Genes determine effect of diet and exercise

Your genetic makeup helps determine how much you get out of dieting and exercising. A researcher now aims to identify the genes that determine the effect that diabetes patients get from diet and exercise.

Are you one of those who eat healthily and exercise several times a week but still weigh too much? Then you may be genetically predisposed to not benefiting much from your healthy lifestyle.

Scientists have found that the effect of dieting and exercising is partly determined by genetics.

"If we all exercise in the same way, not all of us will end up as athletes, regardless how hard we exercise. This is to a great extent due to the differences in our genetic makeup," says Tuomas Kilpeläinen, who is a postdoc fellow at the Department of Biomedical Sciences at the University of Copenhagen, Denmark.

"Everyone will see a response when they go on a diet and are physically active, but there is a difference in the strength of this response. Due to certain genetic variables, some people may require major lifestyle changes and another type of training than others."

People with obesity gene benefit more from exercising

Scientists know that a genetic variant known as FTO, which is the strongest known genetic factor for obesity, is highly likely to have an effect on how much weight we lose when we exercise.

“People who carry the variant of the FTO gene that causes increased body weight benefit more from physical activity than others,” says Kilpeläinen.

“It appears that exercising is particularly important for those who are genetically predisposed to becoming overweight. Physical activity appears to reduce the effect of their genetic predisposition to obesity.”

Scientists also know that some type 2 diabetics benefit from just a little exercise while others need to exercise more to see any effect.

Understanding of genes can improve prevention

Kilpeläinen has now set out to identify the genetic variants that determine how much various types of type 2 diabetes patients benefit from changing their lifestyles.

“If we manage to find the relevant genetic variants, we can become better at advising diabetics individually on what lifestyle benefits them the most, because their DNA will tell us whether they will benefit more from increasing their physical activity or from going on a specific diet,” he says.

Major cohort study provides answers
To find out how the lifestyle and the genes of a diabetic patient interact, Kilpeläinen will be using data from the extensive ‘Diet, Cancer and Health cohort’, which was created in 1993 by the Danish Cancer Society.

The cohort includes some 57,000 middle-aged Danes, who in the early 1990s started answering a long series of detailed questions about their lifestyle, diet and health, while undergoing blood tests, urine tests and clinical tests.

This data has been updated regularly since then to keep the researchers up to date with e.g. lifestyle changes.

"This is a unique dataset, as it provides us with a great deal of detailed information about people’s lifestyles, health and diet. At the same time we are able to map the participants’ DNA, since their blood samples are stored in a biobank.”

Genes and lifestyle compared

In the research project, Kilpeläinen and colleagues will be mapping out the DNA of 6,000 participants, who according to the population register have been diagnosed with type 2 diabetes since the start of the Cancer, Diet and Health cohort study. They will also be mapping the DNA of 9,000 randomly selected control subjects.

The genetic composition of all the subjects will then be compared with their lifestyle. This will enable the researchers to see if there are specific gene variants that play a role in how the subjects’ health condition is affected by lifestyle factors such as diet and exercise.

"When we examine the genetic variables of this many people and compare them with their lifestyles, we hope to identify the genetic variables that determine the health benefits of diet and exercise,” says Kilpeläinen.

Project not limited to diabetic patients

If the researchers succeed in identifying the gene variants they are looking for, the project could pave the way for improved personalised prevention and treatment of type 2 diabetic patients.

One such outcome could be that the findings could be used to create special workouts or diets that are tailored to the genetic makeup of each individual type 2 diabetic patient.

Whatever the outcome, the project will contribute with important new insights into human biology and the interaction between lifestyle and genes, says the researcher.

He believes that the findings will not only benefit diabetics, but that they will also play a role in how we approach a variety of other lifestyle-related diseases in the future.

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If the researchers manage to find the genetic variants they are looking for, it will become easier to provide personalised treatment for type 2 diabetic patients. (Photo: <a href="http://www.shutterstock.com/" target="_blank">Shutterstock</a>) [10]

It appears that exercising is particularly important for those who are genetically predisposed to being overweight. (Photo: <a href="http://www.shutterstock.com/" target="_blank">Shutterstock</a>) [11]
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Tuomas Kilpeläinen

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