

Cold exposure prompts body to convert white fat to calorie-burning beige fat

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Exposure to cold temperatures can convert white fat tissue from the thighs and belly to beige fat that burns calories for heat, but this biological response is hampered in obese people, according to a new study published in the Endocrine Society's *Journal of Clinical Endocrinology & Metabolism*.

Known as [brown adipose tissue](#) (BAT), brown fat is a particular kind of fat tissue that burns energy and glucose to generate heat. Babies and small animals rely on brown fat to stay warm. Brown fat's energy expenditure helps to prevent obesity in rodents.

While white fat does not share this ability, it can play a role in burning calories when it takes on some brown fat characteristics. The tissue created in this process is called beige fat. When rodents are exposed to [cold temperatures](#), they can convert white fat deposits to beige fat.

"We wanted to investigate whether human adults had the ability to transform some white fat deposits into beige fat when they were exposed to cold," said one of the study's authors, Philip A. Kern, MD, of the University of Kentucky School of Medicine in Lexington, KY. "Browning fat tissue would be an excellent defense against obesity. It would result in the body burning extra calories rather than converting them into additional fat tissue."

Researchers analyzed belly fat tissue samples from 55 people to see if the tissue samples taken in winter showed more evidence of browning activity than those taken in summer. Scientists also took thigh fat tissue samples from 16 people after they held an ice pack on the skin for 30 minutes. The analysis checked the tissue samples for specific genetic markers found in brown or beige fat.

The analysis revealed belly fat tissue biopsied in the winter had a higher level of two genetic markers for beige fat, compared to the samples

taken in the summertime. In the thigh tissue samples, researchers found elevated levels of three genetic markers tied to beige or [brown fat](#) in samples taken during the winter.

Researchers analyzed the belly fat samples to see if there was a difference in response among lean and [obese people](#). The analysis revealed that the seasonal effect of fat browning was blunted in obese people. Obesity was defined as having a body mass index greater than 30.

"Our findings indicate inflammation can hinder the conversion of white to beige fat," Kern said. "When we analyzed [tissue samples](#) in the lab, we found that exposing white fat to macrophage cells from the immune system inhibited the transformation."

More information: The study, "The Effects of Temperature and Seasons on Subcutaneous White Adipose Tissue in Humans: Evidence for Thermogenic Gene Induction," was published online, ahead of print.

Provided by The Endocrine Society

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