

Stem Cell Terminology: Practical, Theological and Ethical Implications

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Abstract

Stem cell policy discussions frequently confuse embryonic and fetal sources of stem cells, and label untested, non-reproductive cloning as “therapeutic.” Such misnomers distract attention from significant practical and ethical implications: accelerated research agendas tend to be supported at the expense of physical risks to women, theological implications in a multi-faith community, informed consent for participation in research, and treatment decisions altered by unrealistic expectations.

When public discourse lags behind scientific developments, errors commonly become entrenched in ethics and policy development. Lessons that we have learned in previous contexts are also frequently lost in the excitement over new breakthroughs. In the stem cell debate, common errors include confusing terminology regarding types and sources of stem cells, and types and purposes of cloning. These seemingly minor errors of terminology nevertheless may have significant ethical force: explicitly clear definitions for RGTs (reproductive and genetic technologies) are essential to promote policies that are neither overly restrictive nor unintentionally broad, and to avoid entrenching unchallenged assumptions or vested interests. Failure to employ appropriate terminology may encourage unintended injury to women, mask legitimate points of debate in a pluralistic society, undermine fully informed consent for participants in research trials, and inappropriately influence treatment decisions for individuals seeking remedy for their illnesses.

I. Sources of Stem Cells

The U.S. National Bioethics Advisory Commission,¹ the Canadian Institutes of Health Research,² and others have employed the acronyms “ES,” for embryo stem cells, and “EG” for “embryo” germ cells, which actually come from aborted fetuses. Referring to both sources as “embryos” is mistaken biologically, but also masks health implications for women and may disguise a variety of theological concerns in a multicultural community.

In the blastocyst stage at five to seven days of embryonic development, an inner cell mass has diverged from the precursor to the placenta; cells from the inner cell mass may still give rise to any body tissue, and are therefore highly attractive for stem cell cultures. However, the

embryo is destroyed when the inner cell mass is isolated to generate a stem cell line. Such cells are appropriately referred to as “embryo stem” or ES cells.

So-called “EG” cells are the primordial germ cells (precursors to ova or sperm) retrieved from an aborted fetus aged approximately nine to 13 weeks. The distinction between embryos and fetuses occurs at nine weeks of development, when all rudimentary organs and body structures are present. When fetal germ cells are called “embryo” germ cells, a fundamental biological misunderstanding becomes entrenched. Instead, they should be called fetal stem (FS) cells or fetal germ (FG) cells. The distinction of embryos and fetuses is ethically important for two reasons.

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I.a. Implications for Women's Health

Embryo or fetal tissue research of any form must always be considered a women's health issue, because embryos and fetuses can only be accessed following invasive procedures in women's (but not men's) bodies. Embryo and fetal tissue research must also, therefore, be considered in light of anti-discrimination protections between women and men. Bill C-13³ rightly notes the differential impact of RGTs on women in s. 2(c), which states:

2. The Parliament of Canada recognizes and declares that

(c) while all persons are affected by these technologies, women more than men are directly and significantly affected by their application;

The implications for women's health – as infertility patients, ovum donors or abortion patients – differ significantly with the type of cells and the developmental age of the source. *In vitro* embryos are located outside a woman's body, following the retrieval of ova from her body, while fetuses are located inside the womb until after an abortion.

We must ensure that a woman's own fertility treatments have been completed optimally before we approach her to donate ova or embryos for research purposes; financial incentives and the desire to be a "good patient" may compromise patient consent and the therapeutic relationship.⁴ Healthy women donating ova specifically for research must be protected from the risks of ovarian hyperstimulation syndrome⁵ and other complications of ovum retrieval. Informed consent regarding the risks of ovulation induction and ovum retrieval has been less than adequate to date in assisted conception and ovum donation programs.⁶

The regulatory framework in *Bill C-13* would partly address concerns about risks and consent for ovum retrieval, and would regulate the creation and use of embryos, but it does not apply to abortion techniques or the use of fetal tissue. We must ensure that women's health concerns related to having an abortion are not compromised by altered timing or technique in order to retrieve useful fetal stem cells. The careless linking of fetal tissues with embryonic tissues represented by the terms "ES" and "EG" masks the fact that women face different health concerns in retrieving tissues at these different stages. Legislation designed in part to protect women's reproductive health should not similarly confuse

developmental stages, as doing so leaves women unprotected against research interests in certain types cells that are obtained from their bodies.

I.b. Faith Perspectives on Embryos⁷

The distinction between embryonic and fetal cells matters enormously for some faith perspectives, although the implications are sometimes quite different from what one might assume. Embryos are destroyed in the

process of isolating blastocyst cells, while fetal germ cells are retrieved from fetuses that were already deceased following an abortion. One point of contention is the direct versus indirect killing of an early human entity, which in some ways parallels the "killing versus letting die" debate (e.g., lethal injection vs. removal of a ventilator) at the end of life. Of even greater concern for faith communities is the status of the human embryo or fetus, which in turn engages questions of when the soul enters the human body.

Some faith communities view embryos and fetuses as morally equivalent entities, and reject in principle any intervention that may harm them. The Vatican is the only major religious organization to reject IVF in principle, because it separates conception from within marital intercourse;⁸ accordingly, embryo research cannot be supported in any form. In Catholic and some Protestant perspectives, the soul is believed to enter the body at conception; embryos and fetuses therefore have the same full moral status as children and adults. Accordingly, abortion is perceived to be the murder of a person, and research upon cells taken from aborted fetuses is ethically problematic.

At the opposite extreme, some faith communities view embryos and fetuses as morally equivalent entities below the status of full persons, thus allowing both embryo experimentation and abortion (at least early in the pregnancy). In Judaism,⁹ the embryo is considered to be "like water" for the first 40 days of development. For Orthodox Judaism, the fetus becomes a full person after 40 days of gestation; this distinction would allow embryo research but would prevent abortions at the nine -13 week stage of development necessary to retrieve fetal germ cells. For most other Jewish traditions, the fetus becomes a partial and potential person at the 40th day but full personhood arrives with the live birth of the baby's head, making abortion fairly unproblematic. Both Sunni and Shi'a schools of Islam¹⁰ teach that becoming a person is a gradual process,

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and that ensoulment occurs at the first perceived fetal movements in the fourth month of gestation, which is far later than the stage at which fetal germ stem cells would be isolated. The embryo merits some form of protection as a human entity from conception, but in the Shi'a tradition, abortion is permissible for any reason prior to four months. Most traditional First Nations' languages have no word for abortion, but instead give a woman authority to "make her period come."¹¹

Eastern faith traditions may raise different concerns about embryo and/or fetal stem cell research. Hindu, Buddhist, Taoist and Confucian¹² perspectives all reject body/spirit duality: there is never a state of pure matter alone that souls enter. Souls are thus present at conception, but achieving full humanity is a gradual process that may take years. The rebirth of souls in Hindu and Buddhist traditions brings the karma of past lives to the new embryo, endowing it with spirit and a previous history that makes it deserving of respect. If the embryo dies, the soul simply returns in another lifetime. However, forcing conception and unnatural cell development in the laboratory are potentially serious disruptions of the natural order. Might souls waiting to be born into a new lifetime be endlessly cycled through laboratory embryos, or be stuck in frozen storage? In Buddhist traditions, life begins at conception when three conditions combine: sexual intercourse occurs, it is the mother's fertile period, and there is a "being to be born" (Gandhabba) ready to enter life as an infant.¹³ The implications are unclear for IVF embryos, which are created asexually and possibly at a non-fertile time. The implications of RGTs may thus be metaphysically far-reaching in ways rarely considered in the dominant North American traditions.

II. Cloning Procedures

Although the word "clone" commonly conjures images of identical offspring, and thus tends to prompt emotionally or politically sensitive responses, it actually refers to several different procedures related to the duplication of genetic material.

- a) Gene replication involves copying a single gene or gene sequence, and is frequently called "gene cloning." Isolated genes might be introduced to stem cell cultures, which should be no more ethically problematic than somatic cell gene therapy.
- b) Embryo splitting — sometimes called "embryo cloning" — creates multiple identical embryos by separating clusters of cells within the first two days of development, when the cells are fully undifferentiated. Pre-implantation genetic diagnosis is done in this way, as part of the embryo is tested and the remainder is

stored for potential uterine implantation if the embryo is healthy.

RGT regulations must specify whether an embryo created for fertility purposes may be split, with part being transferred to the uterus and part cryopreserved for future stem cell use rather than tested for genetic anomalies. The goal of such a process would not be to create multiple identical offspring, but to have a child with a unique genetic pattern who might have access to an identical embryonic stem cell line if needed.

- c) In somatic cell nucleus transfer, or SCNT, the nucleus from a non-reproductive cell of an existing person is inserted into an ovum whose own nucleus has been removed. The embryo produced by this process may then be the source of a stem cell line — or offspring — virtually identical to an existing person. The same process is used for reproductive cloning (which produced Dolly the sheep), and also for creating stem cell cultures genetically identical to a specific individual.

The *Tri-Council Policy Statement*¹⁴ specifically prohibits SCNT, and the CIHR will not fund SCNT projects. Regardless of any specific prohibition on SCNT, the prohibition on creating embryos for research purposes at s. 5(1)(6) of *Bill C-13* creates a *de facto* ban on SCNT research, as SCNT cloning creates an embryo from an enucleated ovum.

III. Purposes for Cloning: When Is it "Therapeutic"?

The common terms that distinguish the uses for the SCNT technique — "reproductive cloning" and "therapeutic cloning" — are incorrectly applied and may lead to significant ethical and policy lapses. "Reproductive cloning" involves any transfer to a woman's uterus of embryos that have an identical genetic structure to another person or embryo, for the purposes of producing living offspring with a genetic code identical to another individual. This phrase does not specify whether embryo splitting, SCNT, or perhaps some other technique created the genetic duplicate. The intentional production of offspring genetically identical to existing persons remains the most controversial and risky cloning variation, and has consistently been prohibited in Canadian RGT policy.

"Non-reproductive cloning" includes the creation of an embryo by SCNT for development into stem cell cultures and transplantable cell lines, or perhaps for other non-

reproductive purposes. The term “therapeutic cloning” is widely used — by the CIHR, the World Health Organization¹⁵ and in the summary document that accompanied Bill C-56,¹⁶ among others — to offer contrast to cloning for reproductive purposes. This label is another misnomer. “Non-reproductive cloning” or “somatic cloning” would be more appropriate.

First, using the phrase “therapeutic cloning” as a comprehensive term for non-reproductive cloning ignores the longstanding distinction in genetics between “gene therapy” and “genetic enhancement.”¹⁷ While stem cells trained to be muscle tissue might one day offer a useful therapy for cardiac damage or muscular dystrophy, exactly the same process may create a non-therapeutic, but highly marketable, enhancement of muscles or heart tissue for elite athletes. The first would be therapeutic, while the second medical procedure would be a non-therapeutic cosmetic or elective enhancement.

More important, the word “therapeutic” means that research has already validated that the benefits of a treatment demonstrably outweigh risks. Human trials of stem cell transplants have barely begun, and therapies are merely hoped-for; just as gene therapy and fetal tissue transplants have largely failed to live up to their promise, SCNT and stem cell transplantation may never achieve therapeutic validation or use. Indeed, the ethical justification for human trials of an experimental therapy includes “clinical equipoise,”¹⁸ which is a state of genuine uncertainty regarding the relative benefits of the new and existing interventions. The mere possibility that a procedure may one day work is not sufficient evidence to support a genuine belief that the intervention is likely to work as well or better than existing treatments. Distinctions between therapeutic interventions and the much larger category of research activities — including “therapeutic research” and the use of “experimental therapies” — date back to the mid-1970s.¹⁹ These lessons apparently have been forgotten. We do not yet have sufficient basic research even to justify human clinical trials of stem cell techniques, let alone sufficient evidence to call them “therapeutic.”

Speaking about early research stages as if they were validated therapies is dishonest and fosters false hopes that may misdirect personal treatment decisions or policy priorities. Such terminology works to the advantage of researchers who benefit from greater attention and investment, while the projection of unwarranted optimism may compromise informed consent and pose risks for donors, research participants, and those whose illnesses motivate the stem cell research in the first place.

Meanwhile, SCNT cloning for reproductive purposes is considered by some to be a therapy for infertility; the line between “reproductive” and “therapeutic” uses only makes sense if one considers infertility relief a non-therapeutic intervention. A further scenario involves cloning a patient’s cell, transferring the embryo for partial gestation and abortion, and then using fetal stem cells or tissues for transplant; this would blend reproductive and non-reproductive purposes in a single SCNT cloning/transplant attempt. As noted above, embryo splitting to provide the offspring with matching embryonic stem cells would also blend reproductive and non-reproductive cloning efforts via a procedure other than SCNT.

In any event, distinguishing SCNT embryos for stem cell lines from SCNT embryos for reproductive cloning may, in practice, be unenforceable. It will be difficult to prevent the transfer of an embryo-clone to a woman’s uterus, either accidentally in a laboratory mix-up, or by design to circumvent prohibitions on reproductive cloning.

The definitions used in the regulation of infertility practices, embryo research, and fetal tissue acquisition related to stem cell research must be explicitly clear and accurate, and must reflect the lessons learned over several decades on related issues in genetics, women’s health, and human subjects research. Allowing sloppy terminology to confuse the issues not only undermines many years of ethical and policy clarifications, but masks risks for women, offence to various faith communities, and the promotion of untested interventions on ailing, vulnerable individuals. It is these types of dangers that *Bill C-13* must endeavour to avoid.

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