Fat chance: Brown vs. white fat cell specification

14 May 2008

In the May 15th issue of G&D, Dr. Bruce Spiegelman (Dana Farber Cancer Institute) and colleagues elucidate the molecular pathway that induces cells to become energy-burning brown fat cells as opposed to energy-storing white fat cells.

Since brown adipose tissue (BAT) and white adipose tissue (WAT) have essentially antagonistic roles in energy homeostasis (WAT stores calories; BAT burns them), insight into the genetics of adipocyte specification is particularly interesting to those contemplating the conversion of white-to-brown fat cells as a therapeutic treatment for obesity and obesity-related disorders.

Dr. Spiegelman and colleagues previously identified the protein PRDM16 as a dominant regulator of brown fat cell determination. PRDM is selectively expressed in BAT, where it activates brown fat-specific gene expression and represses white fat-specific gene expression. The scientists have now answered the complicated question: How?

Dr. Spiegelman and colleagues discovered that PRDM16 is able to switch between an association with the co-repressor proteins, CtBP-1 and -2, to inhibit WAT genes, and the co-activator protein PGC-1alpha, to induce BAT gene expression. Thus, PRDM16 can differentially regulate fat cell gene expression programs to favor the formation of BAT.

Dr. Spiegelman feels that "As we learn more about the molecular mechanisms by which PRDM16 acts, we hope to be able to use this pathway to modulate metabolism in living organisms to counteract obesity and diabetes".

Source: Cold Spring Harbor Laboratory