BIOTECHNOLOGY

Going bald? Lab-grown hair cells could be on the way

These biotech companies are reprogramming cells to treat baldness, but it's still early days.

By Antonio Regalado

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The company's founder is Ernesto Lujan, a Stanford University–trained biologist. He says his company can produce the components of hair follicles by genetically "reprogramming" ordinary cells, like blood or fat cells. More work needs to be done, but Lujan is hopeful that the technology could eventually treat "the underlying cause of hair loss."

We're born with all the hair follicles we'll ever have—but aging, cancer, testosterone, bad genetic luck, even covid-19 can kill the stem cells inside them that make hair. Once these stem cells are gone, so is your hair. Lujan says his company can convert any cell directly into a hair stem cell by changing the patterns of genes active in it.

In biology, we "now understand cells as a 'state'" rather than a fixed identity, says Lujan. "And we can push cells from one state to another."

Reprogramming cells

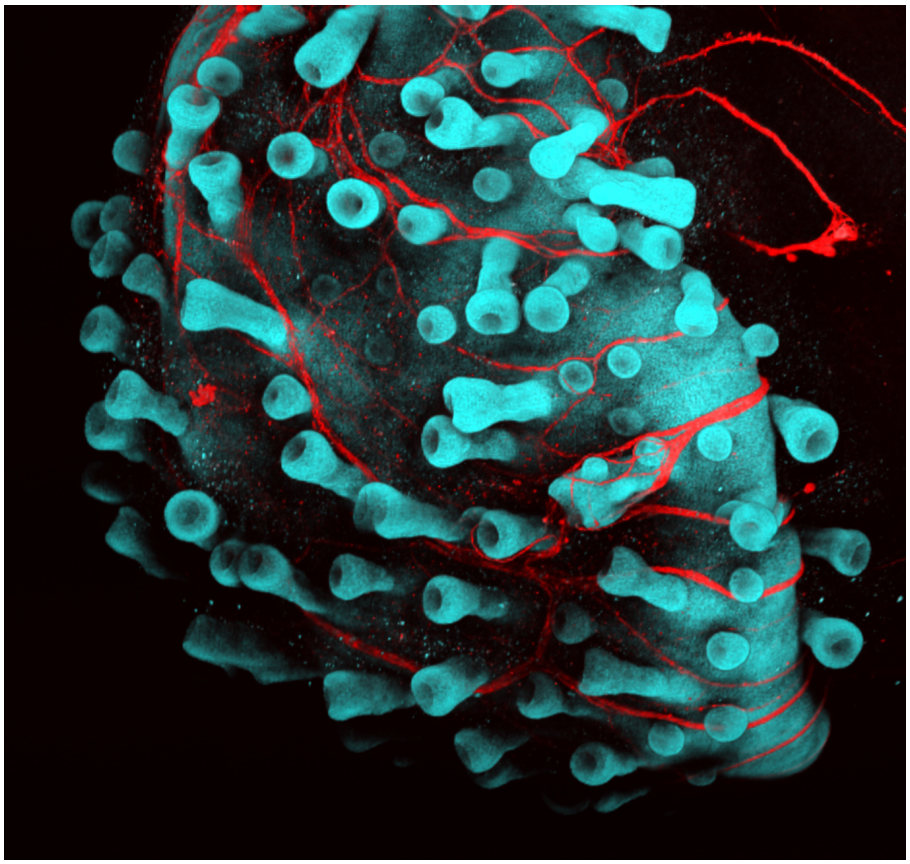
The chance of replacing hair is one corner in a wider exploration of whether reprogramming technology can defeat the symptoms of aging. In August, MIT Technology Review reported on a stealthy company, Altos Labs, that plans to explore whether people can be rejuvenated using reprogramming. Another startup, Conception, is trying to extend fertility by converting blood cells into human eggs.

people. Then, last November, a US company, Vertex Pharmaceuticals, said it might have cured a man's type 1 diabetes after an infusion of programmed beta cells, the kind that respond to insulin.

The concept startups are pursuing is to collect ordinary cells such as skin cells from patients and then convert these into hair-forming cells. In addition to dNovo, a company called Stemson (its name is a portmanteau of "stem cell" and "Samson") has raised $22.5 million from funders including from the drug company AbbVie. Cofounder and CEO Geoff Hamilton says his company is transplanting reprogrammed cells onto the skin of mice and pigs to test the technology.

Both Hamilton and Lujan think there is a substantial market. About half of men undergo male-pattern baldness, some starting in their 20s. When women lose hair, it's often a more general thinning, but it's no less a blow to self-image.

These companies are bringing high-tech biology to an industry known for illusions. There are plenty of bogus claims about both hair-loss remedies and the potential of stem cells. "You've got to be aware of scam offerings," Paul Knoepfler, a stem-cell biologist at UC Davis, wrote in November.



A close-up of a skin organoid that is covered with hair follicles.

JIYOON LEE AND KARL KOEHLER, HARVARD MEDICAL SCHOOL

Tricky business

So is stem-cell technology going to cure baldness or become the next false hope? Hamilton, who was invited to give the keynote at this year's Global Hair Loss Summit, says he tried to emphasize that the company still has plenty of research ahead of it. "We have seen so many [people] come in and say they have a solution. That has happened a lot in hair, and so I have to address that," he says. "We're trying to project to the world that we are real scientists and that it's risky to the point I can't

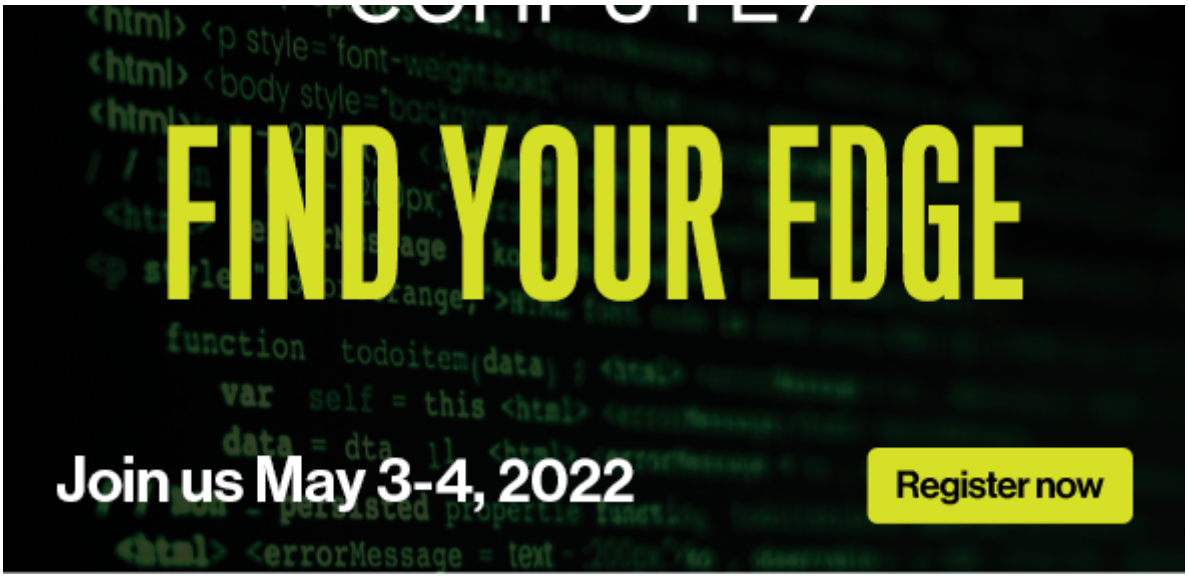
“Anytime you see these images,” says Koehler, “there is always a trick, and some drawback to translating it to humans.”

Koehler’s lab makes hair shafts in an entirely different way—by growing organoids. Organoids are small blobs of cells that self-organize in a petri dish. Koehler says he originally was studying deafness cures and wanted to grow the hair-like cells of the inner ear. But his organoids ended up becoming skin instead, complete with hair follicles.

Koehler embraced the accident and now creates spherical skin organoids that grow for about 150 days, until they are around two millimeters across. The tube-like hair follicles are clearly visible; he says they are the equivalent of the downy hair that covers a fetus.

One surprise is that the organoids grow backwards, with the hairs pointing in. “You can see a beautiful architecture, although why they grow inside out is a big question,” says Koehler.

The Harvard lab uses a supply of reprogrammed cells established from a 30-year-old Japanese man. But it’s looking at cells from other donors to see if organoids could lead to hair with distinctive colors and textures. “There is absolutely demand for it,” says Koehler. “Cosmetics companies are interested. Their eyes light up when they see the organoids.”



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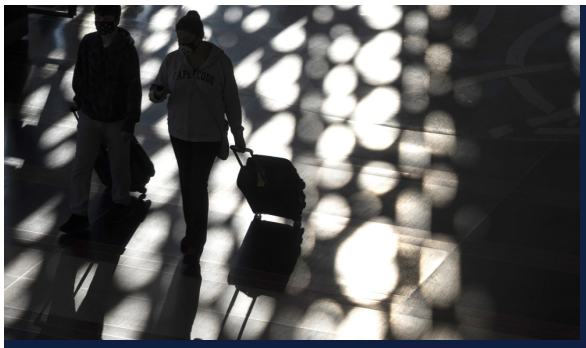

We won't know how bad omicron is for another month

Gene sequencing gave an early alert about the latest covid variant. But we'll only know if omicron is a problem by watching it spread.

By Antonio Regalado

A gene-edited pig's heart has been transplanted into a human for the first time

The procedure is a one-off, and highly experimental, but the technique could help reduce transplant waiting lists in the future.

By Charlotte Jee

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