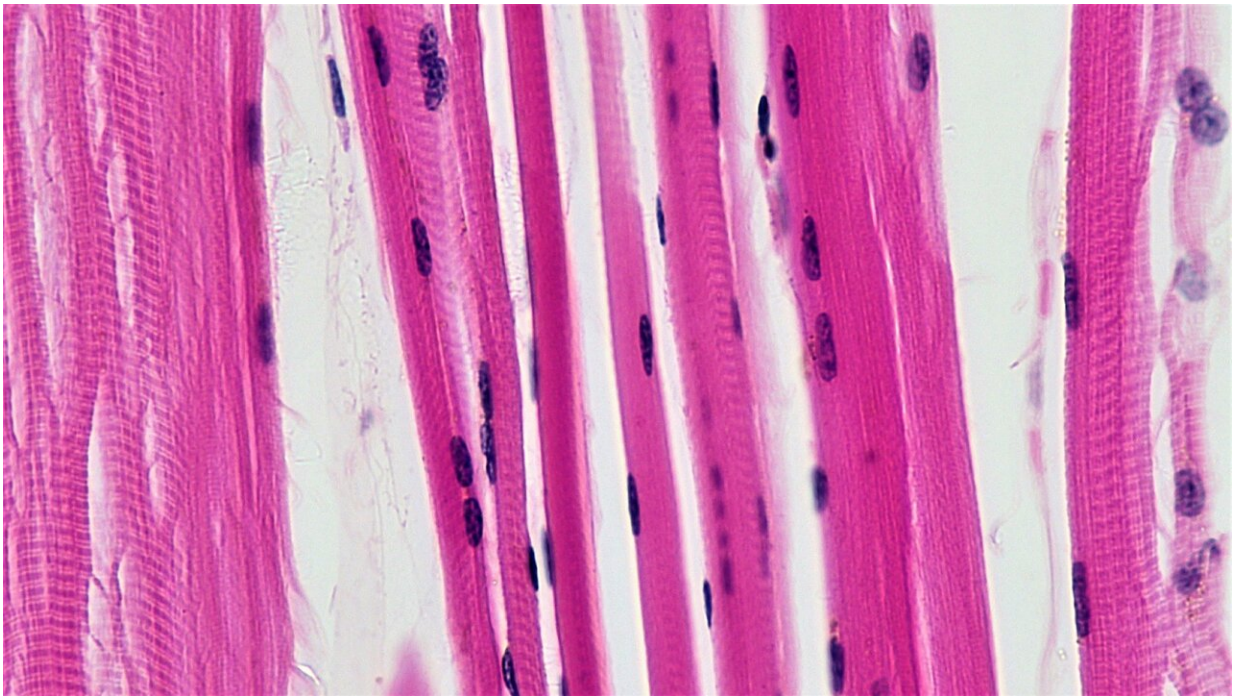


# Researchers identify muscle proteins whose quantity is reduced in type 2 diabetes

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Skeletal muscle fibers. Credit: Berkshire Community College Bioscience Image Library / Public domain

Globally, more than 400 million people have diabetes, most of them suffering from type 2 diabetes.

Before the onset of actual type 2 [diabetes](#), people are often diagnosed with abnormalities in [glucose metabolism](#) that are milder than those

associated with diabetes. The term used to indicate such cases is prediabetes. Roughly 5-10% of people with prediabetes develop type 2 diabetes within a year-long follow-up.

Insulin resistance in [muscle tissue](#) is one of the earliest metabolic abnormalities detected in individuals who are developing type 2 diabetes, and the phenomenon is already seen in prediabetes.

In a collaborative study, researchers from the University of Helsinki, the Helsinki University Hospital and the Minerva Foundation Institute for Medical Research investigated the link between skeletal muscle proteome and type 2 diabetes.

In the study, the protein composition of the thigh muscle was surveyed in men whose glucose tolerance varied from normal to that associated with prediabetes and type 2 diabetes. A total of 148 muscle samples were analyzed.

The results were published in the *iScience* journal.

"Our study is the broadest report on human muscle proteomes so far. The findings confirm earlier observations that have exposed abnormalities in muscle mitochondria in connection with type 2 diabetes," says Docent Heikki Koistinen from the University of Helsinki, Helsinki University Hospital and Minerva Foundation Institute for Medical Research, who headed the study.

## **Protein concentration already decreases in prediabetes**

The researchers utilized [mass spectrometry](#), enabling them to identify over 2,000 muscle proteins.

According to the findings, the quantity of dozens of proteins had already changed in prediabetic study subjects.

The greatest changes were observed in connection with type 2 diabetes, where the quantity of more than 400 proteins had primarily dropped. Most of these proteins were associated with mitochondrial energy metabolism.

In fact, the results highlight the significance of mitochondria when prediabetes is progressing toward type 2 diabetes.

"We found that the levels of mitochondrial muscle proteins are clearly reduced already in prediabetes," Koistinen notes.

The researchers also observed abnormalities, both in conjunction with prediabetes and type 2 diabetes, in the concentration of a range of phosphoproteins, which affect metabolism and muscle function.

## **Regular physical activity as targeted therapy**

The researchers believe their new observations have multiple uses, including in the search for new drug targets.

"Still, there already exists an excellent and economical targeted therapy, since [regular physical activity](#) increases the number of muscle mitochondria and improves metabolism diversely," Koistinen points out.

Physical activity is also key when reducing the risk of developing diabetes.

"You can halve the risk of developing diabetes by losing weight, increasing [physical activity](#) and observing a healthy diet," Koistinen says.

**More information:** Tiina Öhman et al, Skeletal muscle proteomes reveal downregulation of mitochondrial proteins in transition from prediabetes into type 2 diabetes, *iScience* (2021). [DOI: 10.1016/j.isci.2021.102712](https://doi.org/10.1016/j.isci.2021.102712)

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