AN INCLUSIVE ETHICS FOR THE TWENTY-FIRST CENTURY: IMPLICATIONS FOR STEM CELL RESEARCH

John F. Kilner

ABSTRACT

An important contribution of Christian ethics in the pluralistic world of the twenty-first century is to emphasize inclusivity. Rather than promoting the interests of certain groups at the expense of the most vulnerable, society does well to prioritize ways forward that benefit all. For stem cell research, inclusivity entails benefiting or at least protecting the beneficiaries of treatment, the sources of materials, and the subjects of research. Adult stem cells are already benefiting many ill patients without causing harm, and select adult cells may prove even more beneficial in the future. Other types of stem cells require other bodily materials such as eggs and somatic cells that should be obtained without unduly harming those who provide them. Research subjects, especially the most vulnerable, require protection as well. Should human embryos be included among them? Considerations of location, formation, individuation, and intention are here examined. Ultimately, for safety reasons as well as workability, pluripotency, and compatibility, relatively new types of pluripotent stem cells, especially induced pluripotent stem cells, warrant special priority according to an inclusive ethics.

KEY WORDS: *stem cell research*, *embryo*, *Tuskegee Syphilis Study*, *inclusive ethics*, *vulnerable people*, *research ethics*

SCIENCE AND MEDICINE ARE two of the greatest human endeavors. Few causes are more important for everyone to rally around than these. Yet one of the most promising venues in which science is propelling medicine forward—stem cell research—has become more of a battleground than a meeting place. Everyone loses if that continues.

On one side, some opponents of embryonic stem cell research are attributing to their adversaries the outlook portrayed on signs and T-shirts that read: "I support stem cell research, but only as a byproduct of my support for killing babies."[1] The fallacious implication is that those who support embryonic stem cell research also support efforts to track down smiling, cute infants—and kill them. That claim is

[1] A picture of this is available at http://www.tshirthell.com.

outrageous, and supporters of embryonic stem cell research understandably refuse even to discuss embryonic stem cell research with those who would make such claims.

Meanwhile, a counterpoint to this assertion proclaims from the pages of a major national news venue: "Nearly every American is beginning to understand the issue in a new way: It's 'pro-cure' vs. 'anti-cure'" (Alter 2005). In other words, the message is that those who oppose embryonic stem cell research are primarily motivated by an active desire to make sure that people dying from a wide range of diseases do in fact die rather than somehow get cured. That claim is equally outrageous, and opponents of embryonic stem cell research understandably refuse even to discuss embryonic stem cell research with those who would make such claims.

These extremes signal the presence of many contentious (even if less extreme) views. However, the predicament is far from hopeless. Between the two extremes—and evident even within the extremes themselves—is a common concern. It is a concern to help particularly vulnerable people by making sure that they are included in efforts to preserve life and health. An ethics for the twenty-first century will have to make sense of this concern and give it concrete form. Christian ethics is well suited to the challenge because it aspires to give an account of what authentically *human* living looks like—not merely some more narrow account of *Christian* living. Moreover, it can draw on a wealth of historical reflection, based on the lived experience of people with God and their fellow human beings. As argued elsewhere, in some ways Christian ethics is better able to explain concerns about vulnerable people and inclusiveness than other contemporary ethics that affirm similar sensitivities (Hollman and Kilner 2006).

Arthur Dyck, at Harvard University, is a good example of a Christian ethicist who engages the challenges of the twenty-first century by considering what authentic human living looks like. In his book *Rethinking Rights and Responsibilities: The Moral Bonds of Community*, Dyck observes that an essential dynamic of human community, recognizable by theists and non-theists alike, is tantamount to what he calls "loving impartiality." Loving impartiality entails an "orientation or relation of the self to others such that all human beings belong to one inclusive community" (2005, 199). He rationally discerns that in order for community and humanity to flourish, certain conditions are necessary, prominent among them "that no human being fall outside [that is, not benefit from] the moral responsibilities to protect life" (2005, 308). These responsibilities are part of a larger set of individual, parental, and communal responsibilities to nurture (2005, 121–25).

Such an inclusive ethics appears to underlie international understandings of human rights that go far beyond the Christian community.

A good example is the United Nations Universal Declaration of Human Rights (1948). This manifesto declares that "recognition of the inherent dignity and of the equal and inalienable rights of all members of the human family is the foundation of freedom, justice and peace in the world." An inclusive ethics leads directly to paying special attention to those who are most vulnerable—for they are the ones most in need of help.

This special concern for the most vulnerable in an inclusive ethics is also being espoused by Christian ethicists such as Lisa Sowle Cahill who are taking an explicitly theological approach to Christian ethics. In her book *Theological Ethics*, Cahill invokes a wealth of historical and contemporary experience that people have had with God and their fellow human beings to discern what human flourishing will look like in the twenty-first century. "The gist of the theological contribution," according to Cahill, includes "an understanding of the common good that stresses . . . solidarity in seeking the material, social, and spiritual well-being of all; and a 'preferential option' for vulnerable and marginal members of communities and societies" (2005, 73). Christian ethics must play a "special role . . . in enhancing solidarity with the vulnerable" because "a fair and righteous community is an inclusive one" (2005, 72, 230).

Cahill notes the ample testimony borne to the wisdom of this understanding not only by traditional and contemporary religious practice, but also by the Christian Scriptures. "Biblical foundations can be found for such a perspective, especially in the Hebrew prophets and in the teaching and example of Jesus, about love of neighbor and serving the poor and vulnerable" (2005, 42). The biblical wisdom literature contains many observations along the lines of, "Whoever oppresses the poor shows contempt for their Maker, but whoever is kind to the needy honors God" (Proverbs 14:31). This recognition that even the weakest member of the human community has been created and is loved by God provides a powerful basis for an inclusive ethics that other outlooks are hard-pressed to match (Mitchell et al. 2007; Verhey 2001). This ethics is fueled by a vision of future wholeness in which "no one will be excluded" (Peters et al. 2008, 75).

Many other Christian ethicists in the first part of the twenty-first century are recognizing the central importance of an inclusive ethics. Together with Dyck and Cahill, they have developed approaches that differ from each other in many ways. But a common and urgent theme among them is the importance of paying special attention to the needs of those who are most vulnerable. For example, in her book *Disruptive Christian Ethics*, Traci West adds an important insight regarding inclusiveness and vulnerability that suggests a way of proceeding in this essay. A shortcoming of many discussions of controversial issues is

that the voices of all who have a serious stake in the issue are not heard. That deficiency is sometimes due to the fact that the voices of the weakest and most vulnerable are often the least accessible (2006, 107–9). Accordingly, in the following discussion of the implications of an inclusive ethics for stem cell research, it will be important to hear from a range of major stakeholders—paying careful attention to give voice to the weakest and most vulnerable among them.

Unfortunately, this endeavor is sometimes minimized, or sidelined completely, in the rush to defend or advance some particular activity—perhaps adult stem cell research, or embryonic stem cell research, or new ways to produce "embryonic-like" stem cells. A kind of counterfeit inclusiveness is operative here, in which including all forms of research is considered to be an evident good, regardless of what is at stake for all of the people involved.

It is crucial from the outset to be clear about the object of inclusiveness. It is all of the *people* with a stake in stem cell research who are to be taken into account. There is no a priori moral mandate to include all of the forms and activities of stem cell research in what is ultimately pursued. Research is for people; people do not exist primarily to meet the needs of research. To hear some defenses of all possible forms that stem cell research can take, one would think that the activities of research are more important than the people who have a stake in what those activities entail and yield.

An inclusive ethics for the twenty-first century will need to reject an idolatry of technology in favor of holding every potential technological innovation accountable to the flourishing of the entire human community, including those who are most vulnerable. Some people will be particularly sensitive to the needs of one group affected by a technology; others will be especially attentive to the needs of another such group. Rather than being a problem, this diversity can be an asset if people can embrace the fact that others have relationships and experiences they do not have. All people are inherently disadvantaged in their ability to duly appreciate the needs of some who are vulnerable.

Once we recognize that stakeholders challenging us to be more sensitive to the needs of a particular group are not a threat but a gift, we can welcome and listen carefully to such challenges. Here is where our commitment to inclusivity will undergo its greatest test. We may experience a desire to minimize the need of groups about which we are least concerned in order to give every benefit to a group about which we care most. That may take the form of thinking that the needs of another group are not as significant, or even that the group itself does not warrant inclusion among those whose needs are relevant.

Unless the argument for including the group is advanced only by a few self-interested people, or what is at stake for the group at issue is

manifestly less significant than what is at stake for others, there should be a strong presumption in favor of inclusion. The argument for inclusion need not, in the end, convince everyone. But if the argument raises reasonable doubt, and the stakes for the group are high, then it will be important to include that group. Practically speaking, such inclusion entails focusing on efforts to meet people's needs in a way that seeks to benefit all, rather than benefiting some groups at the expense of others.

In the case of stem cell research, the needs of various groups are being emphasized by different people today. Some people are quickest to champion the needs of the potential beneficiaries of stem cell research. These are the patients who are ill or injured and are eagerly awaiting lifesaving and life-changing treatments that this research will almost certainly yield. People personally committed to the well-being of those suffering in this way play a crucial role in sensitizing us all to the huge stakes involved in enabling stem cell research to move forward rapidly (for example, Herold 2006; Bellomo 2006).

Other people are more concerned about those who donate the bodily materials that the research requires. Such donors include those who risk harm by providing eggs or somatic cells for the research cloning necessary to produce embryonic stem cells genetically matched to the patients using them. A growing chorus of voices is calling attention to these potentially exploited donors (Magnus and Cho 2005; Hyun 2006; and Beeson et al. 2006).

Still other people are particularly attentive to the subjects of the research. Those subjects include patients on whom any form of new stem cell treatment is tried. Many have voiced concern about the importance of protecting human subjects in all research (Lemmens and Waring 2006; Iltis 2005; and Murphy 2004). This includes stem cell research (National Research Council 2005). More controversial, though, are the human embryos most intimately involved as subjects in one of the forms of stem cell research: embryonic stem cell research. Should we also pay attention to those who are speaking up for them? Only if it is reasonable to include human embryos among the vulnerable members of the human community is there a place for them in an inclusive approach to stem cell research. Thus, it will be important to consider whether arguments for excluding human embryos are valid beyond a reasonable doubt.

There are, then, many vulnerable groups connected with stem cell research. To date it has proven counterproductive to focus on just one group. So often when people encounter someone making an argument about stem cell research, they either listen to it with enthusiasm or reject it without careful consideration because it addresses or disregards the needs of a group that particularly concerns them. The virtue

of a more inclusive approach is that it gives everyone a stake in appreciating and endeavoring to meet the needs of all who are seriously affected. The goal becomes using precious and limited resources to benefit all, rather than harming some to benefit others.

Achieving this goal as part of a larger endeavor to foster human flourishing requires careful attention to the specifics of the technologies involved. Many technologies are not a single technology that people either support or oppose. Rather, there are clusters of technologies, some forms of which may be more conducive to an inclusive approach to human flourishing than others. "Stem cell research" is a good example of such a cluster: virtually everyone supports some forms (for example, adult stem cell research), but many do not support all forms. Talking about people who oppose only one form as if they simply oppose "stem cell research" suggests that there are only two approaches: people are either *for* or *against* "stem cell research." Some otherwise excellent discussions aspiring to human flourishing unfortunately tend toward "all or nothing" thinking at this point.[2] Human flourishing instead requires devoting greater attention to the different impacts of various forms of stem cell research on each stakeholder group.

1. The Beneficiaries of Treatment

In terms of stakeholders, the inclusive approach needed today would, first of all, manifestly require a deep commitment to the healing and well-being of patients and their loved ones. Huge numbers of people are suffering today from illnesses and injuries that most likely can be cured or at least significantly helped by stem cell treatments. Unfortunately, many people are not intimately related to any of these sufferers, or at least do not appreciate what stem cell treatments have the potential to do for them.

[2] Peters, Lebacqz, and Bennett, for instance, maintain that "the Vatican holds a prominent place among those who oppose stem cell research" (2008, 58). They add that there are plenty of prominent non-Catholics who "oppose stem cell research" as well, including the majority of the members of the U.S. President's Council on Bioethics, such as Leon Kass and Gilbert Meilaender—who are both "against stem cell research" (2008, 61–62, 69). However, such sweeping claims go too far. These people are not "against stem cell research" but only against certain forms of stem cell research. Since stem cell research promises so much benefit, painting the options as all or nothing can be one way to encourage accepting all forms of stem cell research—the very position that the Peters/Lebacqz/Bennett book advocates. But "all or nothing" language also leads, in this book and elsewhere (such as Peters 2007), to omitting serious attention to the many studies that have documented ways of obtaining pluripotent stem cells other than by taking apart human embryos (e.g., iPS cells and select adult stem cells, to be discussed shortly). In order to do justice to all groups with a significant stake in stem cell research, an inclusive ethics must be diligent in considering the different impacts that different technologies have on different groups.

This lack of appreciation is why people emotionally close to those in need play such an important role in the current stem cell debate. Whether it is a politician with a suffering family member, or a vocal parent with a suffering child, such voices are needed to sensitize us all to the huge stakes involved in enabling stem cell research to move forward rapidly. Otherwise, the human responsibility to nurture will remain a mere abstraction rather than a lived compassion. A celebrity with a potentially treatable illness such as Michael J. Fox (www.michaeljfox.org) can play a similar role. People often feel so close to such a person that the person's suffering can give them awareness that they otherwise would never have.

That so many are aware of, and can identify with, very public figures is therefore an opportunity. However, it is also a danger. Because such figures typically have excellent access to health care, it is easy to take for granted that those in need will receive stem cell treatments once they become available. However, far too many people—even in a wealthy nation such as the United States—do not have sufficient access to the basic health care that they need. While determining what forms of stem cell research should go forward, it is critical to address the ethics of access at the same time. The greater the stake that beneficiaries can plausibly be said to have in whatever treatments stem cell research yields, the greater the importance of insuring that those benefits will be accessible to everyone.[3]

Since the goal here is to benefit suffering patients without harming others in the process, the nearly universal support for so-called "adult" stem cell research is not surprising. This imprecisely named category of stem cell research can encompass work on all stem cells that exist in human bodies at any age of development, except for embryonic stem cells derived from human embryos.[4] Typically, none of the sources of the research materials or the subjects of the research discussed later in this article is harmed by this research, so the benefits to patients can be celebrated by all. Moreover, the possibility that the stem cells involved can be obtained from a patient's own body enhances the likelihood that treatment will be affordable and accessible.

[3] On access and patenting, see Peters et al. 2008, 74, 238. See also Cohen 2007, chap. 8, on related policy issues. In fact, in terms of public spending priorities, for stem cell research (or particular forms of it) to become a relatively high priority, its pursuit must not come at the expense of withholding funds from even more vital and basic health care that the most vulnerable groups in society need.

[4] This categorization corresponds with whether or not the stem cells can be obtained without causing the death of the source of the cells. Accordingly, stem cells from fetuses are commonly considered "adult" rather than "embryonic" if they can be obtained without killing the fetuses in order to obtain them. "Non-embryonic" would be a more precise term than "adult" to describe the alternative to embryonic stem cells, but the more familiar term will be employed here.

The health benefits of adult stem cell treatments are already considerable. Numerous medical conditions have reportedly been improved in some human beings using adult stem cell treatments. The list of seventy-three such conditions found in Bellomo's book *The Stem Cell Divide* (2006) updates the documentation in the U.S. President's Council on Bioethics's 2004 report *Monitoring Stem Cell Research* and is itself constantly being updated in reports, journals, and elsewhere.[5] Additions in recent years have included hundreds of research reports published or analyzed in the *Journal of the American Medical Association* documenting patients with heart and autoimmune diseases benefiting from stem cell treatments, as well as diabetics regaining the ability to produce vital insulin after receiving transfusions of stem cells from their own bodies (Burt et al. 2008; Couri et al. 2009; and Voltarelli et al. 2007).

A big question today is whether there is any evidence to suggest that the human body is so resilient that it contains select adult stem cells that are "pluripotent"—that is, that have the flexibility to be directed to form whatever bodily materials are needed to heal a patient.

There is ample evidence to show that *most* adult stem cells are *not* pluripotent. However, it is going too far to claim that there is no credible evidence suggesting that some adult stem cells have pluripotent capacity. There were indeed some studies reported early this past decade in which claims about the pluripotent capacity of certain adult stem cells later turned out to be invalid. That revelation established in some people's minds that only embryonic stem cells are pluripotent, and that claims asserting comparable potential for any adult stem cells are completely unfounded.

However, this view is not supported by the National Institutes of Health (NIH) in its report "Regenerative Medicine 2006." The report examines fourteen adult stem cell studies published up through the year 2003 that claimed to document pluripotency. Since criteria for demonstrating pluripotency have only been clarified fairly recently, as the report notes, it is not surprising that many of the studies did not address all of the current criteria. While suggesting that a few of the studies do fulfill the criteria, the report wisely recommends that further research is needed after 2003 to demonstrate more conclusively the degree of flexibility that select adult stem cells have (U.S. Department of Health and Human Services 2006, 23).[6]

[5] In the report literature, for example, see U.S. Department of Health and Human Services 2006. In the journal literature, for example, see Smith et al. 2006; Prentice 2006.

[6] The report indicates that further research "may eventually enhance tissue regeneration via this mechanism to clinically useful levels" (U.S. Department of Health and Human Services 2006, 24).

Since 2003 there have indeed been quite a number of further scientific reports suggesting the pluripotency of select stem cells. These have appeared in such journals as the *Journal of Cell Science*,[7] the *Journal of Experimental Medicine*,[8] *Applied Physics*,[9] *Cell Proliferation*,[10] and *Stem Cells*.[11]

Particularly impressive studies have been published in the last few years in the journals *Nature Biotechnology* and *Nature*. The first of these studies discusses adult stem cells found in amniotic fluid and placental tissue (De Coppi et al. 2007). Their extraordinary flexibility was demonstrated by inducing them to differentiate into each of the three major cell types. Similar and additional criteria for pluripotency were met by the study in *Nature*, which focused on germline stem cells found in adult human testes (Conrad et al. 2008). This emerging understanding of the flexibility of select adult stem cells may help explain the amazing ability of the human body to heal itself.

All of these reports will need to be subject to the same sort of rigorous review as those reviewed previously by the NIH. It may well be that, as in the case of those previously reviewed studies, some will meet all the criteria for demonstrating pluripotency and some will not. But there is reason to be optimistic that at least one type of adult stem cell will be able to produce the same broad range of body cells for medical treatments that some people have thought only embryonic stem cells could produce.

That is good news indeed for all those whose illnesses or injuries can be helped by stem cell treatments. And that is good news for a society seeking an inclusive approach to stem cell research that seeks to benefit all, rather than some at the expense of others.

2. The Sources of Materials

The second set of vulnerable people with a stake in stem cell research includes those who donate the bodily materials necessary for

[7] "We report here the isolation of a population of non-transformed pluripotent human cells from bone marrow" (D'Ippolito et al. 2004).

[8] "A new, intrinsically pluripotent, CD45-negative population from human cord blood . . . can be expanded to 10^{15} cells without losing pluripotency" (Kogler et al. 2004).

[9] Researchers here document the discovery of "pluripotent adult stem cells with a remarkable self-renewal ability and differentiation potency" (Kruse et al. 2004).

[10] This study reports "reproducible production of . . . cord-blood-derived embryonic-like stem cells" (McGuckin et al. 2005).

[11] Cells have "pluripotent stem cell-specific transcription factors" and "have the potential to differentiate to all three germ layers" (Miki et al. 2005). Earlier the same year another study in the same journal found cells "able to differentiate not only into multiple cell types . . . but also into mesodermal (endothelium), neuroectodermal, or endodermal (hepatocytes) lineages" (Moriscot et al. 2005).

stem cell treatments. In adult stem cell treatment, the primary bodily material is the stem cells themselves. Where possible, the cells will come from the patient being treated. One reason is that such cells will be genetically matched to the patient and therefore less likely to be rejected by the body's immune system. When using the patient's own cells is not possible, donors should be able to provide the needed cells without incurring serious risk. This would be done much the way that blood or tissue donors make donations already, with careful attention to appropriate informed consent procedures.

If embryonic stem cell treatments are developed in humans, however, the embryonic stem cells will have the disadvantage of not being genetically matched to the patient unless a cloning process is used to produce the embryo in the first place.[12] Such a process would involve placing genetic material from a cell in the patient's body into a donated egg cell. (Genetic material from donor cells would be used during the research phase of developing the cloning technology.)

Experience with organ transplantation suggests that drugs can lessen—but not necessarily eliminate—rejection problems if a genetic match is not present. Moreover, the drugs themselves can introduce new problems. So it is likely that attempts at human cloning, with the need for a supply of eggs and genetic material, will accompany the pursuit of embryonic stem cell research. Recent investigations suggest that the huge supply of eggs needed will have to be human eggs, because animal eggs appear inadequate for the human genetic reprogramming required (Chung et al. 2009). Moreover, not all human eggs can be used, since only high-quality eggs appear sufficient for this demanding process (Cervera and Stojkovic 2008; French et al. 2008).

Some believe that human egg donation is not a big problem, and that the many eggs needed to generate embryonic stem cells genetically matched to each patient would not be difficult to obtain. However, there is indeed a significant danger for the female donors involved. As we formulate an inclusive approach to stem cell research, those who call our attention to this challenge do us a great service.

[12] For simplicity's sake, the term "cloning" is used here whether the relevant technology (called somatic cell nuclear transfer) is intended to produce a born child or an embryo for research never intended to be implanted. This is the use of the term agreed upon by the diverse range of experts who make up the U.S. President's Council on Bioethics. As their 2002 report on cloning explains, there are various ethical problems with cloning itself that must be addressed as part of determining the ethics of embryonic stem cell research. At least such would be the case if it is determined that optimum medical benefit would require that the embryonic sources of the cells be produced via cloning in order to make them genetically compatible with the patient being treated.

The journal *Science* has reported that up to ten percent of egg donors may experience severe ovarian hyperstimulation syndrome, which can cause pain and occasionally leads to hospitalization, renal failure, potential future infertility, and even death (Magnus and Cho 2005). In the notorious South Korean human cloning and embryonic stem cell scandal in which purported successes were actually fabricated, sixteen of one hundred egg donors required in-hospital treatment for adverse effects—including, but not limited to, ovarian hyperstimulation syndrome (Cho et al. 2006). Such serious risks have prompted some high-tech countries such as Japan to ban egg donation altogether (Check 2006).

The South Korean situation illustrates well three different circumstances that can all too easily arise and threaten the crucial ethical standard of informed consent. There can be:

- *informational* coercion (in this case, risks were not fully explained);
- *vocational* coercion (in this case, workers were urged to donate by their boss);
- *financial* coercion (in this case, financially strapped women were offered money to prompt donation that would not have occurred otherwise).

It might seem that women should be able to assess what donating their eggs is worth to them. However, Debora Spar argues in *The Baby Business* that this is not the case (2006). The normal protections of the market—information, competition, and transparency—are largely absent in this situation. Customers—that is, researchers now, but ultimately very ill patients—are desperate; the norm of rational trade-offs does not apply. Similarly, enough money can induce poorer women, including students, to take risks as "donors" that human beings should not have to take in order to meet their basic needs (Papadimos and Papadimos 2004).

This predicament has prompted the National Academy of Sciences to insist that egg donors must not be paid—that they should receive only reimbursement for actual out-of-pocket expenses incurred (National Research Council 2005, recommendation 16). However, it will remain difficult to implement this approach, as discussed in the *New England Journal of Medicine*, as long as participants in other research can be paid for undergoing risky procedures (Steinbrook 2006).

Judy Norsigian, widely known feminist author of *Our Body Ourselves*, has joined a growing chorus of those arguing that this debate misses the most important point, if we are to truly respect and protect the vulnerable women involved here (2006; Beeson et al. 2006). They maintain that research cloning to produce embryonic stem cells is

unethical because the risks of multiple egg extraction from donors are not yet well-enough studied. There is still insufficient information to get true informed consent. At issue here is not just the immediate risk, but also the longer-term cancer risk that has been inadequately studied to date (Pearson 2006). In fact, Norsigian has indicated that the ethical violation involved here is so significant that if research cloning goes forward, she feels compelled as a mobilizer of the women's movement to encourage women's health advocates to persuade women not to donate.

"But we *have* to obtain those eggs," some will say, because developing the cures to help hurting people requires it. Such thinking is detrimental to an inclusive approach if it inclines us toward justifying harming some in order to benefit others. We need to appreciate deeply the suffering of patients who need stem cell treatments *and* the suffering of women who can all too easily be pressured into egg extraction. Our aspiration for inclusiveness should strengthen our resolve to alleviate both—and certainly not to add substantially to the suffering of one group in order to lessen the suffering of another.

The donation of other body ("somatic") cells is not immune from similar issues of coercion. But an even greater danger of exploitation of the vulnerable has to do with the problem of "therapeutic misconception" (Hyun 2006). This problem can occur when donors have no prospect of personally benefiting from the experiment in which they are participating. They may nevertheless think that they will benefit—and they may participate only because of that mistaken idea. The result is a violation of informed consent.

Somatic cell donors, for example, may donate their genetic material for research cloning only because they assume that any embryonic stem cells developed will give them guaranteed access to lifesaving genetically matched treatments. If that is not intended by the researchers, then the informed consent process must be more proactive than it generally is to prevent this misconception—even at the risk of losing donors. Here again a commitment to inclusiveness will help us not to put one group, whom we laudably endeavor to help, ahead of another vulnerable group in a way that harms some in order to benefit others.

3. The Subjects of Research

The third group of vulnerable people connected with stem cell research includes the subjects of that research. Regarding adult stem cell research, standard research ethics guidelines must be followed, as elsewhere in research (Emanuel et al. 2008; Lemmens and Waring 2006; and Iltis 2005). Adult stem cell research is subject to the same temptation already discussed—that is, to harm some in order to benefit

many. For instance, in their zeal to help children with diabetes, researchers prematurely subjected several children to a risky adult stem cell study before experiments on consenting adults had demonstrated sufficient benefit to justify the risk (Manier 2007). An inclusive approach would encourage the aggressive pursuit of treatments for children suffering from diabetes without exposing some children to serious harm in the process.

Embryonic stem cell research presents a unique challenge, in that the human embryos involved in the research typically are taken apart and then die in the process. How serious a matter is that? Many people see embryos as human beings, worthy of the same protections that should be given to other human beings—or at least have a reasonable doubt about the claim that embryos are not human beings in this fullest sense. It is not simply a matter of debates over the science involved or the religion involved, although it is often cast that way. An entire way of thinking is involved. Because an inclusive approach to stem cell research requires that the well-being of no affected group of people be seriously compromised if that is avoidable, the dynamics at work in excluding human embryos need careful attention.

3.1 *Scientific and philosophical considerations*

People's concerns about embryos often begin with the science. They may be familiar with the long-standing definition of the human embryo provided by the National Institutes of Health: "the developing organism from the time of fertilization until the end of the eighth week of gestation" (2009). Or as various embryology textbooks put it, the life history of a new individual has begun at conception.[13]

Accordingly, many people recognize that even the early embryo, at the blastocyst stage, is not just "human life"—as blood cells are alive and human. Rather a human embryo is a human organism—a being that is human—who, unless fatally disabled or injured, can typically develop throughout the human lifespan as long as suitable nurture and environment are provided. A child or an adult is also a human being who, unless fatally disabled or injured, can typically develop throughout the human lifespan as long as suitable nurture and environment are provided. Recognizing this parallel gives many people pause.

[13] Ronan O'Rahilly originated the international Carnegie Stages of Human Embryological Development for the International Terminologica Embryologica Committee which determines scientifically correct terms for embryology worldwide. As he writes in his basic embryology textbook, fertilization "is a critical landmark because, under ordinary circumstances, a new, genetically distinct human organism is formed. . . . The embryo now exists as a genetic unity" (2001, 8, 33). The Carnegie Stages are also discussed in Carlson 2005.

They are struck by the difference between a bunch of human cells that are gathered together in the same place—such as a group of skin cells—and an integrated human organism, or being, that has already begun developing in an increasingly complex way toward adulthood. They note that living adult bodies could also be described as "some cells," but that adults, like embryos, are not "*just* some cells." They are also biologically integrated (self-organizing) beings.

That human embryos are, biologically, human beings is enough to persuade many that they warrant the protections due to all other human beings. Other people resist making this equation because they see something added to human beings after the embryonic stage that gives them a more protectable status as "persons." This addition most commonly has to do with location, formation, individuation, or intention. Why do many find it unconvincing that some such feature adds to the significance and protectability of human beings?

The appeal to *location* is that even if embryos implanted in a womb are persons, those in dishes in a lab are not, because they cannot develop there into born human beings. However, people are people regardless of where someone puts them. If someone chooses not to put adults where they can obtain what they need in order to live, that does not invalidate their personhood; nor would that seem, to many, to invalidate an embryo's personhood.

It is important to avoid "genetic determinism" here. Genetics and environment, for example, are both important influences on who people become over time. But development over time is not the same issue as status at a given moment in time. At a given moment, genetics helps define whether one is human, whereas environment helps define whether a human is thriving, not whether one is human.

The appeal to *formation* is that only embryos whose neurological "primitive streak" has formed—generally by about fourteen days after fertilization—should be considered persons, because the primitive streak provides biological evidence that these organisms will have human brains and related capacities such as self-awareness and reasoning in the future. However, if it is the biological evidence that such capacities will develop in the future that matters, that is already present genetically from day one. If it is the capacities themselves that matter, rather than the biological basis for them, then it would be acceptable to kill born children who have not yet developed such capacities or adults who have lost them—an approach that relatively few would espouse.

The appeal to *individuation* flows from the observation that early embryos can divide and become more than one embryo, as in the case of identical twins. Because the embryos are not in their final form yet, it is held, they do not qualify as persons. However, embryos are

changing form in all sorts of ways throughout their development. So the question really is whether division per se demonstrates that what was thought to be something (a person) was not really that thing. Division is not an unusual phenomenon. For instance, a country may divide into two countries. The division does not mean that there was not a country present before the division. Division simply suggests that multiple entities (countries or persons) were in some unofficial sense present previously—or at least can be in the future. One (or more) was genuinely present prior to division.

The appeal to *intention* has primarily to do with embryos produced through cloning for the purpose of embryonic stem cell research. The idea is that embryos produced through cloning and intended to be implanted and born may be persons; but they are not persons if they are intended only for research and thus death before they are fourteen days old. However, as many see it, people are people regardless of what others intend to do to them; and such is the case with people at any stage of their development, whether embryonic or adult.

In other words, many would say that embryos are *persons with potential* rather than *potential persons*. Sperm and eggs—in fact, every body cell in this age of cloning—have the potential to become persons. So it is understandable that some may refer to them as "potential persons." But such language is inappropriate regarding human embryos. They already are beings or organisms that are human. Their moral significance is rooted in what they are, not merely in what they have the potential to become.

In this understanding, the fact that human embryos have not yet manifested their full potential no more invalidates their personhood than young adults' personhood is invalidated by the fact that they have not yet manifested their full potential. *Potential* persons rightly do not receive the same protections as actual persons. But embryos are not potential persons, in the eyes of many; they are persons with potential.

So, it is not hard to understand why so many at least have questions about claims that human embryos are not "human beings," or that all human beings are not persons. Unless all reasonable doubt on these matters can be removed, it makes sense that embryonic stem cell research be viewed as an example of the objectionable, non-inclusive approach to meeting human need—that is, severely harming some to benefit others.

3.2 *Religious considerations*

The discussion to this point illustrates that the basis for being protective of human embryos is scientific and philosophical, and not necessarily religious. In other words, this is a *human* concern, which

can stand on its own without uniquely Christian or other religious justifications. But many people find that biblical resources, which have been sources of wisdom for so many people through the ages, are also helpful sources of insight that affirm and help explain the significance of what science and reason demonstrate. To be sure, biblical writings say little about human life at the embryonic stage of development. But they do make references to the uniqueness of human beings, with a suggestive glimpse or two at what that might mean for their earliest formative stage.

For instance, the book of Genesis suggests that the preciousness of the life of human beings is rooted in humanity being created in the image of God—a distinction that is in place when a being is established as human as opposed to plant or animal.[14] Needless to say, it is only in light of the relatively recent understanding of genetics that this distinction is now understood to be in place genetically at the embryonic stage.

Later biblical passages reflect such an outlook regarding early human life. For example, in the Psalms (for example, Psalm 51), King David comments on the earliest days of his existence—which he says took place when he began to grow within his mother. David considers the "me" who is speaking as an adult to be the same "me" (person) who was conceived in his mother's womb.

Many who look to New Testament writings such as the book of Luke find a similar mindset there. When they read that Mary, newly pregnant with Jesus, meets with her cousin Elizabeth, they find that God has become a human. God has identified completely with the experience of a human being, not by taking the form of an adult, but by becoming a human embryo.[15]

Such insights do reinforce other considerations, but they are not required in order for people to recognize human embryos as their fellow humans. That point needs to be made loudly as Christian ethics endeavors to make a public contribution in the twenty-first century. Otherwise, any identification of people as "Christian" may be enough to disqualify anything they have to say on a matter of ethics in the public arena. Simply because someone has a personal faith, or personally considers a religious argument to be persuasive, does not relieve others of the obligation to engage the non-religious arguments that a person

[14] According to the opening chapter of Genesis, God creates plants (1:11–12), then animals (1:20–25), and then "God created humankind in his image" (1:27).

[15] According to the opening chapter of Luke, when Mary became pregnant with Jesus she "went with haste" (1:39) to Elizabeth's home, where Elizabeth discerns that Jesus, her Lord (1:44), is present and Mary is his mother, even at this presumably embryonic stage in Jesus's development.

of faith puts forward. Non-religious arguments are no less valid simply because the person who makes them has beliefs on which those arguments do not depend. Fairness requires recognizing that those who consider embryos to be vulnerable human beings worthy of the protection due to all persons often do so on non-religious grounds. Some are motivated by religious conviction to act on or to speak up for those views, but motivation should not be confused with argumentation. Otherwise, non-religious participants in public debates should also typically be excluded because they are inspired by motivations that many others do not share.

Charles Krauthammer, a *Washington Post* journalist who has served on the U.S. President's Council on Bioethics, has offered a pointed reminder not to assume that arguments supportive of human embryos are religious:

> Many secularly inclined people such as myself have great trepidation about the inherent dangers of wanton and unrestricted manipulation—to the point of dismemberment—of human embryos. You don't need religion to tremble at the thought of unrestricted embryo research. You simply have to have a healthy respect for the human capacity for doing evil in pursuit of the good [2007, A19].

A fellow member of the President's Council, Princeton law professor Robert George, voices a similar concern (George and Gomez-Lobo 2005).

3.3 *Anti-inclusive thinking*

This concern over harming some to benefit others is a reminder that the same anti-inclusive temptation is present here as it is elsewhere in the stem cell arena. It is possible to be so overwhelmed with the importance of helping suffering patients or protecting endangered egg donors that the importance of sufficiently respecting the lives of human beings at the embryonic stage of development is neglected. Those concerned about the well-being of human embryos encounter this neglect whenever they hear embryonic stem cell research being advocated without any mention of the embryonic subjects of that research who are harmed in the process.

They hear many advocates saying implicitly—and sometimes quite explicitly—that it does not matter whether embryos are human beings: so much can be done through embryonic stem cell research that will benefit so many people to so great a degree, that this itself is sufficient justification for the research. Such a view embodies the heart of the anti-inclusive outlook at work here—namely, that if enough benefit can be generated for enough people, then whatever must be done to a minority in order to achieve that great end can be justified.

If a minority must be treated badly enough, those responsible for doing so may well feel compelled to bring into question the full humanity of those mistreated, in order to better justify the mistreatment. For instance, in debates over embryonic stem cell research, it may be claimed that if embryos are human beings, surely they are not as much so as adults or children are: people know a human being when they see one.

Why is this line of thinking so upsetting to many people? What concerns them is that this is a line of thinking that has been voiced before in the United States. There was a time that using black slaves as property was so economically beneficial that people advocated doing it. That made some people uncomfortable unless slaves could be defined as less than fully human. That was not hard to do because there were obvious visual differences between these black slaves and their white owners. Even the Supreme Court conveniently ruled in the Dred Scott case that black slaves were mere property from which to profit, rather than human beings sharing in the basic equality of all human beings. As the Court saw it, it was "too clear for dispute" that Dred Scott was not a human being (U.S. Supreme Court 1857, 393).

What unsettles many today is that it was as clear to the Court then that Dred Scott was not a full human being as it is clear to others today that an embryo is not a human being. It is quite easy to underestimate what we can mentally justify, many worry, if the economic or medical benefits that we aspire to are attractive enough. This is, emphatically, not to suggest that weighty arguments against the personhood of the human embryo cannot be made. Rather, it is to suggest that without such arguments, the door is wide open for anti-inclusive thinking.

The dangers of this thinking—especially the inadequate protections for certain groups of people that can follow—are quite substantial in the realm of medical research. Some point to the Tuskegee Syphilis Study, conducted in Alabama from 1933 to 1972 by the U.S. Public Health Service, involving 399 poor African American men in Alabama with latent syphilis (Brandt 2000). Researchers wanted to learn how the disease would progress if left untreated. The goal was to learn whether various medical interventions would genuinely be beneficial. They knew that if the men learned about treatment options, those patients might get treated, and their value to the study would be lost. So the men were not told, nor were they treated, and many were seriously harmed in the process.

A more recent careful review of the scientific environment of the Tuskegee Syphilis Study helpfully cautions against attributing to the researchers involved a malicious intent (Benedek and Erlen 1999). For most of the study, the treatment available was not very effective or accessible, and the disease often went away on its own. Nevertheless,

medical experts at the time the study was launched did not view such considerations as reasons not to treat syphilis (Moore et al. 1932); and both state and national law sometimes required syphilis to be treated during the years of the study based on the best medical understanding of the day (Benedek 1978, 43). Thus, the Tuskegee Syphilis Study in all likelihood harmed some men and their family members without their consent—though to what extent is hard to quantify.[16]

To be sure, the standard of informed consent had no legal status until late in the study. Nevertheless, that a practice is not illegal does not necessarily mean that it is ethical, especially where human well-being is manifestly at risk. Further, the withholding of treatment from the men in the study—in violation of current state law, without seeking a legal waiver—may suggest that those involved knew that something less than upright was being done. It is also telling, according to the official panel convened years later to investigate, that no informed consent requirements were observed even after they received legal status following the formulation of the Nuremburg Code for the protection of research subjects (Katz 1973, 14).

The Tuskegee researchers likely had the same good motives as embryonic stem cell researchers today: that is, they hoped to be able to more effectively treat suffering patients in the future. What worries many people is that such motives can become disengaged from inclusive thinking—as they did in the Tuskegee Study, according to a senior investigator's official critique (Katz 1973, 14). When that happens, if there appears to be no other way to obtain certain medical benefits, then seriously harming some to benefit a greater number of others who are suffering can be justified. Admittedly, few would own this rationale were it worded so baldly. However, if those being harmed are limited to those considered by many not to be as fully human or worthwhile as others, then the idea becomes more palatable and persuasive.

Although Tuskegee researchers thought that they could not achieve the medical ends in view without doing what they did, would they have used means that normally would not have been condoned, had they been working with people more mainstream than these voiceless black heirs of the Dred Scott legacy? Many worry today that voiceless embryos are being treated the same way in embryonic stem cell research. As cited earlier, the findings of Krauthammer and George and Gomez-Lobo are among them. The challenge here is not

[16] Some sources suggest that as many as one-hundred men died of syphilic complications who might have been helped, with many more subjected to increased suffering (for example, Jones 1993b, 275). See also Jones 1993a. Others note that another forty wives plus nineteen babies may have been unnecessarily contaminated in the process (for example, Ricard and Thuan 2001, 17).

to forget the lesson of the tragic Tuskegee experience, as preserved on the web site of the Tuskegee Syphilis Study Legacy Committee: "Doing Bad in the Name of Good" is a temptation that society today must fastidiously resist. The point here is not that the Tuskegee research and embryonic stem cell research are similar in all respects—only that anti-inclusive thinking has often been operative in the justification of both.

As chronicled in the book *Useful Bodies*, this experience is a part of a larger pattern of experiences in the United States and elsewhere (Goodman et al. 2003). While regulations are currently in place to constrain abuse of research subjects, the experiences in this book document how persistent the tendency is to look at the bodies of human beings—especially the weakest and most vulnerable—and justify using them more as property than human beings. A comment from a leader connected with one of the experiences discussed in this book is particularly telling: "If you think these kinds of experiments can't happen again, then they probably will" (Massachusetts Department of Mental Retardation 1994, 3). When people do not recognize non-inclusive thinking as such, it is most free to flourish.

Thus, zeal for producing medical treatments, though often quite well-intentioned, can run into conflict with an inclusive disposition not to mistreat some in order to benefit others. This disposition is what causes people to recoil when they hear about the Dred Scott case. One popular way to forestall such reaction against mistreating human beings is to claim, as Ron Reagan did before millions of viewers at a national political convention, that the difference between human embryos and human beings is obvious (Reagan 2004). Rather than engaging the biological and philosophical arguments for the full humanity of human embryos, Reagan pursued a strategy that surfaces all too often today. He suggested that the only reason that anyone cares about human embryos is "theological"—and that therefore such a concern is irrelevant in the public arena.

Wired magazine—a secular biotech publication—has published a different view:

> The stem cell argument isn't exclusively a religious debate anymore. Right-to-life advocates aren't the only ones who believe stem cell research could threaten moral integrity. . . . Now, even stem cell researchers themselves, and patients who could be cured as a result of stem cell studies, are opposing them. Mary Jane Owen is one of them. She is blind, has partial hearing loss, and uses a wheelchair because of a spinal cord injury. [As she puts it:] "I think we've lost our sense of morality. . . . We've become so utilitarian" [Philipkoski 2000].

Krauthammer would likely agree.

3.4 *Beyond definitions*

How convincing are the arguments that the lives of human embryos should be protected like the lives of other human beings? Needless to say, they are convincing to many people who oppose embryonic stem cell research. As National Stem Cell Holding, Inc. has found, even those supportive of embryonic stem cell research often recognize that it is difficult to overcome the influence of at least some of the arguments against the full humanity of human embryos.[17] Jon Shields has analyzed the many current debates over embryonic stem cell research in the feature article of a symposium in the journal *Society*. He concludes that proponents of embryonic stem cell research "have a serious intellectual problem." They have not been able to refute the argument for viewing human embryos as true human beings—an argument which he believes is "grounded in science and philosophy" (2007, 18, 20). Recent objectively worded survey questions also suggest that a large portion—perhaps the majority—of the U.S. population shares the view that human embryos should not be destroyed for research purposes (Levin 2008, 51–52).

Accordingly, it is not surprising to find some supporters of embryonic stem cell research pursuing a different tactic. They are endeavoring to change the very definition of the word "embryo" in a way that makes people think that embryos are not involved in producing embryonic stem cells.

Dividing the pre-fetus embryonic stage of human development into sub-stages has long been done. Doing so can be helpful when it adds clarity and precision to discussion. There are differences between pre-implantation embryos and post-implantation embryos. But efforts to replace the term "pre-implantation embryo" with "pre-embryo" have generally obscured rather than clarified. The embryonic period has long referred to the earliest period of development in many species, not just humans. So the term pre-embryo suggests, by definition, that a being has not yet begun its earliest stage of development.

Accordingly, the NIH and various leading embryologists indicate that an embryo is present from day one onward, as noted earlier; and the widely accepted terminology of "embryonic" stem cell research is based on that definition. It makes little sense to say that embryonic stem cells do not come from embryos. Nevertheless, some embryonic

[17] National Stem Cell Holding, Inc. announced in July 2007 the discovery of a group of biomaterials produced from embryonic stem cells that appear to have special healing ability. Nevertheless, the company continued similar research using adult stem cells and celebrated in an August 12, 2007, PR Newswire press release their discovery of a way to produce the same biomaterials without using, as they put it, "problematic" embryonic stem cells.

stem cell research supporters are suggesting a re-definition of "embryo" along the lines of the confusing "pre-embryo" terminology—thereby defining "embryo" as "a developing organism beginning about two weeks after conception" (Herold 2006, 121).[18] That would be convenient for embryonic stem cell research, since it would mean that embryonic stem cells do not come from embryos. However, as embryonic stem cell researcher James Thomson has acknowledged, "You're creating an embryo. If you try to define it away, you're being disingenuous" (Boyle 2005). Promoting deceptive language does a great public disservice, since it dupes people into supporting technologies that they may deeply oppose. The eventual backlash when the duplicity is revealed only serves to foster public distrust of science.

A constructive way forward will require open and honest discussion. Most people who are protective of human embryos would be happy if these sources of embryonic stem cells were not actually human beings. These advocates really are eager to help the first vulnerable group discussed earlier—those who are ill or injured—in every ethical way possible. The problem is not typically a lack of compassion for such sufferers. Many people simply do not find convincing the arguments that either deny human embryos are human beings, or claim that not all human beings are "persons" and that only persons' lives warrant full protection.

But what if embryonic stem cells could be obtained without doing harm to embryos? (For the purposes of discussion, the cells in view here will simply be called "pluripotent" stem cells. Whether they actually come from embryos or not, this term emphasizes the ultimate goal for the stem cells in view here: the highly prized capacity of giving rise to all cell types in the body.) If such cells could be obtained without doing harm, then the major ethical obstacle would be removed. Two basic approaches to avoiding this obstacle have been proposed. One involves producing pluripotent stem cells without harming embryos. The other involves using only "unwanted" embryos that will be dying anyway.

3.5 *New cell sources*

Producing pluripotent stem cells without doing harm could take numerous forms, four of which are discussed in a paper produced by the U.S. President's Council on Bioethics (2005). One, embryo biopsy,

[18] The term "pre-embryo" is sometimes used by such people to refer to the human organism in the first two weeks of life. However, as Lee Silver has observed, the term has recently been invented "for reasons that are political, not scientific": "The new term is used to provide the illusion that there is something profoundly different between a six-day old embryo and a sixteen-day old embryo" (1997, 39).

typically involves removing a single cell from an eight-cell embryo, developing an embryonic stem cell line from that cell and allowing the embryo to continue to develop to a successful birth.

The second approach, altered nuclear transfer, typically involves a process similar to the cloning technique of somatic cell nuclear transfer. In this approach, the genetic material from a body cell is altered before being placed in an egg whose nucleus has been removed. The resulting entity—not a viable embryo but rather a generator of pluripotent stem cells—could never develop into a born human being.

The third approach, transplantation from dead embryos, operates analogously to organ transplantation from a patient who has just died. The idea is to remove still-living individual embryonic stem cells from embryos that have permanently lost the biological integration necessary to develop into born human beings—much as brain-dead patients have lost that integration and the ability to develop further.

The fourth approach, dedifferentiation of body cells, involves reversing the differentiation process that "turns off" or blocks most of the genetic code in cells as they become more specialized. The goal is to "reactivate" most of the genetic code so that the induced pluripotent stem (iPS) cells have the pluripotency of embryonic stem cells, without reactivating the entire code and giving the cells totipotency (that is, the ability to develop into an entire born human being).

Since one inclusive goal in view here is to generate maximally beneficial cells without harming human embryos, there are at least four practical and ethical criteria that can be used to evaluate the four proposed alternate sources of pluripotent stem cells (and any others in the future):

1. *Workability*: Can the technique actually produce stem cells?
2. *Pluripotency*: Do any cells produced have the flexibility to give rise to all cell types in the body?
3. *Compatibility*: Do the cells genetically match the patient to be treated, in order to minimize the risks of rejection?
4. *Safety*: Are human embryos harmed by the technique?

How well do the four proposed approaches fare according to these four criteria?

The first approach, *embryo biopsy*, may well meet the workability criterion. Not only has it been accomplished in mice (Chung et al. 2006), but human embryonic stem cell lines also appear to have been developed from single cells removed from early human embryos (Chung et al. 2008; Klimanskaya et al. 2006). The cells produced, being embryonic stem cells, would indeed be pluripotent.

However, cells produced through embryo biopsy would not be genetically matched to the patient needing treatment unless the embryo were

produced in the first place via a cloning process using a cell from the patient's own body. Since even in the United States only a minority of people consider cloning for research (that is, non-reproductive) purposes to be ethical, there is a built-in hurdle attending this approach.[19] The extra (cloning) step involved could also render this approach more expensive than other ways of producing genetically matched pluripotent stem cells, thereby exacerbating the "fair access" challenges noted earlier.

While embryo biopsy aspires to avoid harming embryos, it would only be harmless under two conditions. The seven-cell embryo remaining after the single cell is removed must be able to develop into a born infant and ultimately an adult without having been harmed by the biopsy process. And the single cell removed must not have the capability of developing into a born human being, as when an early embryo splits and both parts of the embryo develop into born twins.

Embryo biopsy has been done for a number of years now as a part of preimplantation genetic diagnosis (PGD)—using the removed cell to make sure that the embryo is healthy or otherwise desirable. This procedure kills some embryos in the process and may well inhibit the ability of others to implant in the womb (Hudson 2006). Thus, it is not a procedure that those most protective of human embryos would want to encourage. In fact, it is not clear yet if PGD itself would become less reliable if the cell removed had to divide an extra time to produce one cell for testing and another for generating an embryonic stem cell line.

Moreover, there is not yet any long-term experience available to establish whether or not the process has caused damage to the embryos that will only become evident later in life. The first mammal cloning, involving the British sheep named Dolly, was initially declared a complete success. But after a number of years, Dolly's early arthritis and death raised questions warranting further study before the safety issue could be resolved.[20] In the primary experiments in which embryo biopsies generated human embryonic stem cells, the biopsied embryos either perished or were frozen, instead of being allowed to develop to implantation and birth (Chung et al. 2008).

As for the single cell removed from an eight-cell embryo, such a cell appears to be able to develop successfully to the point of birth and

[19] This was the overall verdict of survey results produced by Johns Hopkins University's Genetics and Public Policy Center ("Biologists" 2006). These figures were also confirmed in Levin 2008. They are also discussed in Condic and Rao 2008. This latter study found that less than one-third of the people support research cloning.

[20] According to the Science Museum of the National Museum of Science and Industry in London, "Dolly's arthritis and now relatively young death fuel concerns that even clones appearing healthy at birth may have underlying genetic abnormalities" (2009). Similarly, see Giles and Knight 2003.

beyond in some animals.[21] Whether such is the case in humans is currently a matter of debate.[22] More research will be needed before the totipotency of such a cell can be firmly established or dismissed. Meanwhile, efforts are under way to carry out some embryo biopsies earlier—at the four-cell stage (for example, Wang et al. 2008). Such efforts increase the likelihood that new embryos are being produced and harmed—that some cells being removed could have instead developed to implantation and birth.

The second approach, *altered nuclear transfer*, has not been accomplished yet in humans, so its workability is unknown. However, one form of it has been accomplished in mice (Meissner and Jaenisch 2006). Part of its attractiveness is that it would straightforwardly meet both the pluripotency and compatibility criteria (Hurlbut 2005).

Its ability to meet the safety criterion is more controversial. Some worry about the risks to egg donors discussed earlier, since so many eggs would be needed for the research phase and later to produce stem cells genetically matched to every person who needs them (McLaren 2007). Others are particularly concerned about harm done to human embryos. The version of altered nuclear transfer accomplished in mice involves inactivating a gene in the genetic material from the body cell and turning it back on in the stem cells generated by the "entity" produced through the transfer. This entity appears to some to be closer to a genetically disabled embryo than to something truly other than an embryo.

A more recent form of the approach, called oocyte-assisted reprogramming, is more widely considered likely to meet the safety criterion (Condic 2005).[23] It involves using the cytoplasm of an egg to genetically reprogram the genetic code (that is, the genome) in the nucleus of a body cell, as in cloning; but the new cell produced is a pluripotent stem cell rather than a totipotent embryo. This procedure has not yet been accomplished in animals or humans because of various scientific obstacles (Byrnes 2007).

[21] "These results show that up to the 8-cell stage, at least some blastomeres retain the potential to develop into an animal" (Tarkowski et al. 2005). The authors cite previous studies involving animals other than mice in which normal adults were obtained from single blastomeres removed from eight-cell embryos, and indicate that they are the first to accomplish the same in mice—albeit using the support of other blastomeres in the process.

[22] For example, Klimanskaya et al. 2006 doubt that single cells at this stage can develop into a born human being, whereas McLaren argues that such cells could be totipotent. The national German Reference Centre for Ethics in the Life Sciences considers these cells in most cases to be totipotent (2009).

[23] See descriptions on the Altered Nuclear Transfer web site, including the proposal put forward by Grompe and George 2005. For one list of supporters, see "Production" 2005.

The third approach, *transplantation from dead embryos*, appears to some to be workable (Landry and Zucker 2004). Others have doubts. The debate over workability stems from the fact that there is published research claiming to demonstrate that human embryonic stem cell lines have been produced from cells removed from embryos that have died (Zhang et al. 2006). However, there are no accepted criteria to demonstrate that a particular embryo has "died," analogous to brain death criteria for born human beings. Moreover, cells from embryos that have stopped developing may already be genetically faulty—if not damaged in the arresting process—and so might not consistently produce healthy stem cell lines.

This approach fares well in terms of pluripotency. Yet, as with embryo biopsy, the compatibility criterion would not be met unless a controversial cloning procedure were used to produce the embryo. If the embryos involved were dead already, then there would be no safety concerns regarding those embryos. However, if single cells were salvaged no later than at the eight-cell stage, there would be the same ethical problem as in embryo biopsy—specifically, that the cell might be able to develop into a born human being.

The fourth approach, *dedifferentiation of body cells*, is where the great breakthrough has occurred. Although prospects for this technology appeared remote when the President's Council issued its paper, they improved considerably in June 2007 with the publication of results from three different research groups showing that normal skin cells can be reprogrammed to an embryonic state in mice (Okita et al. 2007; Wernig et al. 2007; and Maherali et al. 2007). Before the year was out, the same feat had been accomplished in human beings by two different sets of researchers (Takahashi et al. 2007; Yu et al. 2007).

What sets this approach apart at the present time is its demonstrated ability to meet all four criteria. Not only does the technique work, but the iPS cells produced are pluripotent, they can genetically match the patient to be treated, and their production does not harm human embryos. In fact, major confirmation of workability and pluripotency came in mid-2009 when another two studies used iPS cells to produce every type of body cell by producing live-born mice (Zhao et al. 2009; Kang et al. 2009).

One lingering problem, though, concerns a safety issue of another type. Because the revolutionary cell reprogramming was initially accomplished using the cancer-causing c-Myc gene inserted using a cancer-causing retrovirus, there were concerns about the safety of patients who would be receiving iPS cells. However, researchers very quickly developed a way to reprogram cells without using the c-Myc gene (Kim et al. 2008). Soon thereafter researchers learned that a safer adenovirus could be used instead (Stadtfeld et al. 2008). Then, in

mid-2009, an alternative approach dispensing with viruses altogether was announced (Woltjen et al. 2009). Such rapid overcoming of safety risks—together with the discovery of ways to improve the efficiency and speed of the process (Aasen et al. 2008)—bodes well for the future of this technology.

The enthusiasm of scientists in response to this development is thus understandable. When the breakthrough in mice demonstrated its realistic potential, a report in *Nature* quoted Max Planck Institute stem cell specialist Hans Scholer as saying, "It's unbelievable, just amazing. It's like Dolly [the first cloned animal]. It's that type of accomplishment" (Cyranoski 2007). The similar achievement in humans generated even greater excitement. Robert Lanza, Chief Science Officer of Advance Cell Technology, exclaimed that production of these so-called iPS cells in humans has reached "a tremendous scientific milestone—the biological equivalent of the Wright Brothers' first airplane" ("Milestone" 2007). Soon thereafter was reported a stunning announcement by Edinburgh University researcher Ian Wilmut, the cloning pioneer famous for producing Dolly: he was abandoning cloning and embryonic stem cell research because iPS cell technology "represents the future for stem cell research" (Highfield 2008).

It turns out, then, that there is at least one emerging approach to producing pluripotent stem cells (iPS cells) that is more in line with an inclusive ethics than using human embryos. It is more attractive for other ethically significant reasons as well. Yet, just as the tendency of embryonic stem cells to produce cancer in mice has made it very difficult to test them safely in human beings (Blum et al. 2009), so iPS cells and all other forms of stem cells must remain accountable to appropriate standards of human safety. An inclusive ethics supportive of all subjects of the research requires no less.

3.6 *Unwanted embryos?*

What about the other proposed way to obtain embryonic stem cells without doing harm—that is, using only "unwanted" embryos that will be dying anyway? Proponents of using leftover embryos for stem cell research typically hold that using such embryos is in line with the ethical treatment of human beings. But many appropriately question that assumption. They look to other settings where human beings are dying, to see if it is considered ethically acceptable to remove their vital body parts before they have actually died.

That issue has been publicly addressed at length with regard to removing vital organs from dying patients by the U.S. Department of Health and Human Services (n.d.). The U.S. United Network for Organ Sharing has given similar careful consideration in its white papers to

removing vital organs from prisoners on death row (see also Petechuk 2006). In both cases the fact that people will inevitably be dying has been found to be an insufficient justification for killing them even earlier. The ends in view—obtaining vital bodily materials for sick patients—may be admirable. But harming (especially killing) some to benefit others has been deemed unacceptable. It is profoundly at odds with an inclusive outlook committed to the well-being of all vulnerable groups in society.

Meanwhile, there is another basic problem with the notion that unwanted embryos could provide an acceptable source of stem cells: this has to do with the very assumption that these embryos are unwanted. The number of frozen embryos in the United States has often been estimated to be about four hundred thousand, based on a study by the RAND Corporation (RAND Corporation 2003; Hoffman et al. 2003). Many people mistakenly assume from this figure that there is a huge supply of leftover embryos that must be thrown away if they are not used for embryonic stem cell research. This misunderstanding is illustrated by the recent book *Stem Cell Wars*, which invokes the RAND study's four hundred thousand figure to suggest that a huge number of frozen embryos will unavoidably be destroyed whether or not they are used for embryonic stem cell research (Herold 2006, 33). Based on the notion that four hundred thousand embryos would need to be adopted by someone in order to spare them from death—plus the claim that only one hundred embryos have been adopted to date—the book mistakenly concludes that leftover embryos have a mere one in four thousand chance of being adopted (Herold 2006, 127).

An examination of the RAND report itself reveals quite a different picture. The four hundred thousand number itself is sufficiently documented there. However, the vast majority of those four hundred thousand—88.2% of them—are not "left over" according to that report. Instead, they are eagerly wanted by the very people who produced them. Those people are planning to implant them in the future in order to have more children.

Because only about two-thirds of the remaining 11.8% are likely to survive thawing,[24] only thirty thousand frozen embryos are likely to be viable and unwanted by those who produced them. But even these embryos are not truly unwanted. They are very much wanted—by women yearning to adopt them and carry them to term in their own wombs. There are so many such women, in fact, that there are now

[24] This well-established figure for embryos produced through in vitro fertilization has been confirmed for embryos produced through intracytoplasmic sperm injection as well (for example, Figueira et al. 2009).

well over two hundred agencies facilitating embryo donation for reproductive purposes.[25]

Some women prefer embryo adoption to the adoption of born children because of the opportunity to ensure the healthy development of their child while in the womb. Others are motivated by the opportunity to rescue a young one who otherwise would perish, perhaps inspired by the proverbial call to "rescue those being led away to death" (Proverbs 24:11).

Technically, only so-called "donation" is required on the part of the parents who produced the embryo, since the law does not presently recognize embryos as full persons. Accordingly, one of the larger agencies is called the National Embryo Donation Center (2009), based in Tennessee. However, other agencies, such as California's Snowflakes Program, go through a full adoption process as part of their affirmation of the full personhood of the embryo (Snowflakes Program, Nightlight Christian Adoptions, Inc. 2009).

Snowflakes alone, just one of the hundreds of agencies, has provided approximately three thousand embryos for adoption already—and those numbers are expected to escalate in the near future.[26] Such figures suggest that giving thirty thousand embryos a chance at life through an expanded embryo adoption or donation effort is realistic.

Some respond by claiming that many parents with extra embryos do not now seek out embryo donation, so society should encourage the use of these embryos in stem cell research. Again the echoes of Tuskegee are unsettling. Tuskegee researchers claimed that those poor black men with syphilis would never seek out medical treatment anyway, and so should be allowed to die in the syphilis experiments instead (Katz 1973, 14). Was the likely fate of those black men a reason to facilitate it—or, rather, to protest it? Today people would commonly say that everything possible should have been done to help those men avoid such a fate—and many are saying the same regarding the fate of frozen embryos.

4. Conclusion

An inclusive approach to stem cell research for the twenty-first century, then, will listen to all who are speaking up for vulnerable

[25] For a list of hundreds of such agencies and their contact information, see Miracles Waiting n.d.; see also Embryo Adoption Awareness Center 2008.

[26] This figure is made available online by Snowflakes; and a weekly update is available from the Snowflakes Program Coordinator. The anticipated "blizzard" of babies that will be born through embryo adoption in the years immediately ahead is discussed in Lester 2009.

groups with a substantial stake in this research. No such groups will be excluded unless exclusion is warranted beyond a reasonable doubt. There are at least minimally plausible reasons for including patients, donors, and embryos, along with other research subjects, among the relevant vulnerable groups. How to use precious resources to benefit all, rather than harming some to benefit others, is worthy of society's best efforts.

Many other important questions remain related to other aspects of research on human beings from embryos to adults, but those will have to await another venue. Concerning stem cell research: research using adult stem cells is to be encouraged. Great effort should be made to confirm whether select adult stem cells have the pluripotency to generate whatever types of stem cell treatments patients may need. Further development of iPS cell research particularly warrants enthusiastic support as well. An inclusive approach can encompass all of these endeavors.

An inclusive commitment to all of humanity, however, would not welcome embryonic stem cell research that requires the destruction of human beings at the embryonic stage of development, whether they result from cloning (somatic cell nuclear transfer) or fertilization. As long as it appears, as it does at the present moment, that it may well be possible to develop the full range of stem cell treatments without harming human embryos, an inclusive approach can meet the needs of patients, donors, and embryos alike. This is a form of "new century vision for all humanity" that Christian ethics—though not only Christian ethics—can bring to the table (Keeling 1990, 235).

Lest such lofty resolve be relegated merely to the private halls of Christian ethics rather than attributed to the best that human integrity has to offer, we would do well not to lose sight of the Tuskegee experience and other human experiences like it. The Tuskegee review panel concludes its report with the recognition that the danger we must most guard against is our anti-inclusive willingness to do bad to some if the good to be achieved is great enough (1973, 47).[27] Our safety, argues the panel, lies ultimately not in devising many rules and regulations, as important as those are. It is ultimately a matter of the human spirit. It is rooted in our resolve not to harm the most vulnerable among us—whoever they are—even in the pursuit of the loftiest medical goals.

[27] In a similar vein, the Tuskegee Syphilis Study Ad Hoc Advisory Panel concludes its introduction to the report by favorably quoting Hans Jonas's reminder that "society would indeed be threatened by the erosion of those moral values whose loss, possibly caused by too ruthless a pursuit of scientific progress, would make its most dazzling triumphs not worth having" (1973, 22; Jonas 1969, 245).

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