Genetically engineered muscle tissue being developed to treat type 2 diabetes

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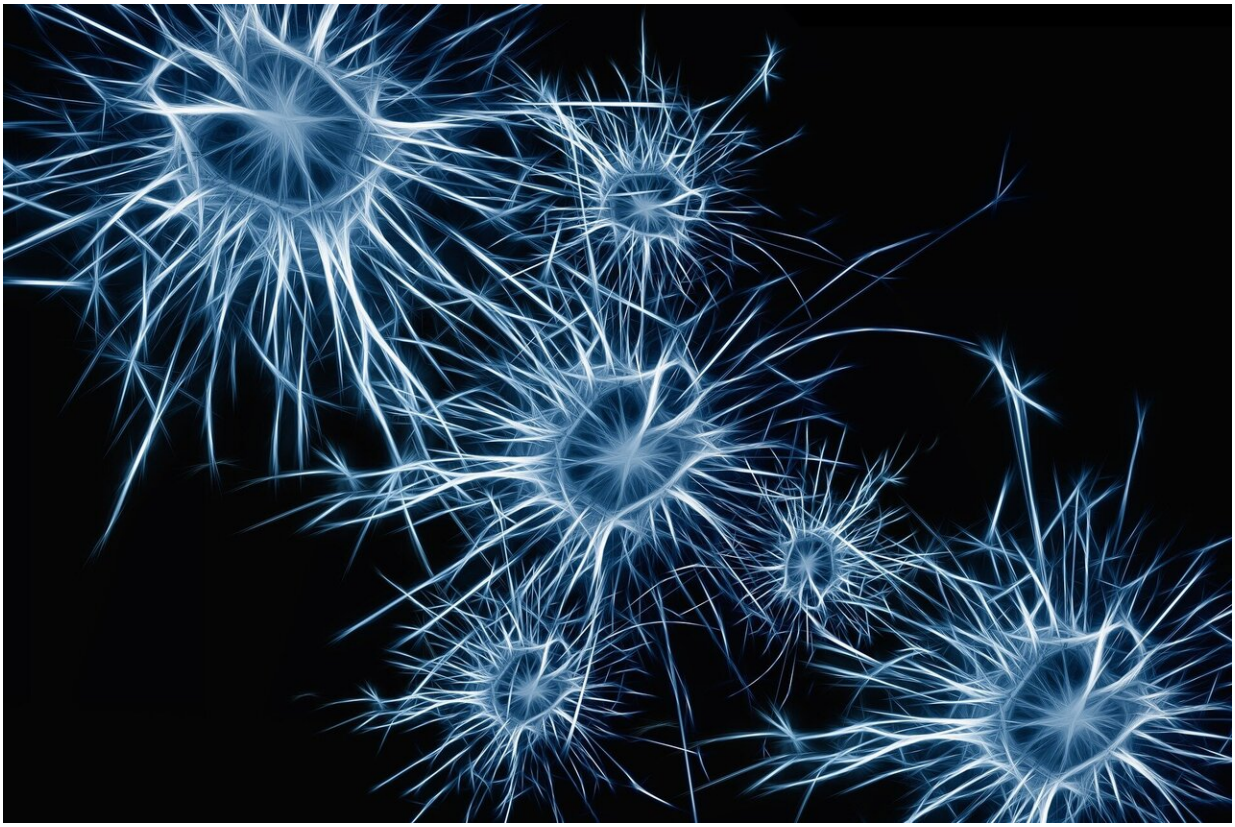

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Injections of genetically engineered muscle tissue hold great promise in treating type 2 diabetes (T2D), according to research to be presented at the annual meeting of the European Association for the Study of

Diabetes in Stockholm, Sweden (19–23 Sept).

T2D is the most common form of diabetes and is responsible for more than 1 million deaths a year, globally. Insulin resistance—where the body's cells don't respond properly to insulin and can't easily take up glucose from blood, causing blood sugar levels to rise—is a key feature of T2D. Over time, high blood sugar levels can damage the heart, eyes, feet and kidneys and shorten life expectancy by around ten years.

T2D is usually treated with oral medication and lifestyle changes initially, but most people will need insulin injections eventually. To find a better treatment, researchers at Levenberg Lab, Technion-Israel Institute of Technology genetically engineered muscle tissue to take up greater amounts of sugar from the blood.

In previous research, the transplantation of genetically engineered muscle cells into diabetic mice improved their blood sugar levels. "A single transplant of engineered tissue kept blood sugar levels lower for four months," says researcher Hagit Shoyhet.

In their latest research, the team used the same technique to genetically modify human muscle cells. The cells were engineered to make more insulin-activated sugar transporter (GLUT4), a protein that's known to help cells take in sugar. The cells were then grown into 3D tissue in the lab on scaffolds—matrices made from a biopolymer. Tests showed that the new tissue was able to take up 50% more sugar than normal muscle tissue.

Pieces of tissue 6 mm in diameter were then transplanted into diabetic mice through a small incision in the abdomen and their blood glucose levels were monitored. The transplant resulted in a reduction in blood glucose levels of around 20%. The team also developed a more flexible, sponge-like scaffold that could be injected using a syringe, removing the

need for surgery.

The tissue grown on the new scaffold developed normally. Tests showed that injection did not cause significant damage to the tissue grown on the new scaffold and that the tissue could still take up sugar from the blood.

Shoyhet says, "New treatments for type 2 diabetes are urgently needed. Our technique would allow a patient's own cells to be modified to take up more glucose.

"Preliminary results indicate the approach has great potential, and in the future, a single injection of engineered tissue could provide long-lasting glucose control, significantly improving quality of life and life expectancy."

The researchers have more pre-clinical work planned and hope to start clinical trials soon.

Provided by Diabetologia