

# ADULT & NON-EMBRYONIC STEM CELL RESEARCH

## Advances & Updates for April 2006

### HIGHLIGHT OF THE MONTH –

#### Stem Cell Hope for Liver Patients

British doctors reported treatment of 5 patients with liver failure with the patients' own adult stem cells. Four of the 5 patients showed improvement, and 2 patients regained near normal liver function. The authors noted: "Liver transplantation is the only current therapeutic modality for liver failure but it is available to only a small proportion of patients due to the shortage of organ donors. Adult stem cell therapy could solve the problem of degenerative disorders, including liver disease, in which organ transplantation is inappropriate or there is a shortage of organ donors."—*Stem Cells Express*, Mar. 30, 2006

### ADVANCES IN HUMAN TREATMENTS USING ADULT STEM CELLS—

**BUERGER'S DISEASE:** Scientists in Korea using adult stem cell treatments showed **significant improvement in the limbs of patients with Buerger's disease**, where blood vessels are blocked and inflamed, eventually leading to tissue destruction and gangrene in the limb. Out of 27 patients there was a 79% positive response rate and improvement in the limbs, including the healing of previously non-healing ulcers. — *Stem Cells Express*, Jan. 26, 2006

**BLADDER DISEASE:** Doctors at Wake Forest constructed **new bladders for 7 patients with bladder disease, using the patients' own progenitor cells** grown on an artificial framework in the laboratory. When implanted back into the patients, the tissue-engineered bladders appeared to function normally and improved the patients' conditions. "This suggests that tissue engineering may one day be a solution to the shortage of donor organs in this country for those needing transplants," said Dr. Anthony Atala, the lead researcher. — *The Lancet*, Apr. 4, 2006; reported by the AP, Apr. 4, 2006

**LUPUS: Adult Stem Cell Transplant Offers Promise for Severe Lupus** — Dr. Richard Burt of Northwestern Memorial Hospital is pioneering new research that uses a patient's own adult stem cells to treat extremely severe cases of lupus and other autoimmune diseases such as multiple sclerosis and rheumatoid arthritis. In a recent study of 50 patients with lupus, the treatment with the patients' adult stem cells resulted in stabilization of the disease or even improvement of previous organ damage, and greatly increased survival of patients. "We bring the patient in, and we give them chemo to destroy their immune system," Dr. Burt said. "And then right after the chemotherapy, we infuse the stems cells to make a brand-new immune system."— *ABC News*, Apr. 11, 2006; *Journal of the American Medical Assn*, Feb. 1, 2006

**CANCER: Bush policy may help cure cancer** — "Unlike embryonic stem cells ... cancer stem cells are mutated forms of adult stem cells. ... Interest in the [adult stem cell] field is growing rapidly, thanks in part, paradoxically, to President George W. Bush's restrictions on embryonic-stem-cell research. Some of the federal funds that might otherwise have gone to embryonic stem cells could be finding their way into cancer [adult]-stem-cell studies." — *Time: Stem Cells that Kill*, Apr. 17, 2006

**HEART: Adult stem cells may inhibit remodeling and make the heart pump better and more efficiently.** — Researchers in Pittsburgh have shown that adding a patient's adult stem cells along with bypass surgery can give significant improvement for those with chronic heart failure. Ten patients treated with their own bone marrow adult stem cells improved well beyond patients who had only standard bypass surgery. In addition, scientists in Arkansas and Boston administered the protein G-CSF to advanced heart failure patients, to activate the patients' bone marrow adult stem cells, and found significant heart improvement 9 months after the treatment. — *Journal of Thoracic and Cardiovascular Surgery*, Dec., 2005; *American Journal of Cardiology*, Mar., 2006

**STROKE: Mobilizing adult stem cells helps stroke patients**— Researchers in Taiwan have shown that mobilizing a stroke patient's bone marrow adult stem cells can improve recovery. Seven stroke patients were given injections of a protein—G-CSF—that encourages bone marrow stem cells to leave the marrow and enter the bloodstream. From there, they home in on damaged brain tissue and stimulate repair. The 7 patients showed significantly greater improvement after stroke than patients receiving standard care. — *Canadian Medical Association Journal* Mar. 3, 2006

## **69 CURRENT HUMAN CLINICAL APPLICATIONS USING ADULT STEM CELLS\***

### **ANEMIAS & OTHER BLOOD CONDITIONS:**

- Sickle cell anemia
- Sideroblastic anemia
- Aplastic anemia
- Red cell aplasia (failure of red blood cell development)
- Amegakaryocytic thrombocytopenia
- Thalassemia (genetic [inherited] disorders all of which involve underproduction of hemoglobin)
- Primary amyloidosis (A disorder of plasma cells)
- Diamond blackfan anemia
- Fanconi's anemia
- Chronic Epstein-Barr infection (similar to Mono)

### **AUTO-IMMUNE DISEASES:**

- Systemic lupus (auto-immune condition that can affect skin, heart, lungs, kidneys, joints, and nervous system)
- Sjogren's syndrome (autoimmune disease w/ symptoms similar to arthritis)
- Myasthenia (An autoimmune neuromuscular disorder)
- Autoimmune cytopenia
- Scleromyxedema (skin condition)
- Scleroderma (skin disorder)
- Crohn's disease (chronic inflammatory disease of the intestines)
- Behcet's disease
- Rheumatoid arthritis
- Juvenile arthritis
- Multiple sclerosis
- Polychondritis (chronic disorder of the cartilage)
- Systemic vasculitis (inflammation of the blood vessels)
- Alopecia universalis
- **Buerger's disease (limb vessel constriction, inflammation) ‡**

### **CANCERS:**

- Brain tumors—medulloblastoma and glioma
- Retinoblastoma (cancer)
- Ovarian cancer
- Skin cancer: Merkel cell carcinoma
- Testicular cancer
- 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: Angioimmunoblastic lymphadenopathy

‡ New to the List This Month

- Multiple myeloma (cancer affecting white blood cells of the immune system)
- Myelodysplasia (bone marrow disorder)
- Breast cancer
- Neuroblastoma (childhood cancer of the nervous system)
- Renal cell carcinoma (cancer of the kidney)
- Soft tissue sarcoma (malignant tumor that begins in the muscle, fat, fibrous tissue, blood vessels)
- Various solid tumors
- Waldenstrom's macroglobulinemia (type of lymphoma)
- Hemophagocytic lymphohistiocytosis
- POEMS syndrome (osteosclerotic myeloma)
- Myelofibrosis

### **CARDIOVASCULAR:**

- Acute Heart damage
- Chronic coronary artery disease

### **IMMUNODEFICIENCIES:**

- Severe combined immunodeficiency syndrome
- X-linked lymphoproliferative syndrome
- X-linked hyper immunoglobulin M syndrome

### **LIVER DISEASE:**

- **Chronic liver failure ‡**

### **NEURAL DEGENERATIVE DISEASES & INJURIES:**

- Parkinson's disease
- Spinal cord injury
- Stroke damage

### **OCULAR:**

- Corneal regeneration

### **WOUNDS & INJURIES:**

- Limb gangrene
- Surface wound healing
- Jawbone replacement
- Skull bone repair

### **OTHER METABOLIC DISORDERS:**

- Sandhoff disease (hereditary genetic disorder)
- Hurler's syndrome (hereditary genetic disorder)
- Osteogenesis imperfecta (bone/cartilage disorder)
- Krabbe Leukodystrophy (hereditary genetic disorder)
- Osteopetrosis (genetic bone disorder)
- Cerebral X-linked adrenoleukodystrophy

**\* There are no current clinical trials in humans with embryonic stem cells:**

*"It is nearly certain that the [human] clinical benefits of the [embryonic stem cell] research are years or decades away. This is a message that desperate families and patients will not want to hear."*

— Science, June 17, 2005