National Institutes of Health / U.S. National Library of Medicine

Engineered Skin Cells Control Type 2 Diabetes in Mice: Study

'Therapeutic skin grafts' might someday treat multiple diseases, researchers say

(*this news item will not be available after 11/01/2017)
Thursday, August 3, 2017

THURSDAY, Aug. 3, 2017 (HealthDay News) -- Scientists have created genetically altered skin cells that may control type 2 diabetes in lab mice. And they believe the general concept could someday be used to treat various diseases.

Using a combination of stem cells and "gene editing," the researchers created patches of skin cells that were able to release a hormone called GLP1 in a controlled manner.

The hormone, which is normally produced in the digestive tract, spurs the production of insulin -- the body's key regulator of blood sugar levels.

The scientists found that transplanting the engineered skin patches onto diabetic lab mice helped regulate their blood sugar levels over four months.

Xiaoyang Wu, a stem cell biologist at the University of Chicago, led the "proof of concept" study. He said it raises the possibility that "therapeutic skin grafts" could be used to treat a range of diseases -- from hemophilia to drug dependence.

Wu's team focused on type 2 diabetes in these initial experiments because it's a common condition.

However, a researcher not involved in the study doubted the usefulness of the approach for diabetes specifically.

People with type 2 diabetes already manage the disease with diet, exercise and medications -- including ones that target GLP1, said Juan Dominguez-Bendala.

Using high-tech gene therapy to get the same result seems unlikely, said Dominguez-Bendala, an associate professor at the University of Miami's Diabetes Research Institute.

"I don't see something like this coming to the clinic for diabetes," he said.

But Dominguez-Bendala also pointed to what's "cool" about the experiments.

Wu's team used a recently developed technology called CRISPR (pronounced "crisper") to create the skin patches. The technique, heralded as a major breakthrough in genetic engineering, allows scientists to make precision "edits" in DNA -- such as clipping a particular defect or inserting a gene at a specific location.

Before CRISPR, scientists could not control where an inserted gene would be integrated into the genome. It might end up in a "bad" location, Dominguez-Bendala explained, where it could, for example, "awaken" a tumor-promoting gene.

Wu and colleauges used CRISPR to make specific edits in GLP1, including one that allowed the gene to be turned "on" or "off" as needed, by using the antibiotic doxycycline.

The modified gene was inserted into mouse stem cells, which were then cultured into skin grafts in the lab. Finally, those grafts were transplanted onto lab mice.

The researchers found that when the mice were fed food with tiny amounts of doxycycline, the transplanted skin released GLP1 into the bloodstream. In turn, the animals' insulin levels rose and their blood sugar dipped.

The engineered skin also seemed to protect the mice from the ravages of a high-fat diet. When the mice were fed a fat-laden diet, along with doxycycline, they gained less weight versus normal mice given the same diet. They also showed less resistance to the effects of insulin, and lower blood sugar levels.

According to Wu, the study lays the groundwork for more research into using skin cells as a way to deliver "therapeutic proteins."

For instance, he said, skin cells could be engineered to provide an essential protein that is missing because of a genetic defect. As an example, he cited hemophilia -- a genetic disorder in which people lack a protein that allows the blood to clot properly.

Skin cells could be an ideal way to deliver such therapies, Wu said.

For one, the safety of skin grafts in humans is well-established, he pointed out. Since the 1970s, doctors have known how to harvest skin stem cells from burn victims, then use those cells to create lab-grown skin tissue.

Because the skin is generated from a patient's own stem cells, that minimizes the issue of an immune system attack on the tissue.

Dominguez-Bendala agreed that using skin cells has advantages. For one, he noted, the skin graft can be easily removed if something goes awry.

But a lot of work remains before therapeutic skin grafts could become a reality for any human disease. And research in animals doesn't always pan out in humans.

A next step, Wu said, is to see whether the skin grafts maintain their effects in lab mice over a longer period. The researchers will also monitor the animals for any immune system reactions against the GLP1 protein itself.

The findings were published online Aug. 3 in *Cell Stem Cell*.

SOURCES: Xiaoyang Wu, Ph.D., assistant professor, Ben May Department for Cancer Research, University of Chicago; Juan Dominguez-Bendala, Ph.D., associate professor, and director, stem cell development for translational research, Diabetes Research Institute, University of Miami Miller School of Medicine; Aug. 3, 2017, *Cell Stem Cell*, online

HealthDay

More Health News on
Diabetes Type 2 [https://medlineplus.gov/alphanews_d.html#diabetestype2]
Genes and Gene Therapy [https://medlineplus.gov/alphanews_g.html#genesandgenetherapy]
Stem Cells [https://medlineplus.gov/alphanews_s.html#stemcells]

Recent Health News [https://medlineplus.gov/healthnews.html]

Related MedlinePlus Health Topics

Diabetes Type 2 [https://medlineplus.gov/diabetestype2.html]

Genes and Gene Therapy [https://medlineplus.gov/genesandgenetherapy.html]

Stem Cells [https://medlineplus.gov/stemcells.html]