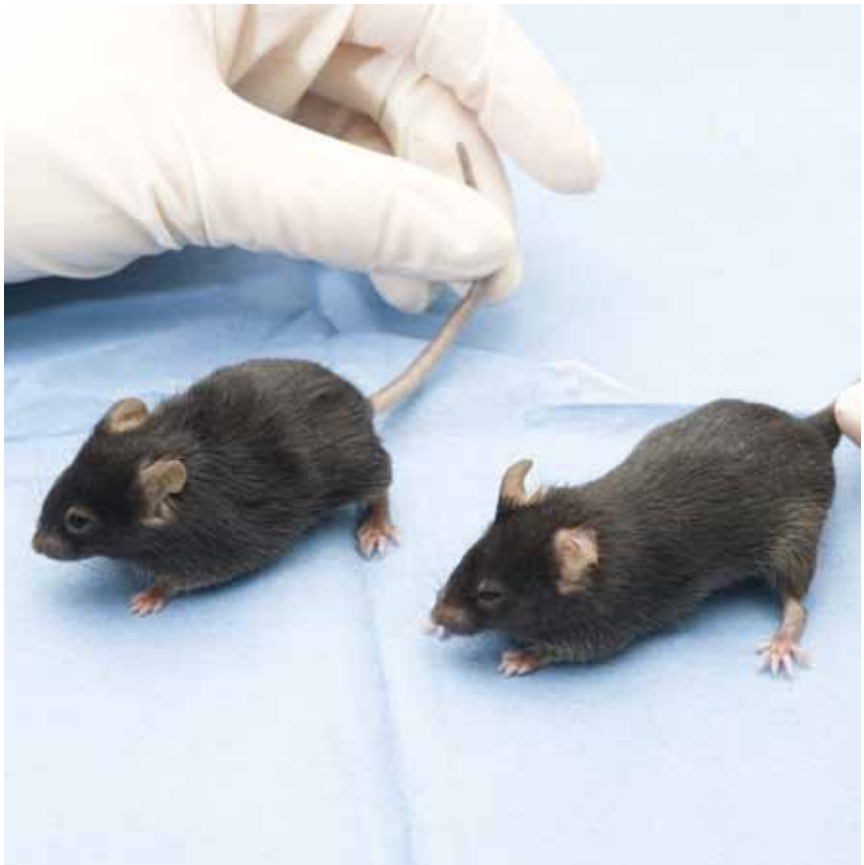
# Social Engagement Changes Fat Type



When mice are given a more engaging place to live with greater opportunities for social stimulation, some of their energy-storing white fat is transformed to energy-burning brown fat. As a result, the animals expend more energy and lose weight even as they eat more. The findings reported in the September Cell Metabolism point to the powerful effect that animals' social and physical environments can have on their metabolisms.

"I'm still amazed at the degree of fat loss that occurs," says Matthew During of The Ohio State University. "The amount that comes off is far more than you would get with a treadmill...After four weeks in the enriched environment, the animals' abdominal fat decreased by fifty percent," added Lei Cao, also of Ohio State.

The standard laboratory mouse lives what might be considered a "couch potato" existence, Cao says. They are kept comfortable with an endless supply of food and water and a few potential playmates. But they don't have much of anything to do. In the enriched environment, animals live in larger groups of 15 to 20 animals. They have more space as well as wheels to run on, mazes to navigate and toys to play with.

"We often think of stress as a negative thing, but some kinds of stress can be good for your health," Cao says. In fact, she says, the enriched housing is more taxing for the animals as they have to deal with each other and with a more complex environment.

The new study follows on one reported in Cell last year by the same research team showing that more complex housing also has profound and beneficial effects on cancer. The researchers had also shown that an enriched environment leads to improved cerebral health as defined by increased production of new neurons, enhanced learning and memory, and greater resistance of the brain to insults. The key in all cases seemed to be an increase in the brain's production of a growth factor known as brain-derived neurotrophic factor (BDNF).

Cao and During had also noted previously that the mice showed changes in their fat tissue and grew leaner than animals living under standard conditions. They now trace that leaner build to an increase in brown fat.

Fat comes in one of two types: white or brown. White fat is the kind we generally try to keep off as it stores all those extra calories. Brown fat burns energy to generate heat. It is perhaps best known for keeping babies warm, but scientists have now realized that adults do retain active brown fat. We can be made to produce more brown fat through exposure to cold or activation of the sympathetic nervous system. The new study suggests a more engaging environment is another, perhaps more effective path to increasing brown fat.

"It's usually hard to induce the switch from white to brown fat," During says. "It takes months of cold — you really have to push — and it doesn't induce brown fat to the same degree as what on the surface appears to be a relatively mild change in physical and social environments."

Animals made to produce more BDNF in their brains also show the increase in brown fat and weight loss observed in those living in an enriched environment. The new result may offer insight into studies showing a link between loneliness and ill health, Cao says. "Loneliness is a profound factor for cancer and death; it's on par with cigarette smoking," she says. "Social engagement is very important." Although it isn't yet clear why, the new study shows fat to be one of the organs most responsive to changes in the environment. The findings might therefore have important lessons for us about the causes of the obesity epidemic we now face. "It's not just a sedentary lifestyle and high calorie foods, but an increasing lack of social engagement," During says, as online networking and social media have replaced more dynamic, face-to-face social interactions.