New clues uncover how 'starvation hormone' works

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Dec. 26, 2010 – New findings by UT Southwestern Medical Center researchers may solve a 17-year-old mystery about how the so-called "starvation hormone" affects multiple biological systems, including preventing insulin sensitivity and promoting cell survival.

The results connect multiple observations about how the hormone adiponectin functions and eventually could lead to new treatments for conditions ranging from diabetes and weight loss to heart disease and cancer.

"Until now, there wasn't really an obvious connection between all these different phenomena," said Dr. Philipp Scherer, professor of internal medicine and cell biology and senior author of the study appearing online today and in a future edition of Nature Medicine.

In this study, the researchers used models of inducible cell suicide in both pancreatic beta cells, which produce insulin, and cardiomyocytes, which are specific muscle cells located in a part of the heart known as the myocardium, to determine how the single hormone could exert such different influences.

"This paper shows that the common theme among all these different activities relies on adiponectin's interaction with a specific subset of lipids known as ceramides," said Dr. Scherer, who directs the Touchstone Center for Diabetes Research.

Ceramides are a family of lipid molecules known to promote cell suicide, or apoptosis. High levels of ceramides have been shown to promote diabetes by sabotaging signaling pathways induced by insulin and killing beta cells.

When the researchers introduced adiponectin into cells, they found that the hormone triggers the conversion of ceramides from a destructive force into one that helps cells survive and inhibits cell death.

"Adiponectin essentially provides a makeover of this ugly cousin," Dr. Scherer said.

Dr. William Holland, lead author and postdoctoral fellow in internal medicine, said the new findings have implications for the treatment of numerous diseases including diabetes and cancer.

"One beauty of this study is that the findings are in both animal models and in vitro," Dr. Holland said. "We were able to show using these models of apoptosis in the beta cell and the heart that we can protect those cells from cell death with adiponectin."

Adiponectin, which Dr. Scherer discovered in 1994, not only controls sensitivity to insulin but also is known to play an integral role in metabolism and obesity. Prior research has shown that when adiponectin levels are high, the body stores excess fat in adipocytes, or fat cells, to protect against possible starvation during lean times. These fat deposits lie primarily in the subcutaneous tissue.

As a person accumulates more fat, however, adiponectin levels decline. Once adiponectin levels start dropping, the body begins storing fat in dangerous places such as the heart, liver and muscle tissues – where it can cause inflammation and pave the way for heart disease. That's why researchers think that adiponectin levels could be a good predictor of

whether someone is at risk of developing diabetes, heart disease or cancer.

Overall, the new findings "endorse the idea that adiponectin is very important and is probably a key manipulator of lipid levels," Dr. Scherer said.

Provided by UT Southwestern Medical Center