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The Sinking Ship of Embryonic Stem Cell Research

by Warren Krug *(November/December, 2005)*

The U. S. Congress continues to debate the merits of embryonic stem cell research. Early in 2006 the Senate will likely vote on a bill that will loosen restrictions on publicly funded embryonic stem cell studies.

The House has already passed the measure, and the Senate is expected to do so also. But neither chamber has enough votes to override President Bush's likely veto.

The question is whether or not the congressmen are arguing over a "sinking ship." Embryonic stem cell research at the moment seems to be going the way of the Titanic.
First, embryonic stem cell research has, so far at least, proven to be pretty much of a total failure. Secondly, research using adult stem cells (the noncontroversial kind of stem cells) has had some remarkable successes. Finally, several projects are underway to try to obtain or mimic embryonic stem cells while trying to avoid the moral concerns.

The two kinds of stem cells

Stem cells are unspecialized cells that can be induced to become cells with special functions such as the beating cells of the heart or the insulin-producing cells of the pancreas. Scientists hope that stem cells can become the basis for treating diseases such as Parkinson's disease, diabetes, heart disease, and many others.

There are two kinds of stem cells. *Embryonic stem cells* are obtained from embryos. Scientists must destroy an embryo in order to obtain the stem cells, and this is what makes the procedure controversial. People who believe life begins at conception find the practice unacceptable.

Adult stem cells are taken from tissues or organs such as bone marrow, the brain, blood vessels, skeletal muscle, skin and liver. Research involving adult stem cells does not require the ending of any life and, as a result, is generally acceptable to prolife citizens.

The advantage of embryonic stem cells is that they are easier to obtain and are pluripotent. This means that they have the potential to be turned into any of the various cells in the body. Adult stem cells have been thought to be more limited in their ability to be turned into other cells. However, adult stem cells have the advantage of being less likely to be rejected by the body if a patient is able to use his own stem cells to treat a disease. **1**

The failure so far of embryonic stem cell research

Just recently it was reported that an international team of researchers has discovered that human embryonic stem cells accumulate changes in their genetic material over time. This means that existing lines may not be suitable for human therapeutic purposes. "This is an extremely important and troublesome discovery," Robert Lanza, a stem cell biologist said.

Aravinda Chakravarti, a geneticist at Johns Hopkins University added that the mutations were pretty major. "We are talking about whole chromosomes being deleted, chromosomal arms being amplified," and big chunks of DNA mutating, he said, adding that many of the changes appeared cancerous. **2**

Even before this latest development, the respected British medical journal Lancet had published a piece that described as "sensationalist" and "hype" claims that embryonic stem cell research will soon result in cures for a host of diseases. "No safe and effective stem cell therapy will be widely available for at least a decade, and possibly longer," the magazine says.

Also quoted was a British neurologist, Neil Scolding, who highlighted some of the problems with embryonic stem cell research. Having to clone hundreds of thousands of human embryos to produce enough stem cells for research "is surely unrealistic," he pointed out. **3**

The successes of adult stem cell research

While embryonic stem cell research has gotten most of the headlines, scientists working with adult stem cells have quietly been racking up a long string of successes.

Over the summer, scientists at Australia's Griffith University announced the results of a four year research project that by itself might render the debate over embryonic stem cell research moot.

They say that olfactory stem cells can be turned into heart cells, brain cells, nerve cells, and almost any other kind of cell in the body. And this can be done without the problems of rejection or tumors forming, a common side effect of using embryonic stem cells.

Research team leader Alan Mackay-Sim told an Australian newspaper that his scientists were able to grow nerve cells, liver cells, heart cells, muscle cells and other cells from cells harvested from the human nose.

Although American scientists don't seem to have taken much note of the discovery, it has excited the medical community in Australia. **4**

Scientists at Children's Hospital in Pittsburgh and Wake Forest University School of Medicine have also found that adult stem cells can multiply and become other types of cells to a degree not previously believed possible. **5.**
As for the accomplishments of stem cell research to date, *stemcellresearch.org* has provided the following list of ailments for which patients have already been helped via stem cells:

Adult Stem cells:

Cancers
Brain cancer
Retinoblastoma
Ovarian cancer
Skin cancer: Merkel Cell Carcinoma
Testicular cancer
Tumors abdominal organs Lymphoma
Non-Hodgkin's lymphoma
Hodgkin's lymphoma
Acute Lymphoblastic leukemia
Acute Myelogenous leukemia
Chronic Myelogenous leukemia

Juvenile Myelomonocytic leukemia
Cancer of the lymph nodes
Multiple Myeloma
Myelodysplasia
Breast cancer
Neuroblastoma
Renal Cell Carcinoma
Various solid tumors
Soft Tissue Sarcoma
Waldenstrom's macroglobulinemia
Hemophagocytic lumphohistiocytosis
POEMS syndrome

Auto-Immune Diseases
Mutliple sclerosis
Crohn's disease
Scleromyxedema
Scleroderma
Rheumatoid arthritis
Juvenile arthritis
Systemic lupus
Polychondritis
Sjogren's Syndrome
Behcet's disease
Myasthenia
Autoimmune Cytopenia
Systemic vasculitis
Alopecia universalis

Cardiovascular
Heart damage

Ocular
Corneal regeneration

Immunodeficiencies
X-linked hyper immunoglobuline-M Syndrome
Severe Combined Immunodeficiency Syndrome
X-linked lymphoproliferative syndrome

Neural Degenerative Diseases/Injuries
Parkinson's disease
Spinal cord injury
Stroke damage

Anemias / Blood Conditions
Sickle cell anemia
Sideroblastic anemia
Aplastic anemia
Amergakaryocytic Thrombocytopenia
Chronic Epstein-Barr infection
Fanconi's Anemia
Diamond Blackfan Anemia

Thalassemia Major
Red cell aplasia
Primary Amyloidosis

Wounds / Injuries
Limb gangrene
Surface wound healing
Jawbone replacement
Skull bone repair

Other Metabolic Disorders
Osteogenesis imperfecta
Sandhoff disease
Hurler's syndrome
Krabbe Leukodystrophy
Osteopetrosis

Embryonic Stem Cells:

NONE

Clinical trials involving adult stem cells have shown good long term results. A new study of blood cancer patients who had stem cell transplants showed them to be nearly as healthy as their peers 10 years later. **6**

Efforts to Overcome Moral Objections to Embryonic Stem Cell Research

Some scientists who still see the potential value of embryonic stem cells despite the early disappointments have been working on projects to overcome the moral objections.

Recently it was reported that the authors of two new studies say they have invented methods that do not lead to the destruction of viable embryos. The reports appeared in October in the online version of Nature magazine.

The research so far has been conducted only on mice, but both study teams believe the results could be translated to people.

One procedure uses a standard technique that in vitro fertilization clinics use to perform a biopsy on embryos before they are implanted in the womb. A cell called a blastomere is removed from an eight-celled embryo without destroying the embryo, and a line of embryonic stem cells is created from the blastomere.

The other procedure creates an embryo that is genetically and physically unable to implant in the womb.

However, some bioethicists worry about the ethics of these new techniques, in particular, the embryo that was designed to be unable to implant. It loses its potential to become an adult human, just like an aborted fetus does. **7**.

In another research project, scientists at the University of Wales College of Medicine think they can trick human eggs into creating a "spark of life" by emulating a fertilization process. The "embryos" thus created lack the paternal chromosomes necessary to develop into a unique human being. The tricked eggs begin dividing until they reach 50 to 100 cells, and, in theory, embryonic stem cells could be obtainable at that point. **8**

In still another research program, British and American researchers have produced embryonic-like stem cells from umbilical cord blood. A report on their successes appeared in the August issue of Cell Proliferation.

"It's incredibly exciting," said study co-author Larry Denner. "Being able to use pluripotent stem cells that are available from cord blood really speaks for itself. The potential is there." There are already over 1 million cord blood samples banked.

We must wait and see how successful and ethical these new procedures turn out to be.

In the end, if the successes that adult stem cell research is having continue, embryonic stem cell programs may indeed sink like the Titanic. For this we will surely thank the Lord, and may Congress and the media get the message! *LSI*

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