**BBC News**

**Scientists find link between maternal diet and diabetes**

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**By Neil Bowdler** Science reporter, BBC News

Scientists say they have found a mechanism which may explain why a poor diet during pregnancy can increase the risk of offspring developing diabetes in later life.

They say rat studies indicate an imbalanced diet in the mother can lead to the "silencing" of a gene linked to insulin production in the child.

The Cambridge [**study**](http://www.pnas.org/content/early/2011/03/03/1019007108) is in Proceedings of the National Academy of Sciences.

Experts said it showed a healthy diet was important during pregnancy.

**Silent gene**

Scientists already suspect that a poor diet during pregnancy can result in health problems such as diabetes for the offspring in later life.

What the researchers at the University of Cambridge have come up with is a possible explanation.

They believe an imbalanced diet in the expectant mother can compromise the long-term functioning of a gene in the child.

The gene, called Hnf4a, is thought to play a role in the development of the pancreas and in insulin production.

Because of the difficulties of testing the theory on pregnant women, they fed rats a protein-deficient diet and found higher rates of type 2 diabetes in the offspring, as expected.

What they also found in the offspring was that this Hnf4a gene appeared to be "silenced" or "switched off" as the rats aged.

The researchers suggest this may both cause diabetes, and can be linked back to the maternal diet.

Dr Susan Ozanne of the University of Cambridge, who lead the study, said further research would be needed to establish whether high-fat diets or other imbalanced diets had similar consequences in rats.

She believes similar mechanisms to those seen in the study could occur in humans, and that the effects might be felt by more than just the immediate offspring.

"Having a healthy well-balanced diet any time in your life is important for your health," she said, "but a healthy well-balanced diet during pregnancy is particularly important because of the impact on the baby long-term and potentially even on the grandchildren as well."

**Earliest stages**

Type 2 diabetes is often associated with obesity, although several inheritable genes have also been linked to the condition.

This latest study focuses on what are called the "epigenetic" mechanisms which can affect whether a gene is expressed or not.

Other studies have shown that these changes can be passed across generations without any modifications to our core DNA.

Professor Jeremy Pearson of the British Heart Foundation said the research did not change the advice to pregnant women to eat a healthy, balanced diet, and said there was no reason for expectant mothers to be unduly worried.

But he said the study "adds to the evidence that a mother's diet may sometimes alter the control of certain genes in her unborn child".

Professor Douglas Kell of the Biotechnology and Biological Sciences Research Council said the research fleshed out some of the molecular processes at play.

"This study uncovers - through epigenetics and molecular biology research - an important piece of this puzzle and shows us how apparently minor changes within cells at the very earliest stages of development can have a major influence on our health into old age," he said

**Daily Mail**

**Poor diet during pregnancy can give your future grandchildren diabetes, researchers say**

By [Daily Mail Reporter](http://www.dailymail.co.uk/home/search.html?s=y&authornamef=Daily+Mail+Reporter)  
8 March 2011

A poor diet during pregnancy may increase the risk of a woman’s children and grandchildren developing type 2 diabetes in later life.

The disease mainly affects the middle aged, but a study suggests that susceptibility could be programmed into the cells of an unborn baby if his or her mother eats unhealthily.

In theory, this diabetes vulnerability gene could then be passed down to the child’s offspring and future generations.

Cambridge University scientists pinpointed the gene in tests on rats that showed it was reprogrammed in the womb by a protein-deficient diet given to the mother.

Other research suggests a range of unbalanced diets may result in an increased risk of diabetes, not just protein-restricted ones.

The Cambridge team, whose work is published in the journal Proceedings Of The National Academy Of Sciences, focused on a ‘master regulator’ metabolism gene that is important both in the development of the pancreas in the womb and its ability to produce insulin.

 Feeding mother rats a low-protein diet reduced the gene’s activity, decreased insulin production and made the offspring prone to developing type 2 diabetes in later life.

The scientists say it is likely humans would be affected in a similar way.

**The Guardian**

**Your mother's diet in pregnancy may affect your risk of ageing diseases**

* [Ian Sample](http://www.guardian.co.uk/profile/iansample), science correspondent
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An unbalanced diet in pregnancy can increase children's odds of getting ageing-related illnesses like type 2 diabetes in later life, research on rats suggests

Women who have a poor diet during pregnancy may have children who are more susceptible to age-related diseases than those who have a healthier diet, scientists say.

The warning comes after research found that rats that had poor [nutrition](http://www.guardian.co.uk/science/nutrition) during pregnancy gave birth to young with a high risk of type 2 [diabetes](http://www.guardian.co.uk/society/diabetes), an illness that typically strikes in middle age.

Researchers at Cambridge University traced back the effect to subtle genetic changes that normally accumulate with age.

Similar changes are likely to occur in humans.

The work is believed to be the first evidence that poor maternal diet during pregnancy can make people more vulnerable to the effects of [ageing](http://www.guardian.co.uk/science/ageing).

Type 2 diabetes affects the way the body produces and responds to insulin, a hormone made by beta cells in the pancreas.

The disease is mostly diagnosed in the over-40s, but is becoming more common in younger people.

Scientists led by Susan Ozanne at the Institute of Metabolic Science in Cambridge found that a poor maternal diet led to so-called epigenetic changes that reduced the activity of a gene called Hnf4a in a mother's young.

The gene governs how many insulin-producing cells grow in the pancreas and the organ's ability to respond to high levels of glucose in the blood.

"It's well known that maternal diet and growth of the fetus in the womb impact on the risk of developing type 2 diabetes and cardiovascular disease in later life, but we haven't known the mechanism before," Ozanne said.

[Writing in the journal Proceedings of the National Academy of Sciences](http://www.pnas.org/content/early/2011/03/03/1019007108.full.pdf+html), the researchers describe how the Hnf4a gene was steadily silenced as all the rats got older.

But those born to mothers fed on a bad diet began life with much lower levels of gene activity and developed diabetes sooner.

In the study, rats were fed on either a nutritionally poor diet of 8% protein, or a normal diet containing 20% protein.

Both had the same number of calories.

While genetic mutations can have an immediate effect on a person's health, epigenetic changes are more subtle and can take decades to cause problems.

"It is remarkable that maternal diet can mark our genes so they remember events in very early life," said Miguel Constancia, a co-author on the paper.

People born to mothers who ate badly during their pregnancy are not destined to develop the illness, Ozanne said.

"Diabetes is a very multifactorial disease and poor nutrition and growth in early life is just one risk factor.

"It doesn't mean you will definitely get type 2 diabetes, it just increases your risk.

If you have that risk, it is probably a good idea to ensure your adult lifestyle is going to reduce other risks, for example by having a very active life, eating a good diet and not smoking," Ozanne said.