Medical Xpress

# Researchers transform stem cells found in human fat into smooth muscle cells

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Researchers from the David Geffen School of Medicine and the Henry Samueli School of Engineering and Applied Science at UCLA today announced they have transformed adult stem cells taken from human adipose – or fat tissue – into smooth muscle cells, which help the normal function of a multitude of organs like the intestine, bladder and arteries. The study may help lead to the use of fat stem cells for smooth muscle tissue engineering and repair.

Reported in the July 24 online edition of the *Proceedings of the National Academy of Sciences*, the study is one of the first to show that stem cells derived from adipose tissue can be changed to acquire the physical and biochemical characteristics as well as the functionality of smooth muscle cells.

Smooth muscle cells are found within the human body in the walls of hollow organs like blood vessels, bladder, and intestines and contract and expand to help transport blood, urine, and waste through the body's systems.

"Fat tissue may prove a reliable source of smooth muscle cells that we can use to regenerate and repair damaged organs," said Dr. Larissa V. Rodriguez, principal investigator and assistant professor, Department of Urology, David Geffen School of Medicine at UCLA.

Rodriguez and her team first cultured the adipose-derived stem cells in a growth factor cocktail that encouraged the cells to transform into smooth muscle cells. Researchers observed the genetic expression and development of proteins, which are specific to this type of cell. So it looked like a smooth muscle cell, but would it act like one?

The next step required testing functionality to see if the cells would expand and contract like smooth muscle tissue. Rodriguez turned to associate professor of bioengineering Dr. Benjamin Wu at the UCLA Henry Samueli School of Engineering and Applied Science for help.

Wu's team developed a special device to evaluate the cells' ability to contract by tracking movement of microbeads dispersed in a collagen gel embedded with the cells. Researchers added different pharmacologic agents known to cause contraction or relaxation in smooth muscle.

"We found that the cells did indeed function just like smooth muscle," said Wu. "The new device allowed us to evaluate drug-induced changes in the physical properties of smooth muscle at the cell level – previously we've needed tissue samples to observe this phenomena."

To make sure they could reproduce the smooth muscle cells and to confirm the transformation, Rodriguez and her team cloned one of the primitive stem cells from the adipose tissue and repeated the experiments on a cloned population of cells with similar results.

"We wanted to make sure it wasn't an isolated case or particular conditions in the cell cultures that allowed us to create or select out already existing smooth muscle cells," said Rodriguez, also a member of the UCLA Stem Cell Institute. "We are surprised and pleased with the results and are excited about future applications."

Rodriguez notes the many advantages of using a patient's own fat stem cells for organ re-growth and tissue regeneration, including no need for anti-rejection medications. In patients with a diseased or absent organ, who cannot use their own organ tissue for regeneration, adipose stem cells offer an alternative.

Smooth muscle cells have also been produced from stem cells found in the brain and bone marrow, but acquiring stem cells from adipose tissue is much easier and most patients have adipose tissue readily available, according to Rodriguez.

The next step, she adds, involves identifying and developing the growth factors that will induce transformation of cells more quickly. She is also starting to use smooth muscle cells for tissue engineering in the urinary tract, including the urethra.

Source: University of California - Los Angeles