

# Obese fat becomes inflamed and scarred, which may make weight loss harder

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Fat in obese people can suffocate and struggle for oxygen supply. Credit: University of Exeter

The fat of obese people becomes distressed, scarred and inflamed, which can make weight loss more difficult, research at the University of Exeter has found.

An analysis of the health of adipose (fat) [tissue](#) in overweight [people](#) found that their fat can cease to cope as it increases in size and becomes suffocated by its own expansion.

Dr. Katarina Kos, Senior Lecturer at the University of Exeter's Medical School, examined samples of fat and tissue from patients, including those with [weight](#) problems who have undergone bariatric surgery.

Fat in [obese people](#) can suffocate and struggle for oxygen supply, due in

part to the increase in the [fat cells](#)' size. As cells get bigger they become distressed and struggle for oxygen which triggers inflammation in the fat tissue. The inflammation spills over from fat tissue into the blood stream and is eventually measurable in the circulation by a blood test.

Stressed and unhealthy fat tissue is also less able to accommodate more unused dietary energy. With fat tissue not being able to do its most vital job, which is storing excess calories, the excess energy can be increasingly diverted from fat tissue to vital organs, including the liver, muscle and heart. This can lead to obesity-related health complications such as fatty liver disease and cardiovascular disease.

Dr. Kos found that fat tissue which is fibrous is also stiffer and more rigid. Previous studies of people who have had [weight loss](#) surgery showed that increased levels of [scarring](#) can make it harder to lose weight.

"Scarring of fat tissue may make weight loss more difficult," Dr. Kos said. "But this does not mean that scarring makes weight loss impossible. Adding some regular activity to a somewhat reduced energy intake for a longer period makes weight loss possible and helps the fat tissue not to become further overworked. We know that doing this improves our blood sugar and is key in the management of diabetes."

Dr. Kos, who leads the adipose tissue biology group at the University of Exeter, said where obese people carry their fat can have an impact on their health.

Scarring of fat tissue can change a person's body shape. They can develop an 'apple' body shape with a large tummy and more fat within the deeper layers of the tummy and around the organs. However, they can retain thin arms and legs, as there is little fat just below the skin. Although such people can appear relatively slim, fat can be deposited in

their abdomen and in their internal organs, including their liver, pancreas, muscle and the heart. Fat can also be stored around and in the arteries causing arteriosclerosis, a stiffening of arteries predisposing people to high blood pressure, heart disease and strokes. Scarring of fat tissue has also been linked to diabetes.

"One could have very little fat below the skin and still be at risk of diabetes due to a lot of fat within the abdomen and inner organs," Dr. Kos said.

Dr. Kos, a clinician and specialist in adipose tissue physiology and obesity-related disorders, studied the abdominal fat tissue of obese people which had become fibrous or 'scarred' in order to identify what regulates this scarring and to look at how to reverse it. Scarring makes fat tissue less able to expand and less able to store nutritional energy surplus to its needs.

The research published in the journal *Metabolism*, examined a molecule called Lysyl oxidase (LOX) which regulates scarring by making tissue stiffer. The study, Lysyl oxidase and adipose tissue dysfunction, found that this molecule is more prevalent in fat tissue of obese people and that it was increased by inflammation and oxygen deprivation.

Dr. Kos and her team examined fat tissues from patients who had undergone bariatric surgery and who gave permission for samples of adipose tissue to be examined. She also compared the properties of adipose tissue with leaner subjects who had undergone elective surgical procedures. There was a higher accumulation of the LOX molecule which regulates scarring in obese patients. Those with a higher BMI also tended to have more of the LOX gene expressed in their [adipose tissue](#). She found that low oxygen levels and inflammation were the main drivers of higher LOX levels. The team also found that LOX was not influenced by major weight loss after [bariatric surgery](#).

Dr. Kos added: "Further research is needed to determine how to avoid our fat tissue becoming unhealthy and how protect it from inflammation and scarring. There is evidence that once fat tissue becomes scarred, despite weight loss, it may not recover fully. We need to look after our fat tissue which can cease to cope if it is overworked when being forced to absorb more and more calories. As a clinician, I would advise exercise or at least a 'walk' after a meal which can make a great difference to our metabolic health."

**More information:** Emilie Pastel et al. Lysyl oxidase and adipose tissue dysfunction, *Metabolism* (2017). [DOI: 10.1016/j.metabol.2017.10.002](https://doi.org/10.1016/j.metabol.2017.10.002)

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