Joslin study identifies protein that produces 'good' fat

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A study by researchers at the Joslin Diabetes Center has shown that a protein known for its role in inducing bone growth can also help promote the development of brown fat, a "good" fat that helps in the expenditure of energy and plays a role in fighting obesity.

"Obesity is occurring at epidemic rates in the U.S. and worldwide and that impacts the risk and prognosis of many diseases," said Yu-Hua Tseng, Ph.D. an Assistant Investigator in the Joslin Section on Obesity and Hormone Action and lead author of the paper published in the August 21 issue of *Nature*. "We hope this study can be translated into applications to help treat or prevent obesity."

Tseng noted that obesity is a major risk factor for type 2 diabetes and is closely linked to the metabolic syndrome, a collection of medical problems associated with insulin resistance that can lead to an increased risk of atherosclerosis, the buildup of plaque in coronary arteries that leads to heart attack and stroke.

In laboratory studies of mouse cells, Tseng and her colleagues identified that a bone-inducing protein called BMP-7 drives precursor cells that give rise to mature brown fat cells. According to Tseng, there are two main types of fat cells in the body – white and brown.

"White fat cells are the 'conventional' form of fat designed to store energy. By contrast, the main role of brown fat is to burn calories by generating heat. Brown fat cells largely disappear by adulthood in

humans, but their precursors still remain in the body," Tseng explained.

A 2005 Joslin study by Dr. Tseng and colleagues discovered genes that control the creation of the precursor cells of brown fat. Another more recent 2007 Joslin study led by C. Ronald Kahn, M.D., head of the Joslin Section on Obesity and Hormone Action and also a co-author of the current Nature study, found clusters of brown fat cells dispersed between bundles of muscle fibers in an obesity-resistant strain of mice.

Now, this latest study identified BMP-7 as the protein capable of inducing the formation and function of brown fat cells. According to the paper, delivery of BMP-7 into mice using adenovirus as a vector resulted in an increase in the development of brown fat tissue. In one of the experiments, the mice that developed brown fat tissue gained less weight than those that did not. In another experiment, mice that received injections of progenitor cells – similar to stem cells – that had been pre-treated with BMP-7 also developed additional brown fat tissue.

The study sought to address a fundamental question in adipocyte biology, namely what controls the development of fat depots. BMPs are a family of proteins known to regulate organ formation during embryonic development. In this study, Dr. Tseng and her colleagues proposed that different members of BMPs determine brown versus white fat cell fate. Scientists hope that improved knowledge of fat development will lead to new drugs or therapeutic approaches to fight obesity.

"Diet and exercise are still the best approaches for weight reduction in the general population," Tseng said. "However, for people who are genetically predisposed to obesity, these approaches may have very little effect."

"As we learn more about the controls of brown fat development, medical

interventions to increase energy expenditure by brown fat inducing agents, such as BMP-7, may provide hope to these individuals in losing weight and preventing the metabolic disorders associated with obesity," she said.

Source: Joslin Diabetes Center