# Fat-burning fat exists, but might not be the key to weight loss

December 16 2015, by Desiree Wanders


Tip the scale. Credit: www.shutterstock.com., CC BY-NC-ND

When you think about body fat, it's probably white fat that comes to mind. That's where our bodies store excess calories, and it's the stuff you want to get rid of when you are trying to lose weight.

But white fat isn't the only kind of fat in the body – you also have brown fat and beige, or brite, fat, which can actually burn calories instead of storing them.

Fat that burns calories instead of packing them on the body sounds like the Holy Grail of obesity treatment, and researchers want to find ways to activate or increase these types of fat in our bodies. In fact, the National Institutes of Health (NIH) has put out a call for research to figure out how to do it. But is the potential of brown fat to curb weight all it's cracked up to be?

## So what makes brown and beige fat different from white fat?

You might think that white fat just stores calories, but it actually does much more than that. It insulates the body, protects the internal organs and also produces proteins that regulate food intake, energy expenditure and insulin sensitivity.

Brown fat is rich in mitochondria, which gives it a brown appearance. You may remember from high school science class that mitochondria are the "powerhouses" of the cell because they burn fatty acids and glucose for energy, releasing it as heat. That is why brown fat burns calories instead of storing them, like white fat does. White fat also has mitochondria, but not nearly as much as brown fat does.

Newborn babies have brown fat because it generates heat and helps them maintain body temperature. Rodents also have brown fat for the same reason. Until recently, it was thought that brown fat disappeared over the course of childhood. Now, thanks to advances in imaging technology, we know that adults also possess brown fat.

In humans, brown fat tends to be located around the neck and clavicle, but can also be found in a few other locations around the body. Weight can influence how active a person's brown fat is, so the more a person weighs, the less active their brown fat is at burning fatty acids and glucose.

Beige or brite fat is made up of "brown-like" fat cells present in traditionally white fat deposits. Studies using animal models have shown these beige fat cells can form in white fat deposits under certain treatments, including cold exposure.

Whether these beige fat cells were preexisting white fat cells that turned into beige cells in a process called "transdifferentiation" or they are brand new cells is a point of contention among researchers. Like brown fat cells, beige fat cells appear to have the ability to burn fatty acids and glucose as energy.

## Calories in, calories out


Brown adipose tissue seen in positron emission tomography (PET) scan. Credit: Hellerhoff via Wikimedia Commons, CC BY

The principle behind weight loss or weight gain is called energy balance, which is the difference between energy intake (how many calories you eat) and energy expenditure (how many calories you burn).

Sticking to a low-calorie diet and an exercise-heavy lifestyle to lose excess weight isn't always easy, so researchers have been looking for other ways to tip the energy balance in favor of expenditure. And some think that increasing the activity or quantity of brown or beige fat in the body might be one way of doing it.

This certainly appears to be the case in rodents. Studies have found that the chemical norepinephrine, cold exposure, diets and various proteins made in the body can all induce "browning" of white fat or activate brown fat to burn more calories in rodents. Most of these treatments also have some effect on energy balance, often increasing energy expenditure and causing weight loss.

Imagine if we could do the same thing in humans and transform the metabolically inert white fat that is weighing so many of us down into metabolically active brown fat that actually burns calories throughout the day. While it sounds like it could be a game changer in the fight against obesity, the research isn't clear on how much of a difference brown fat might make for people.

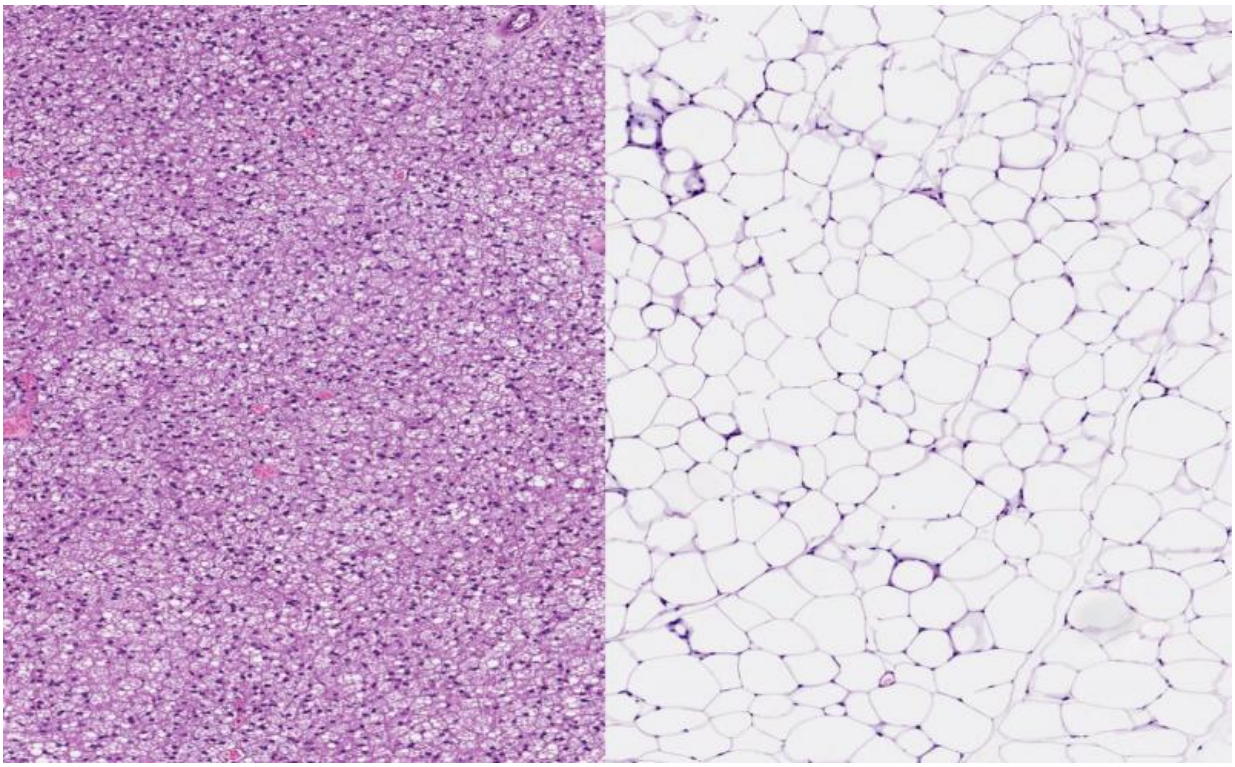
For instance, some research has shown that activation of brown fat by cold exposure in humans translates to an increase in energy expenditure equivalent to less than 20 calories per day, which is hardly enough to have the kind of effects on obesity that we all hope for. Other research has estimated that activation of brown fat in adults could burn up to 125 extra calories per day.

The reason that activated brown fat makes a relatively small contribution to daily energy expenditure is unknown, though it may be because brown fat is present in the body in minuscule amounts compared the less metabolically active white fat. For instance, a recent study showed that out of 14 subjects, only five had more than 10 grams of activated brown fat.

And we also wouldn't want to convert all of our white fat into brown fat, because white fat is actually something our bodies need.

For instance, in rare conditions in which there are no fat deposits, people often have insulin resistance, fatty liver disease and other metabolic complications. This is partially due to the lack of proteins that are produced by the white fat, and also because the excess calories that should be stored in the fat have to be stored in other organs, such as the liver.

**Brown fat might do more than burn calories**



Brown fat has more mitochondria than white fat. Credit: www.shutterstock.com

Even if the data show that activating brown fat doesn't seem to burn many extra calories in humans, it could have other health benefits.

Researchers found that transplanting brown fat from donor mice into the abdominal cavity of age- and sex-matched recipient mice reversed high-fat diet-induced insulin resistance, a condition that contributes to Type 2 diabetes in humans.

Other studies have shown that beige and brown fat has beneficial effects on glucose metabolism and insulin sensitivity that appear to be greater than the modest effects on body weight. Brown fat has the ability to clear lipids (fats) and glucose from the blood, resulting in lower concentrations of circulating triglycerides, cholesterol and glucose. This

may contribute to the beneficial health effects of brown fat, independent of weight loss.

So future human research may lie in how these fats can positively influence insulin sensitivity, or glucose and lipid metabolism, rather than body weight.

There is much interest in being able to harvest the power of brown fat in humans to combat obesity and accompanying metabolic disease, but this research is relatively in infancy.

To help answer these questions, the NIH has announced grant opportunities to identify conditions that trigger the "browning" of white fat, or increase quantity of brown fat in humans, find ways of testing for brown fat that don't require needle biopsies, and explore the biological functions of these fats. This push means we should be learning more about this intriguing tissue soon.

*This story is published courtesy of* The Conversation *(under Creative Commons-Attribution/No derivatives).*

Source: The Conversation

Citation: Fat-burning fat exists, but might not be the key to weight loss (2015, December 16) retrieved 11 July 2023 from https://medicalxpress.com/news/2015-12-fat-burning-fat-key-weight-loss.html