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The Gravity of Weight

Special Delivery: What Can Brown (Fat) Do for You?

Newly discovered muscle hormone, irisin, has exciting potential for obesity.

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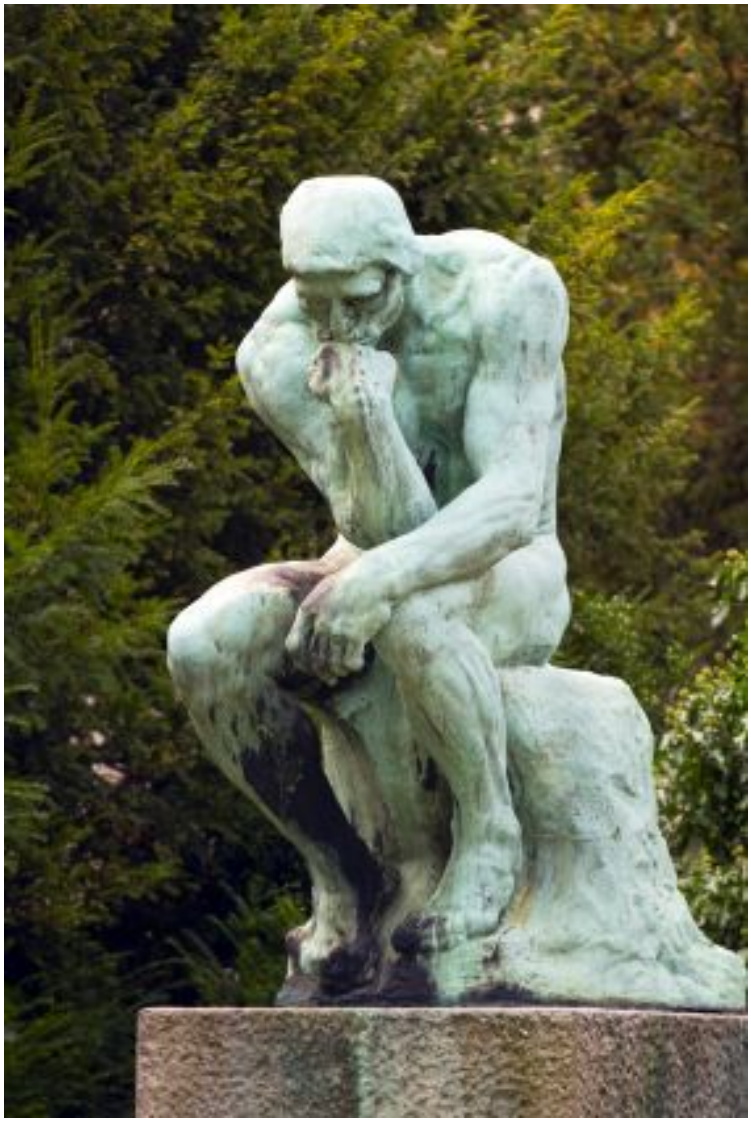
At least since the days of Hippocrates in Fifth Century B.C. Athens, we have known the value of exercise for health, but not until very recently have researchers begun to comprehend precisely how exercise actually exerts its beneficial effects. Only in the past ten years, for example, have we begun to think of skeletal muscle as an endocrine (i.e., secretory) organ that is capable of communicating with other organs by hormones--myokines--that muscles can release into our bloodstream.

A new discovery in the cell biology lab of Professor Bruce Spiegelman, his postdoctoral fellow, Dr. Pontos Boström, and their colleagues, who are researchers at the Dana-Farber Cancer Institute and Harvard University, undoubtedly brings us closer to understanding the importance of exercise on a molecular level. Reported in the January 2012 issue of the prestigious journal *Nature*, these researchers have isolated a new hormone found in skeletal muscle that they have named, “irisin,” after the Greek messenger goddess Iris. This goddess Iris, “swift-footed” and “golden winged” is mentioned by Homer in the *Iliad,* and there are

depictions of her on Ancient Greek vase painting. The famous French sculptor, Rodin, depicted Iris erotically or pornographically, depending on your perspective.



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For our purposes, here, though, irisin seems to be part of a communication (i.e., messenger) system between muscle and fat and may explain why physical activity and specifically exercise are so advantageous. Levels of irisin increase significantly in the blood of mice and humans with exercise, and irisin seems to offer a protective effect against many diseases (e.g. diabetes and diet-induced obesity) so far, at least, in mice. Interestingly, irisin found in the mouse is structurally (i.e., genetically) equivalent to that in human muscle. In contrast, human leptin, the hormone in fat involved in energy balance and regulation, shares only about 83% of its genome with mice (and insulin, only 85%). Most importantly, Irisin also seems to have the effect (i.e., acts as a signal) of "browning" white adipose tissue. This is significant because white adipose tissue is much less metabolically active than brown adipose tissue, which can generate heat, (i.e., has a thermogenic effect and important for animals that hibernate, for example), and hence can cause an increase in energy expenditure (i.e., burning calories.) In other words, exercise seems to activate this "browning process," at least so far in mice.

For years, researchers believed that brown adipose tissue was found predominantly only in human infants and was responsible for their ability to regulate temperature without shivering. The assumption was that brown fat remained only in very small vestigial amounts as we age, unlike animals like rodents which keep their brown fat throughout life. It is now believed, with the advent of higher-resolution imaging, that adults have more brown fat than originally thought (and cold temperatures make it more visible on scans.) Brown fat, which has a large supply of mitochondria, (i.e., the "power plants" of the cell so-called because, among other functions, they are responsible for creating chemical energy) gets its color from its rich vascular supply. There is speculation that brown fat actually protects against obesity by regulating thermogenesis, one of the ways we burn calories. (For those interested in more details about thermogenesis please refer to

my textbook, *The Gravity of Weight*, pp. 57-63.) Brown fat is seen most prominently in human adults in neck and shoulder (cervical and supraclavicular) areas and is more prominent in younger adults who have lower body mass indexes, as well as those who have never smoked. Researchers in Spiegelman's lab now believe there are actually two different types of brown fat: so-called classical brown fat and now brown fat (called "brite cells or beige cells") originating from the browning of white fat.

Those who maintain their weight by strenuously watching their caloric intake and exercising regularly (as much as an hour a day, especially after substantial weight loss) know how very difficult it is for most people. We also know that physical inactivity seems to increase our risk for many chronic diseases, including cardiovascular disease and cancer. The idea of "exercise in a pill" (or even in an injectable form) seems only an implausible fantasy and clearly too good to be true. We are unquestionably a long way off, but perhaps irisin can hold some promise eventually for obesity treatment. Researchers do believe that brown fat may play a role in energy homeostasis and provide a "metabolic brake" that might one day be manipulated genetically or pharmacologically to treat obesity. Further, writing in a recent April issue of *The New England Journal of Medicine*, though, Pedersen ("The Muscular Twist on the Fate of Fat") says that it is possible that patients with diseases that compromise their ability to exercise may also benefit from the discovery of irisin.

About the Author

Sylvia R. Karasu, M.D., is a clinical professor of psychiatry at Weill Cornell Medical College and the senior author of *The Gravity of Weight.*

In Print: *The Gravity of Weight: A Clinical Guide to Weight Loss and Maintenance*

Online: my own website