

## Fat cells seem to remember unhealthy diet

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Credit: University of Copenhagen

It only takes 24 hours for a so-called precursor fat cell to reprogram its epigenetic recipe for developing into a fat cell. This change occurs when the cell is put into contact with the fatty acid palmitate or the hormone TNF-alpha, according to a study conducted by researchers from the Novo Nordisk Foundation Center for Basic Metabolic Research at the University of Copenhagen.

Precursor <u>cells</u> are cells that have not yet matured to undertake a specific



function in the body, e.g. the function of a muscle or fat cell. Palmitate and TNF-alpha are able to disturb the development of the cell, causing it to develop into a dysfunctional fat cell later in its life. In particular, this reprogramming is found in obese patients suffering from type 2 diabetes, the researchers have found.

People are exposed to palmitate through food, especially foods containing large amounts of saturated fat, including dairy products, meat and palm oil. TNF-alpha is an inflammatory hormone that is secreted in the body during illness. Obese patients also have a higher level of TNFalpha, as obesity is linked to inflammation. "Our results stress the importance of a healthy diet and lifestyle for metabolic health. To a large extent, a <u>healthy diet</u> and healthy lifestyle can help prevent the reprogramming of our precursor cells. In the long term, we hope our study may be at the origin of new strategies to reverse the abnormal programming of fat precursor cells, making them healthy and functional once again," says Romain Barrès, who headed the study.

## **Environmental Factors Play a Key Role**

Several epigenetic studies have suggested that human precursor cells have a memory of past environmental exposure. But until now, no one has been able to identify the factors affecting the reprogramming of precursor fat cells or establish the rapidity at which cells are reprogrammed. In cooperation with the Surgical Gastroenterology unit at Hvidovre Hospital, the researchers collected fat tissue from 43 planned operations. Fifteen patients were lean, 14 were obese and 14 were obese and suffered from type 2 diabetes. By collecting samples from these three groups of patients, the researchers were able to compare the health of the precursor fat cells between them.

The team learned that the cells from the group of <u>obese patients</u> suffering from type 2 diabetes had been reprogrammed and therefore



did not function like normal, healthy fat cells. By exposing healthy <u>precursor</u> fat cells to the two external factors for just 24 hours, the researchers were able to mimic the reprogramming they had observed in cells from the diabetic <u>patients</u>.

The researchers are unsure whether it is possible to reverse the programming to make the cells healthy and functional again. And even if it is possible, they do not know how to do it.

"We now know that <u>precursor cells</u> can be reprogrammed in such a way that function is impaired at the final stage of their development, but so far, no one has discovered how to reverse the process. But it is a promising field," says Romain Barrès. The study, "Preadipocytes from obese humans with type 2 diabetes are epigenetically reprogrammed at genes controlling adipose tissue function' has been published in the *International Journal of Obesity*.

**More information:** Emil Andersen et al, Preadipocytes from obese humans with type 2 diabetes are epigenetically reprogrammed at genes controlling adipose tissue function, *International Journal of Obesity* (2018). DOI: 10.1038/s41366-018-0031-3

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