'Good fat' activated by cold, not ephedrine, research finds

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Aaron Cypess, M.D., Ph.D., is an Assistant Investigator in the Section on Integrative Physiology & Metabolism at Joslin Diabetes Center and an Assistant Professor of Medicine at Harvard Medical School. Credit: John Soares

Researchers at Joslin Diabetes Center have shown that while a type of "good" fat found in the body can be activated by cold temperatures, it is not able to be activated by the drug ephedrine.

The finding, published in today's issue of PNAS USA Early Edition, may lead to drugs or other methods aimed at activating the good fat,

known as brown fat. When activated, brown fat burns calories and can help in the battle against obesity.

"We propose that agents that work similarly to cold in activating brown fat specifically can provide promising approaches to fighting obesity while minimizing other side effects," said Aaron Cypess, M.D., Ph.D., an assistant investigator and staff physician at Joslin and lead author of the paper.

"At the same time, we now know that ephedrine is not the way to do it," he added.

Brown fat is found in humans naturally and consumes calories to generate heat. Prior studies had shown that brown fat can be activated by cold exposure in a process called non-shivering thermogenesis.

Researchers have been working for years to find ways to activate brown fat.

Ephedrine, a decongestant and bronchodilator, has been used as a weight loss drug because it increases the number of calories burned. However, there are side effects.

In this study, the Joslin team tested 10 study subjects in three ways. They were each separately given injections of ephedrine, given injections of saline as a control, and made to wear "cooling vests" that had water cooled to 57 degrees pumped into them. After each intervention, the brown fat activity was measured using PET/CT scans.

The researchers found that brown fat activity was the same following both the ephedrine and saline injections. However, after the subjects wore the cooling vests for two hours, their brown fat activity was stimulated significantly.

Both interventions — ephedrine injections and the wearing of the cooling vests — did result in the same number of calories being burned, Dr. Cypess noted.

"But we found that ephedrine was not using brown fat to do it," he said. "This is the first time it has been found that ephedrine does not turn on brown fat."

Both interventions had other effects on the sympathetic nervous system -- which activates the fight or flight response -- such as increased blood pressure, but those associated with brown fat activation were fewer, the study showed.

"Mild cold exposure stimulates (brown fat) energy expenditure with fewer other systemic effects, suggesting that cold activates specific sympathetic pathways," the paper concludes. "Agents that mimic cold activation of (brown fat) could provide a promising approach to treating obesity while minimizing systemic effects."

As a result of the findings, drug companies may find it easier to come up with agents that stimulate brown fat to help people lose weight, Dr. Cypess said.

One method may be simply to design cooling vests that people can wear to help them lose weight. A future study will have subjects wear the vests for several weeks to see what happens, Dr. Cypess said.

"Will they get the same health benefits they would have seen with several weeks of exercise? That's the billion dollar question."

The findings should also be of interest to heart researchers interested in the mechanisms of activation of the sympathetic nervous system, he added.

Provided by Joslin Diabetes Center