Identification and Characterization of Chondrogenic Progenitor Cells in Adult Skeletal Muscle Fascia

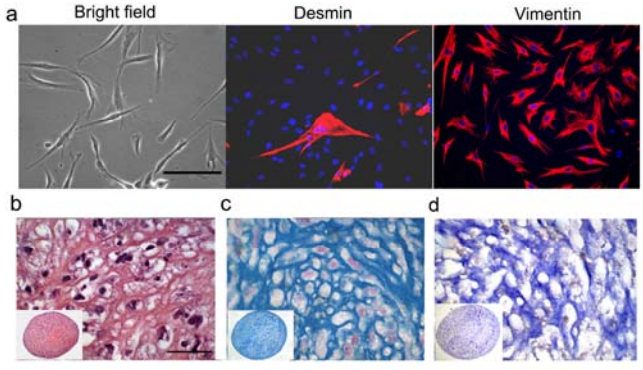
Guangheng Li, Bo Zheng, Laura B Meszaros, Joseph B Vella**,** Karin A Corsi , Arvydas Usas, Tomoyuki Matsumoto and Johnny Huard
Stem Cell Research Center, Children's Hospital of Pittsburgh, Department of Orthopaedic Surgery, University of Pittsburgh, 4100 Rangos Research Center, 3460 Fifth Avenue, Pittsburgh, PA 15213-2582; Tel. 412-692-7807; Fax 412-692-7095; E-mail: jhuard@pitt.edu

BACKGROUND: A chondrogenic phase is typically observed during bone morphogenic protein (BMP) induced ectopic bone formation in the skeletal muscle, suggesting that there exists a population of chondrogenic cells associated with skeletal muscle. Identifying the cell population that undergoes cartilaginous cellular differentiation during this process and isolating them from skeletal muscle could provide an alternative cell source for cartilage repair.

METHODS: Rat fascia derived cells (FDCs) were isolated from the fascia of the left gluteus maximus of Fisher 344 rats by mechanical detachment and following several enzymatic digestions [1]. Their surface marker profile was analyzed and chondrogenic potential was evaluated. Human FDCs of skeletal muscle were also investigated by using the same methods.

RESULTS: Results showed that the majority of rat FDCs expressed mesenchymal cell makers (CD29, CD59, and CD90) but not endothelial cell markers (CD34, CD31, CD144, vWF, Flk-1 and CD146). These FDCs underwent chondrogenic differentiation after treatment with bone morphogenic protein-4 (BMP4) in vitro. Human FDCs showed similar characteristics to rat FDCs in terms of cell surface markers and chondrogenic potential (figure).

CONCLUSTIONS: This study shows that FDCs which reside in fascia in the skeletal muscles contain a population of chondrogenic progenitor cells. Human Fascia of skeletal muscle could be the tissue from which cells could be harvested for cartilage repair. Future research will focus on isolating these cells and using them to repair cartilage.



(a) Freshly isolated human FDCs acquire fibroblasts shape in vitro. Immunostaining for desmin (red) shows very few are positive. Vimentin (red) staining shows most of cells (nuclei, blue) are positive. (b,c,d) With safranin-O, Alcian blue and collagen II staining, human FDC pellets show positive staining and typical chondroctyes

REFERENCE

[1] Qu-Petersen Z, Deasy B, Jankowski R, et al. Identification of a novel population of muscle stem cells in mice: potential for muscle regeneration. J Cell Biol. 2002 May 27;157(5):851-64