

# Metformin improves mitochondrial function in patients with type-2 diabetes

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Metformin 500mg tablets. Credit: public domain

A research team from the Department of Physiology of the University of Valencia, the FISABIO foundation and University Hospital Dr. Peset have proven that the mitochondrial dysfunction that occurs in type-2 diabetes can be countered with metformin. The study is published in *Antioxidants & Redox Signaling*.

Mitochondria are organelles involved in different cell processes, such as the degradation of lipids of metabolizing carbohydrates. Furthermore, they are responsible for meeting tissues' energetic demands through cellular respiration. When mitochondria fail to perform these tasks correctly, there is [mitochondrial dysfunction](#).

Mitochondrial dysfunction contributes to type-2 diabetes, a chronic inflammatory disease characterized by hyperglycaemia and hyperinsulinaemia. One substance used to treat it is metformin, an anti-diabetic drug that can regulate the amount of blood glucose.

"In this study we have shown that type-2 diabetes is linked to mitochondrial dysfunction, and that metformin can modulate said effect," explains Víctor M. Víctor, researcher at the UV and FISABIO and one of the article's authors.

To perform the study, which is on the front page of this pioneering publication in its field, researchers analyzed the anthropometric ([body size](#), weight, stature) and biochemical markers from 135 healthy individuals and 120 patients with type-2 diabetes recruited at the Endocrinology Department of University Hospital Dr. Peset, in Valencia. Of these, 81 patients were being treated with metformin and 39 were not.

The study shows the improvement of mitochondrial function in patients with type-2 diabetes being treated with metformin. Furthermore, also in these patients, researchers observed a decrease in the interactions

between leukocytes and [endothelial cells](#), which entails a decrease in the inflammatory process associated with type-2 diabetes.

In this sense, aside from type-2 diabetes, other diseases could derive from mitochondrial dysfunction. Several studies say that arteriosclerosis, a condition that entails the narrowing of arteries, could also be linked to the bad functioning of mitochondria. Therefore, according to this study, metformin could also be an [effective treatment](#) against developing arteriosclerosis and, as a result, cardiovascular diseases.

Aranzazu Martínez de Marañón, FISABIO researcher and first signee of the article, says, "The message we want to spread with this article is that metformin, while far from being an exclusive treatment to regulate [blood glucose levels](#), has several benefits on a cellular level. Specifically, it improves the state of [mitochondria](#) and the function of immune cells. This decreases the initial stages of the atherosclerotic process, a common complication in patients with type-2 [diabetes](#)."

"Our findings have significant clinical implications, as they back the idea that metformin plays a key role in modulating the inflammation that takes place in patients with [type-2 diabetes](#). Meanwhile, the study highlights the beneficial effects of this drug, which prevents mitochondrial dysfunction and deregulation," says researcher Víctor M. Víctor.

**More information:** Aranzazu M. de Marañón et al, Does Metformin Modulate Mitochondrial Dynamics and Function in Type 2 Diabetic Patients?, *Antioxidants & Redox Signaling* (2021). [DOI: 10.1089/ars.2021.0019](#)

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