



# VIRGINIA LEGISLATIVE ISSUE BRIEF

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## *Medical, Ethical, and Scientific Issues Relating to Stem Cell Research*

In the last several years, the controversy surrounding stem cell research, particularly research using human embryonic stem cells, has become ubiquitous, with media attention and even hyperbole generated for virtually every new development.

### **Stem Cell Characteristics**

Stem cells are unique in that they asymmetrically divide, producing another cell like themselves and a progeny cell that has the potential of differentiating into one or more cell types/tissues.

Embryonic stem cells are said to be pluripotent, i.e., capable of maturing into any cell type depending on the surrounding environment and the signals being received.

Adult stem cells, on the other hand, appear to be "multipotent," able to differentiate into several cell types, but not all cell types.

Some stem cells may only divide once and others can divide many times, producing many different cell types. Thus, the most difficult problem in stem cell science may be to figure out how and which stem cells have the capacity for generating specific tissues.

### **Stem Cell Therapies**

Adult stem cells have been identified and isolated for approximately twenty years. However, human embryonic stem cells (or, as they may be referred to, germ cells) are a new research development, having only been reported on November 5, 1998, by two independent research teams in two different journals.

At this time, only adult stem cells are being used for human therapies in the United States. Adult stem cells derived from blood (peripheral and umbilical cord) and bone marrow have been used in the treatment of various cancers, such as certain leukemias and breast cancer, and some other diseases, such as sickle cell anemias, for at least 10 years. There are more than 120 FDA-approved uses of adult stem cells for human therapeutics and FDA-monitored human clinical trials, using adult

stem cells. Recently, adult stem cells derived from adipose and other tissues have been used in regenerative treatments

Embryonic stem cell research is, however, still in its early stages, with most of the research being preclinical and experimental. Thus, although the public wants therapies to be immediately available, the development of medical applications for embryonic stem cells will take time.

### **Therapeutic Cloning: Somatic Cell Nuclear Transfer**

Clinical applications for embryonic stem cell research may involve "therapeutic cloning," a term regretted by many scientists. The actual process would be to match an embryonic stem cell line to the patient by performing somatic cell nuclear transfer from the patient into a female donor's oocyte and then to generate a blastocyst (an early stage embryo). The resulting stem cell line would be a precise match for the patient, thus eliminating host-graft rejection.

### **Stem Cell Issues**

In the United States, the public discussion relating to stem cell research has been multidimensional, including religious, ethical, societal, commercial, scientific, and political views. For example:

- Some religions view the destruction of a human embryo as the taking of human life.
- Ethicists often discuss a distinction between embryos created for research purposes and those created for reproductive purposes.
- The vast potential for developing therapies has excited much of the public, particularly those individuals suffering from or having relatives suffering from degenerative diseases and other disorders with little hope of recovery.
- In many countries, the potential for commercialization of medical applications and the possibility of spinning

ahead of American researchers has motivated government funding for human embryonic stem cell research.

- Among scientists the race to be first to discover answers to the many research questions and to identify the best source of stem cells for various applications is being funded more and more frequently with private money.
- Recently, the prestigious National Academies issued human embryonic stem cell research guidelines in response to concerns about the “hodgepodge of federal regulations,” “the lack of regulation of privately supported human embryonic stem cell research,” and “public and scientific uncertainty about the appropriate procedures for conducting stem cell research.”

In the political arena, many actions have taken place. For example:

- From 1996 through 2004, the “Dickey Amendment,” named for its sponsor Representative Dickey, prohibited federal funding for the creation or destruction of human embryos for research purposes.
- In 1999, the Dickey Amendment was analyzed as banning funding of the derivation of stem cell lines from human embryos, but not banning federal funding of research on embryonic stem cells after the cells had been established.
- In 2001, President George W. Bush announced that federal funds may only be awarded for human embryonic stem cells that meet specific criteria, i.e., derived prior to 9:00 P.M. EDT on August 9, 2001; derived from embryos created for reproductive purposes that were no longer needed; and donated after informed consent and without financial inducements.
- In states across the country, legislatures have taken actions to create state-funded stem cell initiatives, to promote cord blood banking as a source of “young” stem cells, to curtail stem cell research, and, more and more frequently, to study the many issues.