

Efferent Labs to use living cells to make diagnoses

By GINO FANELLI

Among all the medical sensors and diagnostic tools on the market, none have yet been able to beat nature in the sense of how cells react to their surroundings.

Cells themselves act as the body's own diagnostics system, producing proteins or other compounds as a result of sickness or in response to outside stimuli. Ibuprofen, for example, stops cells from producing prostaglandins, a lipid compound that causes pain and swelling, while viruses responsible for the common cold steal the protein N-myristoyltransferase from infected cells. In the latter case, you can probably feel that little tickle in the back of your throat that indicates that process starting well before a traditional diagnosis could even show up.

With that piece of scientific trivia, Efferent Labs Inc. has set out with a solution—tracking biology through biology. Efferent is the developer of new type of medical sensor that uses living cells to test for different chemical reactions that could create a sensor far more accurate and timely than anything currently on the market.

“The concept is a sensor that's half alive,” said Spencer Rosero, chief medical officer for Efferent. “So instead of making all these little machines that measure one thing or two things, we actually incorporate living cells as part of the chip, and these living cells are a biological computer; they do all the thinking — that's what they do for a living.”

Founded by entrepreneur Bill Rader as Raland Therapeutics in 2011, Efferent is a member of the second Luminate NY cohort and began in a research lab at the University of Rochester with corporate headquarters in Buffalo.

Efferent was originally a runner-up in Luminate but replaced San Francisco-based Kura Tech, which dropped out of the program.

The end result of nearly a decade of research is a prototype for the CytoComm system, a little black box fitted with a film used to host a stem cell culture. That cell culture uses a technology called green fluorescent protein, which can be bound to a protein of interest and

allows for sensing of that protein. Green fluorescent protein was first cultivated from bioluminescent jellyfish and has the unique property of glowing when subjected to blue light.

“That's why we're part of Luminate — it's all optics,” Rosero said. The technology “pings the cells — shines a blue light — but the cells have a protein that has been used for 30 years in biology, so when you shine a blue light on it, if that protein exists, it gives you a green back. It can pick up a single protein out of hundreds of thousands. If that protein is labeled, and it makes it, we can see it, and if it goes away, we see it go away.”

Efferent is still in the research phase and has done its testing so far on mice and rats. The device can be implanted, constantly taking in cellular information and reporting back the results via Bluetooth. Compared to a traditional blood test, the CytoComm system has the advantage of monitoring protein production in real-time.

“Right now, if you look at any big company that does blood tests, and they say ‘oh, we have 100 markers that we tested,’ that's fine, but those markers are already too late,” Rosero said. “That means they've entered the blood ... (and) by the time they get to the system level, it's too late. So we want to capture things on the cell level, understand it and respond.”

That kind of cellular research has plenty of applications, from pharmaceuticals to traditional medical research. Cancers, for example, are often characterized by the production of abnormal proteins, such as TP53, ERBB2 and so on. The CytoComm system could, theoretically, catch cancer indicators at the cellular level before any notable symptoms arise, and thus guide treatment before the condition would normally be diagnosed. Once implanted, the CytoComm device can survive for about 30 days and takes 10 samples per minute.

But that's a ways off; CytoComm is currently oriented toward research with the first steps into the market aimed at the pharmaceutical industry.

“I think the first powerful markets are as a drug discovery tool, to understand disease and to develop treatments,” Rosero said.



Spotlight on Luminate

Ten companies composed of some of the brightest minds in the field of optics, imaging and photonics are fine-tuning their technologies inside NextCorps' Luminate NY accelerator. The winners of November's second Lightning Awards, these companies each received \$100,000 in funding, free residency in the accelerator and access to NextCorps' web of resources and mentoring. On June 27, the most promising of these 10 will receive a total of \$2 million in follow-on funding. Originally funded for two years, the Luminate NY accelerator has now been funded for three more years via \$15 million in additional state funding.

Leading up to Demo Day, the Rochester Business Journal is featuring profiles of the companies holding the keys to the next chapter in Rochester's history as the world's imaging center.

Efferent completed its first round of successful testing on lab rats last summer through German drug company Evotec at a lab in Toulouse, France. Looking forward, Rosero expects the first non-implantable version for human testing within the next two years.

“It would be early, temporary testing,” Rosero said. “That's a first step, (after) we narrow down using animal implant studies and understand better at that point.”

In 2014, Efferent was a member of the first cohort of Buffalo's 46North accelerator, garnering \$500,000 in grant funding. Five years later, Luminate is serving as a springboard for getting the

company out of the pre-clinical stage and closer to the medical market.

“We were able to participate in all of (Luminate's) resources, and it's been very good, between the networking and instructional components, the training sessions — things you can't get that easily; the team here has provided that access,” Rosero said. “And it's also the back and forth (conversations). There's a lot of interactions that may be just a few sentences, but they're powerful and get you thinking: ‘hmm, that could have been a little more precise,’ and you walk away with that message and improve.”

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