Study unlocks origin of brown fat cells important in weight maintenance

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In ongoing research aimed at battling obesity, UT Southwestern Medical Center researchers have deciphered how new fat cells are formed in energy-storing fat pads.

In particular, researchers sought to find out the origin of "brown" fat cells and whether humans can make more of them in order to burn extra calories – a finding that could have significant impact in battling obesity and related diseases.

"Much of the current excitement in the obesity field stems from recent observations highlighting that, even as adults, we have the ability to generate brown fat cells in response to cold exposure. Unlike white fat cells that mostly just store fat, brown adipocytes keep us warm by burning fat at a high rate," said Dr. Philipp Scherer, Director of the Touchstone Center for Diabetes Research at UT Southwestern and senior author of the study available online at *Nature Medicine*.

While generation of brown fat cells previously was thought to be mostly relevant for rodents and human infants, Dr. Scherer said, current evidence points to the observation that adults also generate these cells when exposed to cold.

Brown fat cells in adults tend to be randomly interspersed in subcutaneous white fat, with a trend toward increased accumulation in the upper chest and neck areas. In general, brown fat tissue makes up just a small percentage of total body fat mass.

The Touchstone Center's staff devotes its efforts to the study of cells and tissues that either contribute to, or are affected by, diabetes and its related diseases, including the physiology of fat tissue. In this study, the UT Southwestern research team examined the timing and nature of changes in fat cell composition in response to weight gain, cold exposure, and development. Genetic tools developed at the medical center over the past eight years were used to label all pre-existing fat cells. Researchers then were able to track where new fat cells emerged.

When mice were exposed to high-fat diets, significant differences between the types of white fat deposits were observed – subcutaneous fat deposits took their existing fat cells and made them bigger, while other deposits were more prone to generating new fat cells. Brown fat cells did not form during this experiment, nor during a test that monitored early growth-related development. Only when exposed to cold did new brown fat cells appear.

"The major finding is that the cold-induced adaptation and appearance of brown fat cells involves the generation of completely new cells rather than a retooling of pre-existing white fat cells into brown fat cells in response to the cold," Dr. Scherer said.

The researchers next hope to translate these findings into clinical use, with future efforts directed toward therapeutic strategies to activate precursor cells to become new brown fat cells rather than to convert white fat cells into brown fat cells.

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