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Epigenetic changes to fat cells following exercise

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Exercise, even in small doses, changes the expression of our innate DNA. New research from Lund University in Sweden has described for the first time what happens on an epigenetic level in fat cells when we undertake physical activity.

"Our study shows the positive effects of exercise, because the epigenetic pattern of genes that affect fat storage in the body changes", says Charlotte Ling, Associate Professor at Lund University Diabetes Centre.

The cells of the body contain DNA, which contains genes. We inherit our genes and they cannot be changed. The genes, however, have 'methyl groups' attached which affect what is known as 'gene expression' – whether the genes are activated or deactivated. The methyl groups can be influenced in various ways, through exercise, diet and lifestyle, in a process known as 'DNA methylation'. This is epigenetics, a relatively new research field that in recent years has attracted more and more attention.

In the study, the researchers investigated what happened to the methyl groups in the fat cells of 23 slightly overweight, healthy men aged around 35 who had not previously engaged in any physical activity, when they regularly attended spinning and aerobics classes over a six-month period.

"They were supposed to attend three sessions a week, but they went on average 1.8 times", says Tina Rönn, Associate Researcher at Lund

University.

Using technology that analyses 480 000 positions throughout the genome, they could see that epigenetic changes had taken place in 7 000 genes (an individual has 20 000 genes).

They then went on to look specifically at the methylation in genes linked to type 2 diabetes and obesity.

"We found changes in those genes too, which suggests that altered DNA methylation as a result of physical activity could be one of the mechanisms of how these genes affect the risk of disease", says Tina Rönn, adding that this has never before been studied in fat cells and that they now have a map of the DNA methylome in fat.

In the laboratory, the researchers were able to confirm the findings in vitro (studying cell cultures in test tubes) by deactivating certain genes and thus reducing their expression. This resulted in changes in fat storage in fat cells.

More information: A Six Months Exercise Intervention Influences the Genome-wide DNA Methylation Pattern in Human Adipose Tissue, *PLOS Genetics*, June 2013

Provided by Lund University