
Oh What a Beautiful Blastocyst: Embryonic Stem Cell Research

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On Friday, November 6, 1998, the *New York Times* reported that two researchers working in different labs had managed to grow a certain kind of cell. This special kind of cell is called a stem cell and to understand why the story was on the front page of the *Times*, you need to know something about human fetal development.

When the egg of our mother and the sperm of our father unite, what used to be two cells becomes one new thing. One new cell. Pretty soon, that cell divides in two, they divide into four, the four divide into eight and so on, until nine months or so later, the Baby You is born.

In the very early stages of this division, the collection of multiplying cells is called a blastocyst; a little later on it is called an embryo. The difference between the few-celled Blastocyst You and the complex Baby You that gets born nine months later is only partly one of numbers of cells. It is also a difference in complexity. By the time the Baby You emerges, you have a heart, lungs, brain, fingernails, eyelids, knees, ears, skin and all the other components of a human body that work together to make you able to eat, sleep, move around and think. The Blastocyst You had none of these things, and yet the Blastocyst You is exactly that collection of cells that gave rise to all those specialized parts of the Baby You that eventually got born. How does that happen?

No one knows all the chemistry involved, but one thing researchers have discovered is that the cells of the blastocyst are “totipotent” which in layperson’s language means they are able to do everything—be a heart, a lung, a brain, a fingernail—because that’s how nature gets from the Blastocyst You to the Baby You. Before our cells differentiate into specific kinds of tissue, they are capable of everything. These “totally capable” cells, the stem cells, are the ones that the researchers reported in the *Times* managed to grow in the lab.

It’s front page news because the researchers hope that if they can isolate cells that can grow up to be anything, the next step might be to coax them to be something in particular. Perhaps a damaged heart could be repaired by inserting a totally capable cell into the heart that will, guided by the body’s signals, “learn” that it is a good, new heart cell. Perhaps a totally capable cell could be encouraged to become a new functioning kidney, to replace a patient’s old and worn out one. Although the experiments need to be repeated, some researchers have already made new heart cells from mouse stem cells and have successfully implanted them into the heart tissue of a living mouse.

So far, this sounds mostly like the next chapter in the Triumphant Progress of Medical Science. Is there an ethical issue here?

It depends where you look. If you look at the application of this amazing technology to real human problems, the ethical issues you might discover are not very different from the ones we have in applying any new technology. How will patients have access to this new development? Will it be so

expensive that only the rich can afford it? Will we know the hazards of the technology in advance of trying it on real people? Are there hidden risks that we are not yet aware of?

The newer ethical issues in stem cell research have less to do with application and more to do with the research itself, especially with the question of the source of the material the researchers are manipulating. Stem cells don't grow on trees. They are found at the very early stages of human development, when sperm and egg have united, formed a blastocyst and are beginning to grow. In natural pregnancies, these stages are within the body and take place quietly without a lot of fanfare. Most often a woman will not even know she is pregnant when the blastocyst or embryo is the size of the ones the researchers used.

But these cells don't come from natural pregnancies. The two researchers in the *Times* got their stem cells from clinics that do In Vitro Fertilization, literally, "fertilization in glass," for couples who have been unable to conceive children naturally. When a couple comes to such a clinic, the woman's ovaries are stimulated so that she produces many eggs instead of the usual one-each-month. The man collects his sperm that the clinic doctor then mixes with the eggs in a petri dish (the "vitro" part). Instead of the one triumphant sperm being accepted by the one egg, as happens when fertilization occurs in the body, many sperm and many eggs unite in the glass and if all goes well, many new blastocysts result. Theoretically, each of these could be implanted into the woman, one at a time and she could give birth to one at a time. The extras are stored in a freezer until it is time for their use. The process deliberately produces extras because it is so costly, both financially and physically, to stimulate the ovaries. "One at a time" is also mostly theoretical, again because of expense. Most often, several embryos are implanted in the woman, in hopes that at least one will result in a pregnancy and live birth.

This deliberate production of extras is the just the source of ethical controversy, not only in stem cell research but in In Vitro Fertilization itself. There is no physical difference between the embryos that get implanted (and, we hope, turn into a baby) and the ones that remain in the freezer waiting their turn. Is it ethical to allow them to remain there forever? Can they be destroyed? Do they have a "right" to be born? Most importantly for stem cell research, may they be the subject of experimentation?

There isn't a question about whether the embryos in the freezer are human. They are. They certainly aren't canine or feline. They have a DNA sequence that makes them unmistakably human. The question is really to what extent should that human life be protected and what rights should be afforded it. (Those who have no problem with experimenting on or discarding these embryos because "they aren't human yet" are making a linguistic mistake. What these people probably mean is that although they may be human genetic material, with the potential for becoming a full grown human being, embryos are not yet human *persons*, deserving of the protection we otherwise give human persons.)

The controversy is deep seated. Some will say that once conception has taken place, once the sperm and egg unite whether it happens inside the body or "in the glass," that conception has all the potentiality of a human person and must be afforded all the protection of one. Sentience should not matter, say these people. Persons who have had serious strokes or have advanced dementia no longer have sentience but that doesn't convince us they are no longer human persons.

Others say that, while embryos are clearly human and should be treated with respect, experimentation on them should not be forbidden. These embryos would be discarded, say these people,

and at least experimentation will bring them no further harm and may actually help other human beings in the long run. The potential for good that may emerge from the research justifies the experimentation. Besides, goes this argument, Nature Herself loses somewhere between 50 and 70 percent of fertilized eggs—very very early pregnancies that women may not even know about and surely don't feel the loss of. Should we be trying to save all of these embryos, or have little funerals for them, or isn't there something about the earliness of development that somehow prevents us from really seeing it as a loss?

So one of the ethical issues in stem cell research has to do with the moral status of very early embryos. This is a controversial question that even the courts have not been comfortable in settling. Look at the case of the couple who went through In Vitro Fertilization, and then died in a plane crash. What happens to those embryos? If they have a right to be born, should they be given to couples who can't produce their own embryos? How do we select which ones to implant and which to discard? Or look at the couple who went through IVF and then divorced. She wanted to have an embryo implanted but he didn't want her to. Are embryos more like property, which the "owners" must agree on the disposition of, or are they more like children, where custody must be decided, but they can't be thrown away?

Another source of ethical difficulty is the way the research has gotten to this point. There is currently a Congressional ban on Federal funding for fetal tissue research, of which embryonic tissue research is a part. There is no such ban on the use of private money. The research reported in the *Times* was conducted entirely with private research dollars. Are we comfortable with a system that bans money for a thing, without banning the thing itself? Or should we as a society undertake more conversation about the development of such technology so that we can embrace it, fund it and be sure that it is subject to the kind of moral scrutiny and ultimate control that normally accompanies Federal funding? Will the companies that funded the research need to recover their costs in a way that jeopardizes fairness in the way the technology is eventually applied?

It turns out, then, that stem cell research is only the latest controversy in the line. How you get the cells for research, a result of free market development of IVF, is actually more problematic than the way the technology may eventually be applied. It raises the question about whether you can ethically take the second step when the first step is ethically controversial.

In Vitro Fertilization is probably the least scrutinized aspect of the health care industry. It developed with no standards, no oversight and no regulation. The likelihood of taking a baby home from an IVF clinic varies a great deal from clinic to clinic—quality outcomes have few benchmarks. One result of this free market development of IVF is the way the spare embryos are regarded.

Other countries that have IVF also have sources of moral deliberation that represent some systematic attention given to these issues. Several countries have decided that up until the 14th day of development, embryos may be experimented upon, but not after that. These issues have been decided in public, in advance. Now wouldn't **that** be something new?