Research derives muscle stem cells from teratomas

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Researchers at the University of Minnesota Medical School have developed a process to regenerate skeletal muscle cells in mice with muscular dystrophy. The unlikely source of those cells is a type of benign tumor called a teratoma.

In a study published in *Cell Stem Cell*'s July 5, 2018 issue, Michael Kyba, Ph.D. and Lillehei Heart Institute colleagues Sunny Chan, Robert W. Arpke, Antonio Filareto, Ning Xie, Matthew P. Pappas, Jacqueline S. Penaloza, Rita C. R. Perlingeiro describe their work in seeking a source of cells to rebuild muscle.

"The goal of this research was to seek in unexplored places a source of cells that, when transplanted, would rebuild skeletal muscle and demonstrate significant improvements in muscle strength and resilience," said lead author Michael Kyba, Professor in the Medical School's Department of Pediatrics.

The authors targeted cells from animal teratomas and found that by refining and sorting cells they were able to rebuild skeletal muscle in mice with muscular dystrophy. Teratomas are a type of tumor that produces cells of all types, including glands and hair follicles.

"We did not study spontaneously arising pathological teratomas," said co-author Sunny Chan, Ph.D., Assistant Professor in the Medical School's Department of Pediatrics.

"Instead, we created teratomas using undifferentiated pluripotent cells injected into an immunodeficient mouse, and found that among their many cell types, the resulting teratomas contained muscle stem cells."

Outcomes showed improved potential to an extent beyond results researchers have seen before. The investigators injected a small number of teratoma derived cells into a diseased muscle and found that they regenerated 80 percent of this muscle versus the 5 to 10 percent regeneration currently possible. The teratoma-derived cells also populated the newly formed muscle with muscle stem cells.

Other important measures of muscle effectiveness including tetanic force, specific force, and fatigue time showed the teratoma cell-generated muscled showed significant improvement over the control muscle.

While the results are promising, the authors note that the main advance is the ability to generate cells of tremendous regenerative potential for study as opposed to therapy at this point. Although the newly-formed muscles showed no signs of the teratomas from which they were derived or any other adverse events, safety is paramount and fail-safe measures would need to be implemented before considering therapeutic applications.

The scientists note that teratomas are conventionally considered an unattractive byproduct of stem cell research. "The fact that teratomas harbor cells of such greater potency than those that spontaneously differentiate when we culture them in a dish is remarkable," says Chan. "Indeed, beauty can be found in the most unexpected of places."

Provided by University of Minnesota