How Exercise May Turn White Fat Into Brown
By GRETCHEN REYNOLDS OCT. 12, 2016

Credit Getty Images

Exercise may aid in weight control and help to fend off diabetes by improving the ability of fat cells to burn calories, a new study reports. It may do this in part by boosting levels of a hormone called irisin, which is produced during exercise and which may help to turn ordinary white fat into much more metabolically active brown fat, the findings suggest.

Irisin (named for the Greek goddess Iris) entered the scientific literature in 2012 after researchers from Harvard and other universities published a study in Nature that showed the previously unknown hormone was created in working muscles in mice. From there, it would enter the bloodstream and migrate to other tissues, particularly to fat, where it would jump-start a series of biochemical processes that caused some of the fat cells, normally white, to turn brown.

Brown fat, which is actually brown in color, burns calories. It also is known to contribute to improved insulin and blood sugar control, lessening the risk for Type 2 diabetes. Most babies, including human infants, are plump with brown fat, but we humans lose most of our brown fat as we grow up. By the time we are adults, we usually retain very little brown fat.

In the 2012 study, the researchers reported that if they injected irisin into living mice, it not only turned some white fat into brown fat, it apparently also prevented the rodents from becoming obese, even on a high-fat, high-calorie diet.

But in the years since, some scientists have questioned whether irisin affects fat cells in people to the same extent as it seems to in mice — and even whether the hormone exists in people at all.

A study published last year in Cell Metabolism by the same group of researchers who had conducted the first irisin study, however, does seem to have established that irisin is produced in humans. They found some irisin in sedentary people, but the levels were much higher in those who exercise often.

But whether irisin acted beneficially in human fat cells the same way as it did in the bodies and cells of mice was still an open and disputed question.
So for the new study, which was published in August in the American Journal of Physiology — Endocrinology and Metabolism, researchers at the University of Florida turned to white fat tissue from women who had undergone breast reduction surgery at the university hospital (with permission) and also to a very small amount of brown fat from people who had had surgery to treat kidney cancer. Most of our meager stores of brown fat cluster around our kidneys.

The researchers, who had previously studied irisin’s effects in mice, had a form of the human hormone available and now set out to marinate the fat cells with it, using three different dosages.

Some of the white fat cells that they treated were mature, while others were baby cells, essentially stem cells that could grow into fat or other types of tissue. They also bathed the brown fat with irisin.

All of the cells were soaked with the hormone for four days.

Throughout, the scientists checked the levels of a protein called UCP1 that is known to contribute to the browning of white fat, as well as for other biochemical markers that would indicate that the white cells were browning.

They found such markers, particularly in the cells that were exposed to moderate or high doses of irisin. Those cells soon began to produce significantly more UCP1 than other cells and also were more metabolically active, meaning that, in the body, they would burn calories.

At the same time, many of the stem cells in the fat tissue exposed to irisin ceased being fat cells and instead became a type of cell that matures into bone. The tissue treated with irisin, in fact, wound up with about 40 percent fewer mature fat cells than tissue untouched by the hormone.

Irisin had no effects on brown fat.

The results strongly indicate that irisin nudges human white fat to become brown and also suppresses the formation of new white fat, says Li-Jun Yang, a professor of hematopathology at the University of Florida and senior author of the study (which was funded by the scientists themselves). It also seems to promote the formation of bone.

“I think this study helps us to understand how, at a cellular level, exercise makes us healthier,” Dr. Yang says.

But these were living cells, not living bodies, and the effects of irisin in actual people still need to be established, she says, especially since many studies have shown that exercise rarely results in significant weight loss. Scientists also do not know what types of exercise lead to the greatest production of irisin or what amount of irisin might be ideal for health purposes.

Dr. Yang hopes to conduct studies of the hormone in people.

But even now, the science related to irisin is compelling enough, she says, that “my advice is, exercise as much as you can. We know it’s healthy and now we’re beginning to understand better why.”