A Scientist Looks At Cloning

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Human cloning is accomplished by introducing the nucleus from a human somatic (body) cell into an egg cell whose nucleus has been removed, hence the term somatic cell nuclear transfer. It produces a human embryo who is virtually genetically identical to an existing or previously existing human being.

Proponents of human cloning hold out two hopes for its use: (1) creating children for infertile couples, so-called "reproductive cloning", and (2) promises of medical miracles to cure diseases by harvesting embryonic stem cells from cloned embryos created from patients, euphemistically termed "therapeutic cloning".

First let us be clear on the terms. All human cloning is reproductive, in that it creates - reproduces - a new developing human intended to be virtually identical to the cloned subject. Both "reproductive cloning" and "therapeutic cloning" use exactly the same techniques to create the clone, and the cloned embryos are indistinguishable. The process, as well as the product, is identical. The only distinction between the embryos is their subsequent use-either implantation in hopes of a live birth, or destruction in hopes of a medical miracle. Indeed, the embryo at that stage, whether produced by cloning or by the old-fashioned method of joining egg and sperm, is the same-embryos produced by the different methods could not be distinguished under the microscope. Disingenuous euphemisms to describe a cloned embryo as something other than an embryo are not scientific. And despite attempts to employ various euphemisms, scientifically, genetically, what is created is a human being; its species is Homo sapiens, it is neither fish nor fowl, monkey nor cow-it is human.

There are good scientific reasons why reproductive cloning should be banned. It has an enormous failure rate-95-99% of clones die before or soon after birth. Out of 277 cloned embryos, one Dolly the sheep was produced, and even this "successful" clone is beset with abnormalities-it was recently disclosed that she has developed early onset arthritis and may need to be put down. In 2001 a group at the Whitehead Institute achieved 5 born mice from 613 cloned embryos, and all of the born mice showed abnormalities in their genetic expression. We can expect that of those few cloned humans who survive to live birth, most will die shortly thereafter and the others be plagued by abnormalities due to the cloning process. And because of the clone's abnormalities, the health of the surrogate mother carrying the clone is also endangered.

No human cloning is therapeutic. In medical ethics, "therapeutic research" is defined as research that could provide therapeutic benefit to the individual subjected to research risks. Thus "therapeutic cloning" is obviously not therapeutic for the embryo-the new human is specifically created in order to be destroyed as a source of tissue. Creating new human life solely to destroy it for the potential benefit of others is unethical. It turns human life into a commodity, creating a caste system of lesser humans for scientific sacrifice, what the renowned biochemist Erwin Chargaff calls "a kind of capitalist cannibalism."

Human research cloning is completely unnecessary for medical progress. Theoretically the embryonic stem cells from the cloned human embryo would be used to generate matched tissues for transplant into the patient from whom the embryo was cloned. However, the promises put forth for therapeutic use of embryonic stem cells are not supported by the scientific literature, and remain speculative. There are no current clinical treatments based on embryonic stem cells, and only few and modest published

successes using animal models of disease. There is even difficulty obtaining pure cultures of specific cell types in the laboratory dish. For example, an Israeli group reported that they had obtained insulin-secreting cells from human embryonic stem cells. While this might initially sound like a potential treatment for diabetes, only 1% of the cells in the dish secreted insulin. The remaining 99% of the cells were a mixture of nerve, muscle, some beating heart cells, and also cells which continued to grow. Those growing cells point out another problem with embryonic stem cells-the potential for tumor formation. In a January 2002 report on the possible use of embryonic stem cells to treat Parkinson's disease in rats, 20% of rats injected with embryonic stem cells died from tumors formed in their brains. A treatment that agonizingly kills one-fifth of the patients is not very promising.

Too often a false choice has been put forth-that we must either destroy embryos or allow patients to die. However, there are other choices, in particular adult (including umbilical cord) stem cells. Those who say adult stem cells are not a valid alternative are relying on obsolete, outdated information. A wealth of scientific publications over the last few years documents that adult stem cells are a much more promising source of stem cells for regenerative medicine. They show the capacity to generate all adult tissues. Most (if not all) tissues contain stem cells, or can be formed from stem cells from other body tissues. Even fat has been found to contain stem cells that can be transformed into other tissues. Indeed, any time someone has looked in a tissue for stem cells, they have found them.

Many published references also show that adult stem cells can multiply almost indefinitely, providing sufficient numbers for clinical treatments. Adult stem cells have been shown to be effective in treating numerous animal models of disease, including diabetes, stroke, Parkinson's disease, spinal cord injury, and heart disease.

Moreover, adult stem cells are already being used clinically to treat many human diseases, including various cancers, multiple sclerosis, lupus, and arthritis, and anemias including sickle cell anemia. Adult stem cells are already being used to form new cartilage and ligaments so that people can walk, to grow new corneas to restore sight to blind patients, to treat stroke patients, and to repair damage after heart attacks. And recently announced, the first Parkinson's patient to be treated has achieved an 83% recovery one year after treatment. The patient's own adult stem cells can be used for these treatments, preventing the problems of immune rejection, with no tumor formation.

Human cloning also poses a serious potential risk to women. An enormous supply of human eggs will be needed to treat even a small group of patients. A calculation based on the best published numbers for cloning of animals and derivation of embryonic stem cells, both extremely inefficient procedures, reveals that to treat just one patient group, the 16 million diabetes patients in the U.S., will require at least 800 million human eggs, or approximately 80 million women of childbearing age to "donate" eggs. This will subject a large number of women to health risks due to the high hormone doses and surgery to which they will be exposed. The result will be that human eggs will also become a commodity, with the resultant exploitation of disadvantaged women in this country and abroad.

The scientific obstacles to human cloning as a source of medical benefits will likely prove insurmountable. Overviews in several scientific journals all point out that the idea of therapeutic cloning is falling from favor because researchers are finding it to be too costly, inefficient, and unnecessary-those who still support it are relying on obsolete information. A recent scientific report supposedly showing success of therapeutic cloning to treat a genetic defect in mice actually was a failure; indeed, the only real success in the experiment was achieved by bringing cloned mice to birth and using the born mouse bone marrow to treat the disease. Ironically, the similar genetic defect in humans, severe combined immunodeficiency syndrome ("boy in the bubble disease"), was cured in infants in 2000 using gene therapy with the infants' own bone marrow adult stem cells.

Even the idea that cloning is the only method for preventing rejection of transplanted embryonic stem cells is completely false. In the March 18, 2002 San Francisco Chronicle, researchers with Geron Corp. and with Advanced Cell Technologies admit that there are ways to prevent rejection of transplanted cells without therapeutic cloning, but that "that message has not gotten out," and that "the need for cloning to overcome immune system rejection has been overstated." The report goes on to note "the scientific community has put out the message that a ban on therapeutic cloning will prevent researchers from solving the immune-system problem--an argument that seems at best a stretch, and at worst, a deception."

Human cloning is unsafe, unethical, and unnecessary. There are no valid or compelling grounds-ethical, scientific, or medical-to proceed. A comprehensive ban on human cloning is the only sufficient answer.