Plenary Presentation: Ethics, Science, and Politics of Cloning: The Costly Dilemma

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The discussion of cloning has been transformed by recent media attention from a "sober scientific" pursuit to something of a spectacle. Weinberg spoke about the evolution of this phenomenon and how it has affected the scholarly endeavor and will continue to do so.

The address began with a refresher on basic biology and terms. Cloning involves stem cells, the "progenitors" of worker cells in the body. Stem cells can self-renew indefinitely and can differentiate into cells with specialized functions. Stem cells retain all the genetic information of the organism without differentiation or specialization, whereas postmitotic cells access only the information in the genome necessary to their specialization. The worker cells perform the work of the tissue until they die, and then the stem cell divides again, creating another specialized cell to continue to do the work of the tissue. Over time, the stem cells die and can no longer regenerate the body's tissues. If one could replenish the body's supply of stem cells, ideally through donors, the body's worker cells could be replenished.

Weinberg moved into a discussion of the different types of cloning. There are two kinds of cloning: reproductive and therapeutic. Reproductive cloning involves the use of an adult cell implanted in an enucleated oocyte, which develops into a multicell organism. Dolly the sheep is an example of this type of cloning. A mammary cell was implanted in an enucleated oocyte and brought to term. The cloning of Dolly proved that reproductive cloning, heretofore only a theory, was possible and that once differentiation is begun it can be undone; that is, a cell reverts to an embryonic state and "forgets" its differentiation when inserted into an oocyte. Complications can occur in this type of cloning. Only a few embryos came to term, and some of the clones that were born had difficulty in breathing and had large-birth syndrome. The question is whether the congenital defects are a result of the cloning.

Therapeutic cloning involves the growth of an embryo matured to about 150 cells and then the cessation of the life cycle. The cells are extracted and could be, in principle, injected into diseased tissue to cause regeneration. Therapeutic cloning does not have the inherent problems associated with reproductive cloning; however, it sparks a heated debate about the beginning of life and the appropriateness of destroying an embryo.

After the appearance of Dolly, several people claimed to have cloned humans. The press took the announcements seriously, and the findings were publicized without scientific discourse and peer review. The biology community remained silent. Research in cloning has undergone a radical shift since federal funding was lowered as a result of the debate about the morality of cloning. Research has moved to the private sector and is "hush-hush". However, the biotechnology industry jumped into the market with both feet, cloning cows and other animals. These companies went directly to the press, again bypassing scholarly review of their work. Some electronic journals focusing on reproductive cloning have been founded, but they seem to lack rigorous peer review.

The discourse about cloning centers around the perception of when life begins and is therefore not easily resolved. These discussions will continue to play a large role in the funding and study of cloning.