

How the brain reacts to obesity

Why does obesity make us sick? What is the reaction of the brain to being overweight? A group of nerve cells in the brain is now suspected to contribute to impaired metabolism in obese mice. A team of researchers from CECAD and the Max Planck Institute for Metabolism Research in Cologne discovered that these nerve cells control metabolic processes in the liver of obese mice. This further increases blood sugar levels resulting in a vicious circle.

According to the German Federal Statistical Office, more than half of all Germans are overweight and the incidences of type 2 diabetes are also on the rise. This disease is a typical consequence of over-nutrition and lack of exercise. Type 2 diabetes is a disease caused by impaired insulin metabolism. Body cells become insensitive to this hormone, which is produced in the pancreas and regulates blood glucose levels.

A research team from the Max Planck Institute for Metabolism Research wants to understand how obesity arises and how the body maintains the balance between food intake and energy consumption. Responsible for this are not only the adipose tissue and the muscles, but also the brain. "We focus on the hypothalamus, an area in the brain that regulates hunger and saturation. More specifically, we look at different nerve cell types and their role in this complex system of body weight regulation," explains Dr. Christine Hausen, a researcher in the department of Director Prof. Dr. Jens Brüning.

A vicious circle contributes to impaired metabolism in overweight mice

In the latest study, the researchers examined the group of MCH nerve cells. These are named after the "melanin-concentrating hormone (MCH)", a messenger substance in the brain that is important for food intake and energy balance. "Overweight mice have elevated insulin levels, even in the brain. In MCH nerve cells we observe, in contrast to other nerve cells, that these are activated by insulin in overweight mice. They remain sensitive to insulin", explains Hausen. These permanently activated nerve cells contribute to a disturbed metabolism in the liver. The liver boosts its sugar production, further increasing blood glucose levels. This leads to a deterioration of the health status. The insulin levels remain high and the MCH nerve cells stay activated. "This is like a vicious circle. As a result, the metabolic state of the body is even further impaired", says Hausen.

In fact, overweight mice with altered MCH nerve cells, which are not sensitive to insulin anymore, are better off. However, Hausen is skeptical about bringing this to clinical application: "The reaction of the brain to being overweight is very complex. Various nerve groups react differently to insulin. In order to intervene in these processes with medication, we need to understand the whole system even better. We will continue to work on this."

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Insulin-Dependent Activation of MCH Neurons Impairs Locomotor Activity and Insulin Sensitivity in Obesity
A. Christine Hausen, Johan Ruud, Hong Jiang, Simon Hess, Hristo Varbanov, Peter Kloppenburg, Jens C. Brüning
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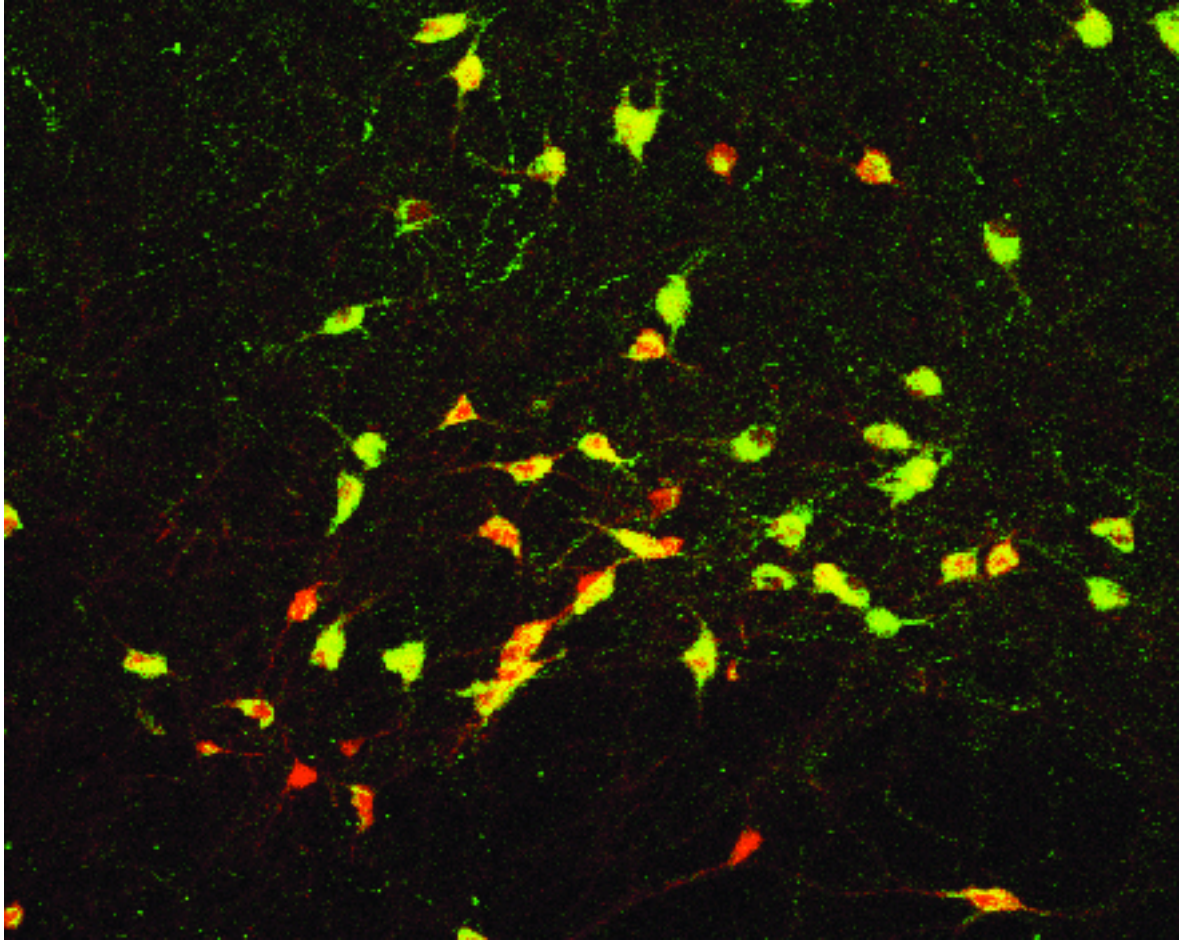


Image caption:

MCH nerve cells control the energy balance in the body. The picture shows stained MCH nerve cells in the hypothalamus of mice.