Not all fat created equal

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It has long been known that type 2 diabetes is linked to obesity, particularly fat inside the belly. Now, researchers at the Joslin Diabetes Center have found that fat from other areas of the body can actually reduce insulin resistance and improve insulin sensitivity.

In a study published in the May issue of *Cell Metabolism*, a team lead by C. Ronald Kahn, M.D. found that subcutaneous fat -- fat found below the skin, usually in the hips and thighs -- is associated with reduced insulin levels and improved insulin sensitivity.

“This points to a new opportunity to find substances made by subcutaneous fat that may actually be good for glucose metabolism,” said Dr. Kahn, Head of the Joslin Research Section on Obesity and Hormone Action and the Mary K. Iacocca Professor of Medicine at Harvard Medical School. “If we can identify how subcutaneous fat does this, we will have a big clue as to where to look for these substances.”

Kahn noted that obesity in the abdominal or visceral area -- the classic “beer belly” or “apple” shape -- increases the risk of diabetes and mortality, and said it has been thought that obesity in subcutaneous areas -- the “pear” shape -- might decrease such risks.

“We started out to answer the basic question of whether fat inside the belly is bad for you because of where it is located, or is abdominal fat itself different from fat in other places,” said Kahn, an internationally recognized researcher in diabetes and metabolism.

To test if the differences were due to anatomic location or intrinsic properties of the fat deposits themselves, transplantations were performed in mice. The researchers found that when subcutaneous fat was transplanted into the abdominal area, there was a decrease in body weight, fat mass, glucose and insulin levels and an improvement in insulin sensitivity. By contrast, transplantation of abdominal fat into either the abdominal or subcutaneous area had no effect.

The paper concludes that subcutaneous fat is intrinsically different from visceral fat and may produce substances that can improve glucose metabolism.

“The surprising thing was that it wasn’t where the fat was located,” Kahn said. “It was the kind of fat that was the most important variable. Even more surprising, it wasn’t that abdominal fat was exerting negative effects, but that subcutaneous fat was producing a good effect. Animals with more subcutaneous fat didn’t gain as much weight as they aged, had better insulin sensitivity, lower insulin levels and were improved all around.”

Earlier studies in humans had shown that removal of subcutaneous fat by liposuction does not result in improvement of any aspect of metabolic syndrome, a collection of medical problems related to insulin resistance, but none had focused on possible good effects of this subcutaneous fat. However, one human study did show that obese individuals with high levels of both intra-abdominal and subcutaneous fat were more insulin sensitive than those with only high levels of intra-abdominal fat.

In addition, Kahn noted that a class of diabetes drugs called thiazoladines may cause patients to gain weight in the subcutaneous area, yet also improve insulin sensitivity.

Kahn said it is possible that subcutaneous fat may be producing certain

hormones, known as adipokines, which produce beneficial effects on metabolism. These effects may offset the negative effects produced by abdominal fat.

The next step is to identify how subcutaneous fat produces these substances that improve metabolism and then find the substances themselves with the idea of creating a drug that can do the same thing.

“We’re already trying to identify through the use of proteomics what is coming out of the different fat cells,” Kahn said.

Source: Joslin Diabetes Center