Reprogrammed human adult stem cells rescue diseased muscle in mice

12 December 2007

Scientists report that adult stem cells isolated from humans with muscular dystrophy can be genetically corrected and used to induce functional improvement when transplanted into a mouse model of the disease. The research, published by Cell Press in the December issue of *Cell Stem Cell*, represents a significant advance toward the future development of a gene therapy that uses a patient's own cells to treat this devastating muscle-wasting disease.

Duchenne muscular dystrophy (DMD) is a hereditary disease caused by a mutation in the gene that codes for a muscle protein called dystrophin. Dystrophin is a key structural protein that helps to keep muscle cells intact. DMD is characterized by a chronic degeneration of skeletal muscle cells that leads to progressive muscle weakness. Although intense research has focused on finding a way to replace the defective dystrophin protein, at this time there is no cure for DMD.

A research group led by Dr. Yvan Torrente from the University of Milan used a combination of cell- and gene-based therapy to isolate adult human stem cells from DMD patients and engineer a genetic modification to correct the dystrophin gene. "Use of the patient's own cells would reduce the risk of implant rejection seen with transplantation of normal muscle-forming cells," explains Dr. Torrente.

Muscle stem cells, identified by expression of the CD133 surface marker, were isolated from normal and dystrophic human blood and skeletal muscle. The isolated human muscle progenitors were implanted into the muscles of mice and were successfully recruited into muscle fibers. As expected, the CD133+ cells isolated from DMD patients expressed the mutated gene for dystrophin and gave rise to muscle cells that resembled muscle fibers in DMD patients.

The researchers then used a sophisticated genetic technique to repair the mutated dystrophin gene in the isolated DMD CD133+ cells so that dystrophin synthesis was restored. Importantly, intramuscular or intra-arterial delivery of the genetically corrected muscle cell progenitors resulted in significant recovery of muscle morphology, function, and dystrophin expression in a mouse model of muscular dystrophy.

"These data demonstrate that genetically engineered blood or muscle-derived CD133+ cells represent a possible tool for future stem cell-based autograft applications in humans with DMD," says Dr. Torrente. The authors caution that significant additional work needs to be done prior to using this technology in humans. "Additional research will substantially enhance our understanding of the mechanisms underlying this effect and may lead to the improvement of gene and cell therapy strategies for DMD."

Source: Cell Press

APA citation: Reprogrammed human adult stem cells rescue diseased muscle in mice (2007, December 12) retrieved 16 September 2021 from https://phys.org/news/2007-12-reprogrammed-human-adult-stem-cells.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.