

You are what your parents ate

March 14 2016



Credit: Jm Verastigue/public domain

Scientists at Helmholtz Zentrum München, in collaboration with researchers from Technical University of Munich and the German Center for Diabetes Research, have shown that diet-induced obesity and diabetes can be epigenetically inherited by the offspring via both the oocytes and the sperm. The results were recently published in the journal *Nature Genetics*.

For its studies, the team of the Institute of Experimental Genetics (IEG)

used mice that had become obese and had developed type 2 [diabetes](#) due to a high-fat diet. Their offspring were obtained solely through in vitro fertilization (IVF) from isolated oocytes and sperm, so that changes in the offspring could only be passed on via these cells. The offspring were carried and born by healthy surrogate mothers. This enabled the researchers to rule out additional factors such as the behavior of the parents and influences of the mother during pregnancy and lactation.

"The results showed that both oocytes and sperm passed on epigenetic information, which particularly in the female offspring led to severe obesity," said Prof. Johannes Beckers, who directed the study. In the [male offspring](#), by contrast, the [blood glucose level](#) was more affected than in the female siblings. The data also show that - like in humans - the maternal contribution to the change in metabolism in the offspring is greater than the paternal contribution.

Possible explanation for rapid spread of diabetes worldwide

"This kind of epigenetic inheritance of a metabolic disorder due to an unhealthy diet could be another major cause for the dramatic global increase in the prevalence of diabetes since the 1960s," said Prof. Martin Hrab? de Angelis, director of the IEG and initiator of the study. The increase in diabetic patients observed throughout the world can hardly be explained by mutations in the genes themselves (DNA) because the increase has been too fast. Since [epigenetic inheritance](#) - as opposed to genetic inheritance - is in principle reversible, new possibilities to influence the development of obesity and diabetes arise from these observations, according to the scientists.

In their theories on heredity and evolution, both Jean-Baptiste Lamarck and Charles Darwin explicitly stated that characteristics and traits that

parents acquire during their lifetime through interaction with the environment could be passed on to their offspring. It was not until the neo-Darwinist "Synthetic Theory of Evolution", which combines the theories of natural selection by Darwin and of genetics by Gregor Mendel, that the inheritance of acquired traits was rejected. "From the perspective of basic research, this study is so important because it proves for the first time that an acquired [metabolic disorder](#) can be passed on epigenetically to the [offspring](#) via oocytes and sperm- similar to the ideas of Lamarck and Darwin," said Professor Johannes Beckers.

More information: Peter Huypens et al. Epigenetic germline inheritance of diet-induced obesity and insulin resistance, *Nature Genetics* (2016). [DOI: 10.1038/ng.3527](https://doi.org/10.1038/ng.3527)

Provided by Helmholtz Association of German Research Centres

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