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Startup Spotlight: A Defense Department-backed biotech pushes platelets to clot blood

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Platelets, a type of blood cell that's vital to clotting, can help stem the bleeding for trauma victims and even wounded soldiers on the battlefield. And one Cambridge, Mass.-based biotech company is working to make it easier to get the cells out to the front lines.

Platelet BioGenesis showed Thursday that it's able to create 100 million platelets with one run of its bioreactor — a big step forward after 20 years of research and investments from funders as varied as the

Department of Defense and an undergraduate investment club. Its founders presented the results in a poster at a Gordon Research Conference in Galveston, Texas.

“Now we’re at the point that we’re so confident that these are real, functional platelets, we’re going to start adding on the bells and whistles to them,” said Sven Karlsson, the president of Platelet BioGenesis.

To create its millions of cells, Platelet BioGenesis relies on a variety of growth factors to coax stem cells derived from cord blood into the cells that create platelets, which are called megakaryocytes.

Creating megakaryocytes from stem cells is, scientifically speaking, well-trod ground. What hasn’t been done before is creating a bioreactor to turn those megakaryocytes into platelets in an amount that might be meaningful outside of academic labs.

“That’s the piece that had sort of been missing from the puzzle,” Karlsson said.

But that piece is particularly important — especially to some of the organizations that have funded the company’s work.

In addition to early-stage funding from the Massachusetts Life Sciences Center, a group of angel investors that included an undergraduate investment club from the University of New Hampshire, the company also recently completed a $10 million Series A round.

“We’re quite a bit different from a lot of the biotech companies you’ve seen that have grown up in the recent venture model, where you start day one with $100 million,” Karlsson said. “We started more typically as you would have seen 10 or 15 years ago — where we started with a group of founders who were dedicated to the science and the mission.”

The company also received a $3.5 million, two-year grant in June from the Department of Defense. That agency, which has jurisdiction over most of the United States’ armed forces, is interested in a platelet bioreactor for obvious reasons.

“Obviously, soldiers and civilians near a war zone are typically bleeding a lot,” Karlsson said. “Platelets are the cells in your blood that stop you from bleeding. If you have any major trauma or injury, you’ll typically get a platelet transfusion.”

Right now, the military ships platelets from the United States through Germany to combat areas.

“A very small number of platelets actually get to the region and very few actually get to the soldiers that need them in time,” Karlsson said — they just don’t last long enough to be useful. In theory, more of those platelets could get to where they need to go if they’re produced closer to their final destination.

“You could take the last step of our production process and put it on a hospital ship or a naval vessel,” he added, along with a frozen supply of precursor cells.

But like every biotech these days, Platelet BioGenesis is a “platform.” Creating normal platelets is just one thing the company hopes to do.

“You can use platelets to do all sort of stuff, like deliver drugs,” Karlsson said. In theory, it ought to be easy and make doses more potent (or even cheaper). The body pulls platelets to cuts and inflammatory sites, and tumors pull platelets in to grow while cloaking themselves from the immune system. And platelets come ready-made with little pouches — technically called granules — that an enterprising scientist could stick a drug into.

“A platelet is a good vehicle to use for any disease that involves inflammation — which is like every disease,” said Karlsson. “The issue that we have is narrowing it down from everything we could do to what’s the best first thing to do.”

Some have already used platelets in just that way, or done experiments with similar goals. But it’s not been done in a way that could be meaningful to humans — yet.

“It’s all been done using donor platelets,” Karlsson said. “The issue is that a donor platelet lasts for five days.”

He used the example of CAR-T therapy, custom-made cancer therapies that rely on a patient’s own immune cells to target the disease. After they’re harvested from a patient, they’re genetically modified and then infused back into the patient — a process that usually takes two to three weeks.

“To do that whole process in five days is essentially impossible,” he said.

It’s still technically impossible for Platelet BioGenesis, too. The company is still doing preclinical work to show the Food and Drug Administration that they can produce platelets that act and behave as they should and that their process that meets certain standards. Clinical trials for these so-called “designer platelets” aren’t likely to start for two or three years, and the company’s plain platelets aren’t likely to get to market until 2024, if the FDA approves them in the meantime.

Between now and then, there will be fundraising rounds and other shakeups still to come — which should help one of the company’s most visible challenges: The only people on the company’s board of directors and scientific advisory board are white men.

“It’s something we’re very aware of,” Karlsson said. “Historically, the field has been — as with many scientific fields — has been white and male. As a company, we’re more balanced than that.”

But as the company gets closer and closer to having an actual clinical trial or an actual product to sell, that might change. “The mix will shift over there over time,” Karlsson said. “That gives us the opportunity to move it in the right direction.”

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