Diet suppresses or boosts mitochondria

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Mitochondria are important cellular power plants whose diminished activity has been previously demonstrated to be associated with obesity by a group of researchers at the University of Helsinki. Now, in a new international study coordinated by the University of Helsinki, the researchers have determined that the method of weight loss affects the metabolic pathways of mitochondria in fat tissue, also known as adipose tissue.

The study was recently published in the *Journal of Clinical Endocrinology and Metabolism*.

The researchers combined two datasets on calorie restriction diets and two datasets on weight loss surgery, or bariatric surgery, from Europe, monitoring dieters' weight loss as well as metabolism. A biopsy was taken from the study subjects' adipose tissue both at the beginning and the end of their weight reduction.

Ordinary dieting based on calorie restrictions put the mitochondria in the adipose tissue out of tune, further reducing the expression of related genes. In the case of similar weight loss resulting from bariatric surgery, the function of mitochondrial genes was improved and the activity level of mitochondrial metabolic pathways was higher.

The analyses conducted in the study were set in proportion to weight loss so that the results did not depend on greater weight loss in patients who had undergone surgery.

Why does lost weight come back? Impaired mitochondrial function is a potential cause

Weight loss brings improvements to many metabolic changes associated with obesity, including disorders of glucose and lipid metabolism. Such beneficial effects were also observed in the new study, both in those who followed a regular diet and in those who underwent bariatric surgery.

"This is why it was astonishing to see that the activity of mitochondrial metabolic pathways in adipose tissue was entirely opposite in the two different groups," says researcher Birgitta van der Kolk from the University of Helsinki's Obesity Research Unit.

"Our observations indicate that impaired mitochondrial activity after losing weight by dieting may be the cause of adipose tissue rapidly building up again after weight loss. At the same time, bariatric surgery patients are better protected against regaining weight, which makes us suspect that a recovery of activity by mitochondria in the adipose tissue may be a factor underlying this phenomenon," says Professor Kirsi Pietiläinen, who led the study.

The study used a technique known as transcriptomics analysis, which makes it possible to read the genome as a whole.

"By combining these broad-based techniques, biocomputing and extensive European datasets, we observed entirely unexpected links between dieting and the mitochondria of adipose tissue. In the future, it is important to investigate the relevance of these mechanisms to the functioning of such tissue and weight regain," Pietiläinen adds.

More information: Birgitta W van der Kolk et al. Differential Mitochondrial Gene Expression in Adipose Tissue Following Weight Loss Induced by Diet or Bariatric Surgery, *The Journal of Clinical Endocrinology & Metabolism* (2021). DOI: 10.1210/clinem/dgab072