications," *Health Law Review Papers* (September 21, 2001): 62-66. Online at: < http://www.stemcellnetwork.ca/news/leg/index.php> Access date: March 2005; Lawrence Nelson and Michael Meyer, "Respecting What We Destroy: Reflections on Human Embryo Research," *Hastings Center Report* 31 (2001): 16-23.

speaking have obligations to respect the personhood of dead people and human parts because dead people have neither interests to respect nor autonomy that can be recognized and human parts are obviously not persons. Thus there would seem to be no good reason to respect them in the way that we respect agents. However, not to have any respect for them seems intuitively wrong. It is out of respect for the person who once existed that we may not do anything we want to or with human corpses. But my concern is whose personhood are we profoundly respecting when we say that we should have some respect for embryos and fetal tissues? Is the answer that it is the woman whose agency and reproductive body we are respecting, or is it rather the potential personhood of the embryo or fetus? I would argue that it is the woman, but people who advocate the third way seem to want to bow to those who believe that embryos and fetuses have duties owed to them directly in order to reach public consensus about destructive embryonic stem cell research and/or germ stem cell research and therapy. I think that even bowing to this idea is misguided. Moreover, since there already is a way to control what we may do with things we can sell and own - namely, by making and enforcing laws and regulations - it seems unnecessary to

increase our moral universe by including a third kind of entity. Moreover, even if we did want to add this third special thing, it is unclear what specific duties we would have in order to meet the criterion of 'profound respect.'

II. a. iii. Gift Exchange

Another way to take up the idea of contested commodities does not suppose a third kind of value apart from instrumental or intrinsic or another kind of thing besides person or property. Rather, it focuses on the kind of exchanges that are appropriate to the good or service. For example, Margaret Jane Raddin thinks that human tissues may be exchanged but that this exchange should not be thought of or executed in terms of market relations; that is, not in terms of goods and services which are things with prices. Rather, such exchanges should be motivated by altruism and should take the form of a gift exchange. Thus, embryos and fetal tissue, ova and sperm, and sex and surrogacy, may be given to others, but only if the giver does not get paid for it. I will return to the issue of altruism later because it is relevant to understanding my position about what the potential harm to women in stem

cell research is. It is enough for now to say that I believe that seeing this exchange as one that should involve an altruistic gift helps to exploit women.

II. b. Commodification and Justice Concerns

In discussing the kind of value that we ought to recognize in ova, embryos, and fetal tissue a concern for the principle of justice emerges when we ask whether commodification would treat women of different social groups or classes equally.

II. b. i. Indigent Donors

Commercialization of reproductive tissue is bound to have powerful incentive effects that may disproportionately induce poor women to become suppliers. Monetary inducements that are intended to overcome strong personal, religious, and moral convictions are unjust in the sense of being unfair when the disadvantaged are disproportionally induced to supply the commodity.[199] Those most at risk from assisted-conception procedures are poor, migrant, refugee, or ethnic minority women. Research into surrogate

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199 Donna, Dickenson, "Commodification of Human Tissue: Implications for Feminist and Development Ethics." Developing World Bioethics 2 (2002): 55-63.

motherhood has already shown that economically deprived women are more vulnerable than other women to exploitation by this industry.[200] The unfairness demonstrated in the context of surrogate motherhood is likely to apply as strongly in the context of tissue supply for the biotechnology industry.

To be sure, the indigent already fill many undesirable jobs, and being an ova and fetal tissue supplier could be regarded as being just one more example of this. Since it is not normally thought to be wrong that poor people fill undesirable jobs in general, it should not be thought wrong that poor women fill the reproductive-supplier role in particular. This market is distributionally just in the

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[200]See UNESCO, *International Symposium on the Effects on Human Rights of Recent Advances in Science and Technology* (Paris: UNESCO, 1985). See also: Michael Mulkay, *The Embryo Research Debate: Science and the Politics of Reproduction* (Cambridge: Cambridge University Press, 1997); Cheryl L. Meyer, The Wandering Uterus: Politics and the reproductive Rights of Women (New York: University Press, 1997); Janice Raymond, *Women As Wombs: Reproductive Technologies and the Battle over Women's Freedom* (New York: HarperCollins, 1994); R. Rowland, *Living Laboratories* (Bloomingdale: Indiana University Press, 1992): 211-216; R. Koval, "The Commercialization of Reproductive Technology" in *Baby Machine: Reproductive Technology and the Commercialization of Motherhood*, ed. Jocelynne A. Scutt (Australia: Australia in Print, 1988); and Gena Corea, "Women, Class, and Genetic Engineering: The Effect of New Reproductive Technologies on all Women," in *Baby Machine Reproductive Technology and the Commercialization of Motherhood*, ed. Jocelynne A. Scutt (Australia: Australia in Print, 1988); Laura R. Woliver, *The Political Geographies of Pregnancy* (Urbana and Chicago: University of Illinois Press, 2002).

sense that it is not unfair that poor women would be shouldering the greater share of the burden of this needed but psychologically and morally charged commodity.[201] Further, it may be seen as non-exploitative with respect to gender. Women not men are the necessary suppliers and thus the direct financial beneficiaries. Women fare worse in the marketplace, for example, with regard to equal pay for work of equal value. Because women, not men, may earn money as reproductive tissue suppliers this will increase women's income in relation to men's.[202]

These views however fail to take into account the unique nature of the material that is to be supplied. Having an invasive procedure to have ova extracted is not an undesirable job like garbage collection or fruit picking. It involves unique emotional and moral work, not only physical work, as well as health risks. Further, the arguments I have discussed could be used to justify the opposite conclusion. Perhaps it would be better if an

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[201]Richard Posner presents such an argument with regard to surrogacy arrangements. See: Richard Posner, "The Ethics and Economics of Enforcing Contracts of Surrogate Motherhood," *Journal of Contemporary Health Policy* 5 (1989): 21-31.

[202]Such arguments are used in the case of surrogacy. See A. Werthheimer, "Two Questions About Surrogacy and Exploitation," *Philosophy and Public Affairs* 21 (1992): 211- 239; R. Arneson, "Commodification and Commercial Surrogacy," *Philosophy and Public Affairs* 21 (1992): 132-164.

already disadvantaged population was not induced to shoulder even more burdens.

Social justice would be better served if indigent women had a greater range of choices extended to them through education in order to increase their job skills, and if they were provided with access to cheaper daycare. These choices are already available to the wealthy. By adopting appropriate social policies, more choices and opportunities for better employment would be created. Then poor women and middle or upper class women would have relatively the same position with regard to being potential suppliers of reproductive material, insofar as such donation is financially motivated.

One way to redress the issue of poorer women having more incentive to engage in this needed but morally and emotionally difficult activity would be to pay them extremely well, as Field has suggested in the context of surrogacy.[203] [204]Yet this strategy leads to a paradoxical

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[203]For example, M. A. Field suggests this course of action with regard to surrogacy. See. M. A. Field, *Surrogate Motherhood* (Cambridge, Mass.: Harvard University Press, 1990), 22.

[204]Adam Smith believed that we need to pay more to people who degrade themselves for our benefit, e.g. opera singers: Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations, 5th edition* (London: Methuen and Co., Ltd., ed. Edwin Cannan, 1904 [1776]): Book One Chapter X Part 1.

situation: it would perhaps result in a larger number of economically disadvantaged women supplying fetal tissue and ova, thus increasing the size of the group one wishes to protect from the exploitation of undertaking difficult emotional and moral work out of economic necessity.

Accordingly, we may decide that the wrong here is not just a matter of the rate of pay. The sale of embryos and fetal tissue is wrong because regardless of how much she is paid, the practice fails to respect the intrinsic value of the woman. The rate of pay is not the issue, that is, this concern is not about equality, rather, the concern is one we have already addressed, namely, that it is simply wrong to treat some things as property that can be bought and sold.

II. b. ii Wealthy Recipients

A second concern based on the principle of justice is the fair allocation of the benefits derived from the supply of reproductive material; namely, stem cell therapies. If the wealthy have the greatest access to these services and should poor women be the major suppliers, then there would be exploitation insofar as the costs and harms accrue to one group (who are already disadvantaged), while the

benefits accrue to another (who are already privileged). Those who would advocate an unrestrained free market for embryos and fetal material argue that with more suppliers there will be more competition. Competition would drive the cost of supply down and as a result the cost of the therapies would also fall. With a lower cost for the therapies, more people, including poor people, would be able to afford them.[205]

But this argument assumes a rational and unrestrained market and this seems to be a theoretical possibility at best. Furthermore, there will always be a portion of the poor who will be too poor to be able to afford these therapies. In addition, there are problems with the unconstrained supply model when it comes to supplies where there are health risks to the supplier. Tissue retrieval is invasive surgery, and carries the usual risks associated with such procedures, as well as particular risks concerned with future reproductive health. What would prevent the supplier from willingly accepting excessive risks out of economic necessity? What guarantee is there that the economically underprivileged have the education to assess

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[205]Richard Posner, "The Ethics and Economics of Enforcing Contracts of Surrogate Motherhood," *Journal of Contemporary Health Policy* 5 (1989): 21-31.

the risks adequately and meet the minimal conditions of informed consent? In sum, the benefits that the disadvantaged are assumed to receive as suppliers are unclear.

Another model recommends unrestrained commercialization on the supply side, with state allocation on the demand side. Beyond the issues raised above concerning unconstrained markets, there are pragmatic concerns with this model. It will likely be the case, at least during the initial stages of stem cell research and development of therapies, that the price will be too high for democratic access to the therapies to be a reality, even given government allocation. With health-care budgets already strained, state provision for stem cell therapy will likely not be feasible. Will insurance companies be prepared to cover these therapies?

III. b. iii. Wealthy Donors and Altruism

A different model places constraints on tissue supply. This model is relevant when there is concern over the exploitation of poor women who are compensated financially for tissue supply that involves moral and emotional repugnance. Financial inducements will always

disproportionately affect the poor. Furthermore, it would be extremely difficult to provide remuneration for tissue supply that would be sufficient to attract the wealthy. A constrained model would therefore not offer financial inducements, so much as encourage altruism.[206]

However, even if the aim is to recruit the disadvantaged and advantaged women equally, it is a fact that wealthier people are more able to be altruistic than poorer ones. Wealthy people can afford to be altruistic because altruism in this context requires being able to take time off from work, pay transportation and baby-sitting expenses, and the like. To enable equal opportunity for altruism, these incidental costs and services could be provided for. This strategy may serve to allay concerns over the unequal allocation of supply, but it does not address the issue of conflicts between suppliers and the industry profiting from the supply. This issue pertains to any biotechnology venture that would need human tissue and not only reproductive material for stem cells.

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[206]Appeals to altruism are what drive the Canadian policy on creating reproductive tissue supply.

III. Where's the Harm in Commodification?

To commodify something is to put a price on it or to set a market value on it, that is, a commodity is something that can be exchanged for other things, it has some kind of commensurate value. Many people believe in the broad view that the commercialization of any human tissue or capacity is inherently wrong because in so doing, a person is reduced to the value of an object and her inherent dignity as a human being is thus forfeited. Because human beings and their parts and capacities in this view have a unique value, a value beyond any exchange, to commodify any part of human being is to deny this value.

I do not hold the broad view that the commodification of human tissues and capacities is inherently wrong, that it is necessarily wrong. I acknowledge that many practices in the existing market for human tissues and capacities used in stem cell science are indeed immoral. But the immorality is not because the tissues are bought and sold, that there is an exchange value and a market for them. Rather, the wrongness obtains because the present market exchange system exploits the woman donor.

To be sure, the nature of exploitation is difficult to define and it is controversial. But for the purposes of the

present discussion I understand exploitation as treating a woman unjustly, violating legitimate claims that she has, or ignoring her interests. It is clear that some of the transactions between a woman and stem cell scientists or their intermediaries are unjust in these ways. The actions themselves are hard to deny as instances of exploitation and are hard to deny that they are thus wrong.

Women are exploited when others benefit and profit from her property and her labour in unfair ways. This market is unfair to women when she is not allowed to enter it and when her contributions to the goods and services offered in the market are unjustly devalued.

The market in women's tissue and reproductive is unfair when the value of the woman as a producer and a vendor is not respected. This lack of respect is evident in the following four cases. First, where a fetus or embryo is held to have absolute value, in which case her status is that of a fetal container; second, in embryo donation where the embryo is considered an entity independent of its biological mother's (rational) interest or concerns. If the *ex utero* embryo's connection to the mother is irrelevant, then the woman who supplied the embryo can claim no legitimate interests in it, or a right to say what happens

to it. Third, women risk being treated as a means only when fetal remains are not considered part of a woman's body and labour. And fourth, when her ova are not considered part of her body or labor.

Commercializing ova, embryos, and fetal material from elective abortions, that is, to commodify women's labour and tissue, is not intrinsically wrong, but it is wrong when there is a failure to respect a woman's autonomy and agency, as in all of these four cases. What price tissues and labor ought to have is a different issue. And in order to be fair and just, we have to be careful not to put burdens on specific groups of women, e.g. the poor or the wealthy.

There is a great scientific and monetary value to women's reproductive tissue and labour in stem cell science. According to Curtis Naser and Sheri Albert, "[t]he use of human tissues and cells is …the *foundation* upon which much of the current biotechnological revolution has been based."[207] The interests of the person supplying the tissue and the interests of researchers or firms may

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[207]Curtis Naser and Sheri Albert, "Genetic Information, Ethics, Ethical Issues in Tissue Banking and Human Subject research in Stored Tissues," in *Encyclopedia of Biotechnology, Volume 1* Thomas H. Murray and Maxwell J. Mehlman, eds. (New York: Thomas Wiley, 1999): 363-389, 363.

conflict. This potential conflict is usually presented as a conflict between the interests of the individual tissue donor and those of scientific progress, of "researchers in freely pursuing scientific knowledge."[208] While scientific breakthroughs have the potential in principle to benefit all humankind, it is not outrageous to point out that the medical biotechnological industry has a great financial incentive for developing therapies and products.

There is a significant financial interest on the side of researchers and firms, who may not be motivated simply by the intrinsic value of scientific knowledge. It is also important to note that potential donors are encouraged to make tissue donations to medical research and therapy altruistically. The potential to save another person's life (or at least ease his or her suffering in some way) is an act represented as so intrinsically valuable that it would be diminished if the donor were compensated for it. Of course, altruistic donors would be extremely convenient to a highly profitable industry that can thus minimize its production costs. According to Lori Knowles, "there is a tension between the altruism that individuals are supposed to exhibit by donating their tissue for research and the

[208]Ibid., 370.

current patent system, which encourages companies to stake lucrative property claims in that research."[209] Donna Dickenson believes the case can be put even more strongly: "the semblance of a gift masks and legitimizes what is actually the extension of commodification… If donors believe that they are demonstrating altruism, but biotechnology firms and researchers use the discourse of commodity and profit we have…complete commodification with a human face."[210]

Guidelines in the UK hold that women who donate embryos or fetal tissue must be prevented from sharing in any profit which the researchers and companies will derive from them. Donna Dickenson tells us that in the UK draft guidelines for consent forms promulgate the gift relationship. Women would be asked to sign forms that say that they understand that they will not derive any profit from the research and development performed on the donated tissue.[211] Nor may donors have any say in what way the products resulting from the tissue will be used. One question to ask is in what way can such a donation be

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[209]Lori Knowles, "Property, Patents, Progeny," *Hastings Center Report* 2 (1999): 38-40.
[210]Donna Dickenson, "Property and Women's Alienation from their own Labour," *Bioethics* 15 (2001): 204-217.
[211]Ibid., 211.

thought of as a gift? It is a one-way exchange, since donors are not allowed to direct their donation to any person or any particular firm, and these terms are non-negotiable. Thus certain forms of gift-giving, namely, donating ova or fetal tissue to friends, family or self, are not allowed, while gifts to anonymous researchers and biotechnology companies are not only allowed, but also encouraged. To call for the supplier to be altruistic when there is no similar call placed on those who would profit greatly from the sale of therapies made from the tissue is bad faith at best. At worst it is gross exploitation.

In addition, a gender issue arises about altruism. Should the creation of embryos for research be allowed, it is likely that pressure would be put on women to donate ova for this purpose. If the creation of embryos, cloned or non-cloned, for research purposes is disallowed, then the source of research embryos would be limited to those left over from fertility treatments. And so pressure would increase on women who undergo such therapy to donate both eggs and zygotes.[212] This is problematic in a society where

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[212] This point was brought up by the Canadian Royal Commission and the Human Ethics Research Panel (USA). See: HERP, *Report of the Human Ethics Research Panel* (Washington, DC: National Institutes of Health, 1994), 56.

women tend to have more of a burden of altruism placed on them already to give what issues from their bodies.

Women could of course be said to have more of a burden placed on them to donate bodily tissue just because it is their reproductive tissue that is in high demand. It is a matter of simple contingency; it just so happens that the way the human species is, (most) women have ova and wombs and under certain conditions these women have the potential to gestate other unique humans.[213] This may not therefore be sexist exploitation that objectifies women as fetal containers. However, given a society that does objectify women in several ways, and in which the "flower-pot" theory of pregnancy (that woman is a passive receptacle for an active sperm) still carries weight, it is likely that reproductive ability is not a contingent factor in women's oppression, and thinkers are right to fear that developments in biotechnology threaten to commodify women and their bodies.

There is a general unwillingness to recognize that the woman as a donor has done any work, that her donation

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213 "The fact that fetal tissue can be used no more makes women into fetal containers than the fact that retinas can be used makes people eyeball containers." Bonnie Steinbock, *Life Before Birth* (Oxford: Oxford University Press, 1996), 184.

represents any kind of labour. Every embryo requires an egg and eggs have to be retrieved from women's bodies, a retrieval that involves some physical risk. Eggs are not retrieved one at a time for efficiency's sake, so the risks associated with the invasive procedure are minimized, as are costs, when many eggs are retrieved at once. As a result super-ovulation drugs may be administered to suppliers. The literature about the effects of these drugs on the women who take them is beginning to suggest that these women suffer a higher risk of ovarian cancer. The point to be made here, however, is that the series of actions required to make the donation (including the initial decision-making procedure, the bodily risks with ova stimulation drugs and egg extraction procedures, the time investment) is not usually regarded as work or labour on the part of the supplier. In a similar way, women's actions to create and preserve embryos and fetuses during pregnancy are not usually regarded as work. Rather, she is seen as a passive container in which pregnancy happens.

The value of ova, in the form of embryos as well as aborted fetuses, is not usually understood as coming from the work that women must do in order for these tissues to be used. And a value is not put on ova and fetal tissue

because doing this could be understood as upholding the idea that one can have property rights over one's body. These tissues are extremely valuable, however, as market commodities. Their value derives from what researchers and companies are willing to pay for the development of therapies, the potential profit to be made from the products derived from the tissue, and from the patents that biotechnology companies and universities can obtain on these tissues.[214] So the question of value involves a contradiction: tissue cannot be owned by its host, yet at the same time it can (perhaps should) be donated to someone

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[214]The famous case in the US involving issues of ownership of tissues and the welfare of the tissue sources against interests of researchers: 1990 Moore v. Regents of the University of California. John Moore was a patient at UCLA with hairy cell leukemia. To treat the leukemia, doctors removed his spleen. But apparently before they undertook the procedure they realized that Moore's blood had certain viral antibodies that made it particularly valuable. Moore alleged that without his knowledge or consent his physician had him continue to give blood, sperm, and so forth for seven years in order for the doctor be able to patent a cell line out of his tissue [the Mo-Cell line, Patent No. 4,438,032].The California Supreme Court ruled that the Moore did not have ownership rights over his tissue that was subsequently turned into a highly profitable product by his physician, another researcher and a pharmaceutical company without Moore's knowledge or consent. It was ruled that physician breached his fiduciary duty to Moore by not disclosing his financial interest in treating and extracting tissue from Moore. See Lori B. Andrews, and Dorothy Nelkin. The Body Bazaar: The market for human tissue in the biotechnology age (New York: Crown Publishers, 2001).

perhaps should) be donated to someone else (or a corporation), who then owns it and can make a considerable profit from it.

Many markets for ova, embryos, and fetal material from abortions already exist. Research on and the production of stem cells lines, which are created from these materials, is already a lucrative business with tremendous profit growth potential. The moral harm involved in the commodification of these tissues is that of the exploitation of women, their reproductive tissues and their agency involved in creating ova, and terminating pregnancy. It occurs when women, as autonomous agents, are not recognized in the products of their volitional and biological labour, and when they are coerced into unconditionally giving up for free what biotechnologists can then manipulate and profit hugely from. Understood in this way, the commodification is wrong precisely because it is incomplete: it confers ownership on something that can be bought and sold at one end, but not at the other. Should complete commodification be implemented in the right way, that is, through fair policy, it would eliminate the exploitation that women suffer and thus end the real moral harm in the treatment of women in stem cell science.

CHAPTER SIX: CONCLUSION

A number of conclusions may be drawn from the present study of the ethics of stem cell research and the moral dangers it poses for women. I wish to focus on conclusions regarding the wrongness of commodification of human body parts and processes. In addition, I will offer a summary of my answer to the question of how stem cell science may pose moral harm to women.

As a result of my study, one learns the following about commodification. Commodification is a morally neutral concept. However, I think that if one takes core aspects of commodification and plugs in certain things or processes it becomes clear whether an act of commodifying is right or wrong. The wrong I have discovered in the commodification of women's reproductive tissue and labour for stem cell research is that the transactions as practiced are unfair and that the woman donor is treated unjustly.

When one speaks of the question of what should and should not be commodified one may think of ownership laws that should never be allowed to exist, for example, that of parents being able to own their children or to sell them into slavery. In addition, one may think that there are

things that may be commodified but not owned individually, e.g. that they should be public goods, owned collectively, and not private goods, owned by individuals. In these cases one is reminded of the relationship between ownership and property rights: some things should not be owned at all, and if they are it is exploitation. And some things should not be owned by individuals, and if they are, it is exploitation.

To be sure, sometimes the ownership by itself may be problematic. But in other cases, it is the alienability (in the non-Marxist sense) that makes the commodification wrong. There are certain things, like voting rights, which should never be transferable. For other things and processes, it is the impact of commercialization, that is, of money or barter, which makes the commodification wrong. Money has special properties, like being transferable and fungible. If something has a price, it can be regarded as commensurable with something else. This is Radin's point about the immorality of the commodification of certain things and activities. If something is a commodity and has a price, there is nothing particularly personal or profoundly human, i.e. intrinsically valuable, about it. In this way, the wrongness of commodification is that it makes

it impossible (or really difficult) for one to respect something that ought to be respected.

Further, if something has a price, if it is alienable, that is, if ownership of it is not transferable, there is a financial incentive and this incentive may create moral danger. For example, because people are willing to pay for human organs even though selling them is illegal, there exists an underground global trade in human organs whose source of product tends to be very vulnerable populations. In addition, if we regard financial incentive as egoistic and not altruistic, people may be more inclined to give organs and tissues to total strangers rather than altruistically to a friend or to family members. Also, diseased organs may be offered because of the financial incentive. And finally, because the concern in the market ethos is for the product, the health of vendor is not immediately important and thus there may be no call to care for or follow-up after the tissue or organ has been vended.

Each of these aspects of commodification which I have referred to reveals a specific way of failing to respect something or someone that ought to be respected. I maintain that exploitation best describes the wrong that occurs in this failure to respect that is brought about through,

within, or around, or as a result of, the commodification of human tissues. My hope is that I have convinced the reader that exploitation is an issue to be worried about even if we are not Marxists.

Regarding stem cell science and commodification, I think that the exploitation of women will not be redressed only if, like Weir suggests, we put into place adequate informed consent procedures for women who are willing to donate their reproductive tissues. Indeed this is a necessary thing to do, but the exploitation of women in the commodification of their reproductive tissue for stem cell science is not only an issue of not telling them that their tissue may be used in very profitable ways. And nor is the issue solved if women are offered financial remuneration for their tissues. An important thing that one may learn from my study is that there can be exploitation even if the exchange between two parties is honest and both parties are better off financially than they would have been without the exchange, that is, even if both parties benefit. And it is not wrong because there are things that should never be commodified. If a woman is not vulnerable, nor tricked, nor pressured and she makes an autonomous choice and is fairly rewarded, then there is no exploitation and no harm done to

her in the commodification of her reproductive labour and tissue.

Even though I have learned a great deal about the moral danger posed by the commodification of human tissue, I realize that there are numerous difficult questions to answer about the nature of commodification and the relationship between it and exploitation that I have not answered. But it is my hope that I have said enough to explain why I think it presents real and important dangers for stem cell science and that as a result it would be a good thing if people worried more about it and less about wrongs done to the embryo or the fetus as well as the somewhat artificial fears about accidentally changing human nature.

The question I sought to answer in this work was whether there are specific harms to women in the embryonic stem cell debate. Lately there is so much attention over the ethics of stem cell science and most of the debate, I think, is not compelling. Some concerns are addressed if one understands the science and many not be seen to have the proper gravity if one does not understand the science. Therefore, even though I realize that narrative accounts of science are not moral philosophy, I thought it was

necessary to present a detailed account of stem cell science. In addition, I thought it necessary to offer a critical appraisal of the prevailing ethical issues and arguments in the stem cell debate in order to clear the field, so to speak, for my arguments about the possible harms to women.

When ethical issues arise as a result of intentionally killing embryos or fetuses, the obvious debate to draw from is the abortion debate. Thus, in the bioethics literature, the question of moral harm to women in the stem cell debate is seen to dovetail with the question of whether the stem cell debate is analogous to the abortion debate. The dominant view in bioethics literature is that human embryonic stem cell science and abortion are not analogous because in the former, no pregnancy is terminated, but in the latter, it is. And this is very revealing, I believe, and indicates how specific attention to harms to women in stem cell science has not been adequately addressed.

It was necessary for me to present and analyze the analogy between the stem cell and abortion debates which I believe to be not only unhelpful but misleading as well as the analogy with abortion which I think is insightful. In order to make this clear; I drew upon women-centered views

about abortion (not the one about a woman owning her body) and this lead directly to what I regard as the real issue about stem cell research: treating the fetal and embryonic tissue as a scientific resource while ignoring its relationship to the woman and her entitlement to decide what happens to it. The wrong here, as in abortion, is in the failure to respect women as agents in the human reproductive process.

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APPENDIX A: GLOSSARY OF TERMS

Assisted Reproductive Technologies (ARTs): Fertility treatments or procedures that involve laboratory handling of gametes (ovas and sperm) or embryos. Examples of ARTs include in vitro fertilization and intracytoplasmic sperm injection.

Asexual reproduction: Reproduction involving one parent cell only and not involving **gametes.**

Blastocyst A stage of early embryo development about 5 days after fertilization in humans. Before implantation a cell mass of between 30 -150 cells. A sphere made out of an outer layer of cells (**trophoblast**), a fluid filled cavity (blastocoel or blastocyst cavity) and an **inner mass of cells (ICM)**. The ICM, consisting of **undifferentiated** cells, gives rise to what will become the **fetus** if the blastocyst is implanted in a uterus. These same ICM cells, if grown in culture, can give rise to **embryonic stem cell** lines.

Blastomeres: A cell from a **morula**-stage **embryo.**

Blastomere Separation: Sometimes called "twinning" after the naturally occurring process that creates identical twins. Splitting a developing embryo soon after fertilization of the ovum by a sperm (sexual reproduction) to give rise to two or more embryos. The resulting organisms are identical twins (clones) containing DNA from both parent gametes.

Cell line: A general term applied to a defined population of cells that has been maintained in **culture** for an extended period and usually has undergone a spontaneous process, called **transformation**, that allows the cells to continue dividing (replicating) in culture indefinitely.

Chimera: An organism composed of cells derived from at least two genetically different individuals.

Cleavage: Process by which a fertilized ovum divides before it becomes a **blastocyst.**

Cleavage pattern - The pattern in which cells in a very early **embryo** divide; each species of organism displays a characteristic cleavage pattern that can be observed under a microscope. Departure from the characteristic pattern usually indicates that an embryo is abnormal, so cleavage pattern is used as a criterion for preimplantation screening of embryos.

Clone: 1) An exact genetic replica of a **DNA** molecule, cell, tissue, organ, or entire plant or animal. 2) An organism that has the same nuclear **genome** as another organism.

Cloning: The production of a **clone.**

Blastomere Separation: See entry.

Hybrid Cloning: Transfer of a somatic cell of one species into an enucleated ovum of a different species. E.g. Human DNA into an enucleated cow ovum.

Parthenogenesis: See entry

Research Cloning: Cloning with the intent for research only.

Reproductive Cloning: Cloning with the intent to produce an offspring.

Somatic Cell Nuclear Transfer: Transfer of a somatic cell nucleus into an ovum that has had its nuclear material removed **(ovacyte)**. It is then stimulated to divide. The donor nucleus can come from a **Germ cell** or a **somatic cell.**

Culture - Growth of cells, tissues or **embryos in vitro** on an artificial nutrient medium in the laboratory.

Differentiation: The process whereby an unspecialized early embryonic sell acquires features of a specialized cell, e.g. heart, liver, brain.

Diploid - Refers to a cell having two sets of chromosomes (in humans, 46 chromosomes). In contrast, a **haploid** cell,

such as a **gamete**, has only one set of chromosomes (23 in humans).

Ectoderm: One of the three layers of the primitive germ cells of the early embryo (the others are the **mesoderm** and the **endoderm**.) The ectodermic is the outermost of the three layers. It gives rises to skin, nerves and the brain.

Embryo (Human): The early developing organism from the time pf fertilization until the end of the 8th week of gestation (after which time it is a fetus).

> **Early embryo**: The earliest stages of this development until the emergence of the primitive streak, at day 14. It includes the zygote, morula, and the **blastocyst**. It is sometimes referred to as the pre-embryo although this designation is controversial.

Endoderm: One of the three layers of the primitive germ cells of the early embryo (the others are the **mesoderm** and the **ectoderm**.) It is the lowermost layer and will later become the lungs and the digestive organs.

Enucleation - A process whereby the nuclear material of a cell is removed, leaving only the cytoplasm. When applied to an ovum the removal of the maternal chromosomes, which are not surrounded by a nuclear membrane.

Ex vivo: Outside the living body. (Latin)

Fertilization: Process in which the male and female gametes unite. It begins at the time of conception and ends some 22 hours later at time of the aligning of the mitotic spindle. The end result of this process is a zygote, the first development stage of early embryo.

Fetus: In medical terms, refers to the developing human from the end of the eighth week to birth. At the end of the eighth week, the **embryo** is 2.0-3.0 cm (0.8-1.2 in.) long and weighs 1-4.5 g (0.04-0.16 oz). The major organ systems (for example, the nervous and cardiovascular systems) and rudiments of limbs, fingers, and toes have formed.

Fibroblast: cells that give rise to connective tissue such as collagenoblasts (collagen).

Gamete: A mature male or female reproductive cell (sperm or ovum) with a haploid set of chromosomes (23 for humans).

Gene Therapy: The process of replacement of a defective gene in organism suffering from a genetic disease. Recombinant DNA techniques are used to isolate the functioning gene and insert it into cells.

Germline Gene Therapy: Genetic alterations on the germ cells. Such modification will thus be passed on to all (potential) offspring.

Somatic Cell Gene Therapy: Genetic alteration on the cells of the individual. Such alteration will not be passed on to any (potential) offspring.

Germ Cell: A reproductive cell, male (sperm) or female (ova) or a cell that can become one of these. All other cells in the body are referred to as **somatic**.

Gonadal Ridge: Anatomic site where primordial (precursor) germ cells are formed.

Haploid - Refers to a cell (usually a **gamete**) having only one set of chromosomes (23 in humans). In contrast, body cells (**somatic cells**) are **diploid**, having two sets of chromosomes (46 in humans).

In utero: In the uterus (Latin).

In vivo: In glass (Latin). In a laboratory dish.

Inner Cell Mass or ICM: The cells inside the **blastocyst**. These give rise to the embryonic disk of the later **embryo** and later the **fetus**.

IVF: Assisted reproductive technique (**ART**) where fertilization takes place outside of the uterus.

Mesoderm: One of the three layers of the primitive germ cells of the early embryo (the others are the endoderm and the ectoderm.) It is the middle layer and the precursor to bone, muscle and connective tissue.

Mitochondrial DNA: Mitochondrion (plural, Mitochondria) - A cellular structure in the cytoplasm that provides energy to the cell. Each cell contains many mitochondria. In humans, a single mitochondrion contains 37 genes on a circular mitochondrial DNA, compared with about 35,000 genes contained in the nuclear DNA.

Morula: The **preimplantation embryo** 3-4 days after **fertilization**, when it is a solid mass composed of 12-32 cells (**blastomeres**). After the eight-cell stage, the cells of the preimplantation embryo begin to adhere to each other more tightly, becoming "compacted". The resulting embryo resembles a mulberry and is called a morula (Latin: *morus* = mulberry).

Multipotent: Attribute of stem cells having the capacity to form into multiple germ layers. Stem cells from the embryo, fetus, or adult, whose progeny are of multiple differentiated cell types and usually, but not necessarily, all of a particular tissue, organ, or physiological system. Contrast **pluripotent**.

Oocyte: Developing ovum inside the ovaries.

Ovacyte An a-nucleated ovum (an ovum with no pro-nucleus. i.e. no chromosomes).

Parthenogenesis: Reproduction by development of an unfertilized usually female gamete that occurs especially among lower plants and invertebrate animals.

Plasticity (of cells): Ability of one stem cell to generate differentiated types of another tissue.

Pluripotent: Capacity of stem cells to develop into all germs layers (endo, ecto and mesodermic).

Primitive Streak: The initial "bond" of cells from which the embryo develops. It also establishes the embryo's head/tail and left/right orientations. Occurs around day 14 after conception.

Pronucleus (plural, pronuclei) - Refers to the **haploid** nucleus of ova or sperm prior to **fertilization**, and immediately after fertilization, before the sperm and ovum nuclei have fused into a single **diploid** nucleus.

Sexual reproduction: A type of reproduction that involves the union of two cells. The offspring from this type of reproduction have a unique combination of genes. Contrast with **asexual reproduction.**

Somatic cell nuclear transfer or **SCNT:** See **Cloning.**

Stem cells (hSC): A cell that has the ability to divide for indefinite periods of time in culture and to give rise to specialized cells.

> **Adult Stem Cells** or somatic stem cells. An undifferentiated cell found in a **differentiated** tissue in an adult organism that can renew itself and can (with certain limitations) differentiate to yield all the specialized cell types of the tissue from which it originated. e.g. Hematopoietic stem cells are the cells from which all red and white blood cells come from.
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> **Embryonic stem cells (hES):** Pluripotent stem cells from the ICM (inner cell mass of a blastocyst, an early embryo).
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> **Embryonic stem (hES) cell lines** - Populations of dividing cells established from **embryonic stem cells** and cultured in the laboratory. Within embryonic cell lines are cells that can produce more embryonic stem cells or, under conditions of **differentiation**, give rise to collections of cells that include most or all cell types that can be found in a postimplantation embryo, **fetus**, or developed organism.

Embryonic germ stem cells (hEG): Stem cells from the gonadal ridge of the fetus.

Somatic Cells: Any cells in the body other than reproductive cells, (germ cells, sperm and ova). Latin *soma* = body.

Telomerase: The enzyme that synthesizes DNA at the ends of chromosomes and confers replicative immortality to cells. When active, telomerase can continually add to the length of the telomeres on the ends of chromosomes within a cell, thus conferring on that cell the ability to continue dividing past its normal lifespan.

Telomere: Repeated sequences of DNA that cap the ends of chromosomes that is replicated in a unique way. Telomere shortening has been suggested to be a "clock" that regulates how many times an individual cell can divide (that is, when the telomeres of the chromosomes in a cell shorten past a particular point, the cell can no longer divide).

Therapeutic Cloning also known as **Research Cloning. See Cloning.**

Totipotent: Having unlimited capacity. This is the capacity of cells (**blastomeres**) of early embryos to totally replicate (twin).

Trophoblast: The feeding layer of the blastocyst. Under normal conditions will turn into the placenta and the umbilical cord.

Undifferentiated: Not having changed or become a specialized kind of cell.

Unipotent stem cell: A **stem cell** that both divides and gives rise to a single mature cell type, such as a spermatogenic stem cell, which only gives rise to sperm.

Zygote: A single cell formed by union of sperm and ovum.