

# Researchers identify specific causes of brown fat cell 'whitening'

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Boston University researchers have learned new information about the consequences of overeating high-calorie foods. Not only does this lead to an increase in white fat cell production, the type prominent in obesity, but it also leads to the dysfunction of brown fat cells, the unique type of fat that generates heat and burns energy.

This study is the first to describe how overeating causes brown fat cells to "whiten." Published in the *Journal of Clinical Investigation*, the results illustrate the important role that a healthy diet plays in overall health and the pivotal role that brown fat plays in metabolism.

Using experimental models, the researchers demonstrate that over-nutrition leads to a cellular signaling dysfunction that causes brown fat cells to lose neighboring blood vessels, depriving the cells of oxygen. In turn, this causes the brown fat cells to lose their mitochondria, which leads to their inability to burn fatty acids and produce heat. This collapse can have far-reaching effects on the development of metabolic conditions, such as diabetes or [cardiovascular disease](#).

"If we go back to when humans were hunter-gatherers, days could pass between when they could eat, so it was a survival advantage to be able to store excess energy in white fat cells," said Kenneth Walsh, PhD, director of the Whitaker Cardiovascular Institute at Boston University School of Medicine (BUSM) and the study's senior author. "What served us so well as primitive organisms is now hurting us because we have a continuous food supply and are accumulating too many white fat cells."

The study results highlight the important relationship between [fat tissue](#) and the cardiovascular system and indicates that the [cardiovascular risk factors](#), such as hypertension and high cholesterol that contribute to blood vessel damage, could also lead to the dysfunction of

brown fat cells.

"In addition to the expansion of white [fat cells](#), our study shows that overeating causes [brown fat](#) cells to get locked into a death spiral, leading to their ultimate dysfunction," said Walsh, who also is professor of medicine at BUSM. "More research needs to focus on whether stopping these activities from happening in [brown fat cells](#) could help combat obesity."

Provided by Boston University Medical Center

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