

Study gives insights into how human fat cells are affected by age

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Knowledge of how human fat tissue is affected by age has long been defined by numerous mouse-based studies. Researchers at Karolinska Institutet in Sweden have now, for the first time, been able to conduct a

prospective study on humans that provides novel insights into how our fat cells reduce lipid metabolism with age. The study is published in the journal *Cell Metabolism*.

As we age, many changes take place in our organs that affect physiological function. Earlier studies on mice have shown that macrophages in adipose (fat) tissue start to degrade noradrenaline, a hormone that stimulates lipolysis (the breakdown of lipids). It has long been thought that humans have a similar mechanism, but the new study shows that age-induced changes in human fat metabolism operates differently. Instead of macrophages, which are a type of immune cell, it is the [fat cells](#) themselves that degrade noradrenaline with age.

"We were surprised to see this difference between animals and humans," says Mikael Rydén, senior consultant and professor of clinical and experimental adipose tissue research at Karolinska Institutet and one of the paper's senior authors. "The earlier mouse studies are correct, but it's been hard to do similar work on humans as you need prospective studies that track the same people over time."

Clear link to age

The foundation of the project was laid many years ago when a diet intervention study was conducted on women between the ages of 30 and 35, in which fat samples were taken before, during and after their diet. Now, over 13 years after the first samples were taken, the same women were contacted for a follow-up study.

"Our findings provide the first insights into the changes in adipose tissue that are controlled by biological age in humans," explains Rydén. "What we find is that lipolysis in the adipose tissue declines over time. These changes also seem to be independent of menopause or pregnancy. They are simply the result of aging."

The breakdown of fat affects body function

A lower rate of lipolysis can contribute to weight gain and the accumulation of fat in other tissue. Atherosclerosis can be a result of this process, for instance, as well as changes in the ability of the body to deal with cold and hunger. The results of the study are also interesting from a public health perspective with respect to obesity—a growing problem that leaves people susceptible to many diseases.

"It was once thought that the fat cell was fairly inactive, but we suspect that it's active and controls a lot more than previously thought," says Niklas Mejhert, co-senior author of the paper and joint group leader with Rydén at the Department of Medicine, Huddinge, Karolinska Institutet. "If we can regulate the accumulation of fat in a more controlled way, it could bring huge advantages."

Further cell studies planned

The results of the study, which explain why [adipose](#) tissue becomes less effective and how lipolysis declines with age, are of interest to the efforts being made to find future treatments able to improve the function of [adipose tissue](#).

"We now plan to examine how different cells within the fat [tissue](#) are affected by age," continues Rydén. "This is particularly interesting when it comes to stem [cells](#), which have the unique and important ability to renew themselves and repair injury. It's something we're keen to follow up on."

More information: Hui Gao et al. Age-Induced Reduction in Human Lipolysis: A Potential Role for Adipocyte Noradrenaline Degradation, *Cell Metabolism* (2020). [DOI: 10.1016/j.cmet.2020.06.007](https://doi.org/10.1016/j.cmet.2020.06.007)

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