

Scientists identify human source of stem cells with potential to repair muscle

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For the first time, scientists at Children's Hospital of Pittsburgh of UPMC have discovered a unique population of adult stem cells derived from human muscle that could be used to treat muscle injuries and diseases such as heart attack and muscular dystrophy.

In a study using human muscle tissue, scientists in Children's Stem Cell Research Center - led by Johnny Huard, PhD, and Bruno Péault, PhD - isolated and characterized stem cells taken from blood vessels (known as myoendothelial cells) that are easily isolated using cell-sorting techniques, proliferate rapidly and can be differentiated in the laboratory into muscle, bone and cartilage cells.

These characteristics may make them ideally suited as a potential therapy for muscle injuries and diseases, according to Drs. Huard and Péault. Results of the study are published in the September issue of the journal *Nature Biotechnology*.

"Finding this population of stem cells in a human source represents a major breakthrough for us because it brings us much closer to a clinical application of this therapy," said Dr. Huard, the Henry J. Mankin Professor and vice chair for Research in the Department of Orthopaedic Surgery at the University of Pittsburgh School of Medicine. "To make this available as a therapy, we would take a muscle biopsy from a patient with a muscle injury or disease, remove the myoendothelial cells and treat the cells in the lab. The stem cells would then be re-injected into the patient to repair the muscle damage. Because this is an autologous

transplant, meaning from the patient to himself, there is not the risk of rejection you would have if you took the stem cells from another source."

Working in dystrophic mice while searching for a cure for Duchenne muscular dystrophy (DMD), Dr. Huard's laboratory team first identified a unique population of muscle-derived stem cells with the ability to repair muscle 8 years ago.

Dr. Péault, a professor in the Department of Pediatrics, Cell Biology and Physiology at the University of Pittsburgh School of Medicine, recognized the importance of determining the origin of these muscle-derived stem cells. His team applied, among others, techniques of confocal microscopy and cell sorting by flow cytometry which led to the discovery in human muscle biopsies that these myoendothelial cells are located adjacent to the walls of blood vessels.

According to their study, myoendothelial cells taken from the blood vessels are much more efficient at forming muscle than other sources of stem cells known as satellite and endothelial cells.

A thousand myoendothelial cells transplanted into the injured skeletal muscle of immunodeficient mice produced, on average, 89 muscle fibers, compared with 9 and 5 muscle fibers for endothelial and satellite cells, respectively. Myoendothelial cells also showed no propensity to form tumors, a concern with other stem cell therapies.

Drs. Huard, Péault and colleagues in Children's Stem Cell Research Center (SCRC) are researching and developing numerous therapeutic uses for the population of stem cells the SCRC team identified. One of the most promising uses could be for the treatment of DMD, a genetic disease estimated to affect one in every 3,500 boys. Patients with DMD lack dystrophin, a protein that gives muscle cells structure.

Source: Children's Hospital of Pittsburgh

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