

BIOCENTURY Innovations

FROM IDEA TO IND

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STRATEGY

DIGITAL PRECLINICAL

By Lauren Martz, Senior Writer

After flying under the radar for the last three years, Vium Inc. is coming out of the shadows with a technology it thinks will change the face of *in vivo* testing. By bringing high tech to life sciences, Vium is developing a system of digital cages and informatics systems for an almost fully automated process of conducting animal studies that it claims is more reproducible, reliable and scalable than the industry standard.

The company was formed in 2013 as [Mouser Inc.](#), and since then has been working with a select group of beta partners to develop the platform. In the last two years, it closed \$30 million in series A funding from Lux Capital, Founders Fund, Data Collective, Dolby Family Ventures and Ame Cloud Ventures.

In a press release issued today, Vium announced its name change, and disclosed the first details of its Digital Vivarium platform for data collection and analysis from animal models.

“We have been writing our patents, doing the technical work and building out our operational capabilities to get us to this point that we’re ready to offer the services to the public,” said co-founder and CEO Timothy Robertson.

Jeff Kindler, a venture partner at Lux Capital, former CEO of [Pfizer Inc.](#) and one of Vium’s board members, told BioCentury the technology serves an important need in the industry, as issues with *in vivo* testing are causing an expensive bottleneck in drug development.

“Not only have we been spending too much and taking too much time in development and testing of animal models, but predictability and reliability also haven’t been what they could be,” said Kindler.

While there’s been no shortage of innovation in the biology of animal models, there have been relatively few advances in the fundamental ways experiments are performed and the ways data are collected and analyzed.

“Most people would agree that how we perform animal studies is similar to what we’ve done for the past 50 years,” said Annalisa Jenkins, CEO of [Dimension Therapeutics Inc.](#) and a board member at Vium.

She said the antiquated *in vivo* protocols used today rely heavily on the interaction between investigators and animals, which introduces variability in data measurements, restricts scalability and ties up resources.

According to Vium co-founder and CTO Joe Betts-Lacroix, inconsistency in preclinical data also stems from variable testing conditions across different labs, which often aren’t recorded or communicated.

Those shortcomings, coupled with the observation of how underserved the field of animal experimentation was by technology, led Betts-Lacroix and Robertson to think that applying sensors and monitoring technology to animal cages could enable far more reliable *in vivo* data collection and processing.

“It can significantly speed up the work required for preclinical development, reduce the cost, and increase the predictability and reliability of the data.”

Jeff Kindler, Lux Capital

Both came to biotech as Bay Area entrepreneurs with a tech background — Betts-Lacroix from mobile computing devices and Robertson from sensor technologies.

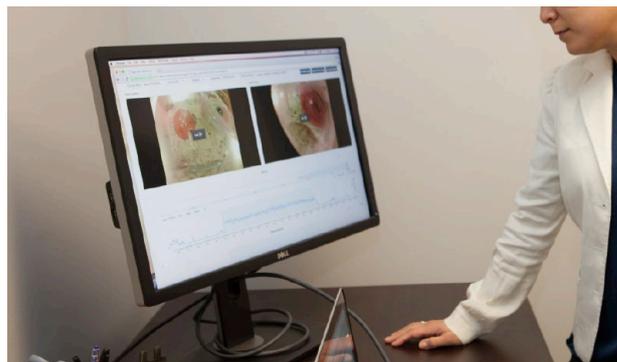
“People in Silicon Valley aren’t aware that these problems exist in the life sciences, or that their technologies could improve this part of the drug development process. They have never been to an animal facility,” said Robertson.

DIGITAL MODELING

The partners created a two-component Digital Vivarium platform that continually monitors and records a wide range of animal metrics as well as changes in environmental conditions throughout the course of an experiment.

The primary component is the cage system — dubbed Vium Smart Housing — which uses a series of sensors for monitoring aspects including temperature, gas, humidity and light, and high-definition cameras to collect the data. The second component is the Vium Cloud, where data are stored and analyzed.

The idea is to continually collect a vast number of data points in an unbiased way, with almost no need for human operators, because



SOURCE: VIUM INC.

the cages automatically record information normally collected by technicians.

That not only avoids limitations on timing and logistics of experiments caused by technician availability, but also provides information from readouts that weren't anticipated in the protocol.

By applying the Digital Vivarium platform's monitoring technologies to established animal models, the company creates sets of alternative experimental readouts to assess disease progression and severity. For example, Robertson said, in glioblastoma multiforme (GBM) experiments in which tumor cells are injected into brain regions, Vium's system can detect limping or paw dragging behaviors long before the tumor causes the animal to die, which is the typical preclinical endpoint.

The company has begun applying the platform to disease models by establishing sets of readouts for four disease areas: rheumatoid arthritis (RA), multiple sclerosis (MS), lupus and aging. It also has several other models under development for indications ranging from Alzheimer's disease (AD) to diabetes.

According to Betts-Lacroix, Vium selected the first disease models based on how well served the disease would be by Vium's technology, and on need — both in terms of the quality of existing animal models and the availability of therapeutics.

Part of the decision process is to look at where target clients are investing their resources. "We use the top focus areas for pharma as a proxy for market need," he said.

Robertson noted that in RA, current testing protocols are some of the most inconsistent among disease models.

Standard methods involve injecting collagen into mice or rats, and measuring paw size to indicate the degree of joint swelling. "This is so problematic because how tight you squeeze, how you hold the

calipers, how you hold the mouse or rat — all of that matters to the data you get," said Robertson.

He added that while most labs use the same experimenter for all of the measurements to standardize data, that doesn't limit all variability or address the problem of low reproducibility across labs.

In Vium's system, the animals are housed in the Digital Vivarium, where metrics including the level of movement and the standard paw measurements are used to create an arthritis index that indicates the degree of disease severity. Several of the company's beta customers are using the arthritis model to screen libraries of anti-arthritis and anti-inflammatory compounds.

THE HOUSING BUSINESS

In addition to setting up its own series of animal models, Vium will work with clients to develop experimental metrics for models tailored to their disease areas of interest.

The company has a partnership with an undisclosed pharma to develop a Digital Vivarium model of liver failure. While most standard models of liver failure depend on expensive serial blood draws, the partners found behavioral indicators that can be measured by the sensors and serve as an alternative readout for the disease.

Vium owns IP covering new models developed in partnerships, and those models become part of Vium's established models offered to other clients.

For now, Vium is restricting its experiments to mice and rats because of the wealth of applications, but it might include larger animals in the future.

"There are over four million mouse and rat cages operating in the U.S., and we have a huge job to do to increase the accuracy,

“Most people would agree that how we perform animal studies is similar to what we’ve done for the past 50 years.”

Annalisa Jenkins, Dimension Therapeutics

repeatability and quantity of data just in that space first,” said Betts-Lacroix.

While the business model primarily involves running experiments for clients at the Digital Vivarium facility, which houses 400 cages for mice and rats, the company is also in discussions with several companies to offer installation of Digital Vivarium equipment on site.

Thus far, Vium’s partners have included small, select groups from academia and industry who have helped develop the company’s platform and initial models, including [Harvard Medical School](#), [twoXAR Inc.](#), [New York University School of Medicine’s NYU Langone Medical Center](#), and at least four undisclosed big pharmas.

The newco plans to be selective with its clients as capacity grows, and to target companies based on their therapeutic focus. Betts-Lacroix added that even when capabilities are scaled, there will always be some level of selectivity.

DIGITAL PERKS

Vium’s backers think the Digital Vivarium provides the kind of preclinical data that regulators want to see in an IND filing, and is a move in the right direction for companies.

Kindler told BioCentury that Vium was an attractive investment because the founders developed a technology for a need that no one else is trying to address. “It can significantly speed up the work required for preclinical development, reduce the cost, and increase the predictability and reliability of the data,” he said.

While Vium hasn’t worked directly with FDA on what preclinical data the regulators would like to see, Betts-Lacroix and Jenkins both believe the agency is beginning to expect more thorough and standardized preclinical data.

Betts-Lacroix noted that the company is being “very thorough, careful and diligent about communicating all of the parameters involved” in how it conducts studies. “We think we will be well received by regulators and eventually they will come to expect more high-quality data like what we provide.”

Jenkins agreed, and added that removing the human interaction component of animal research to provide consistency and the ability to look across programs is the “Holy Grail of FDA.”

The company believes in the long term its protocols will improve candidate selection without increasing costs by saving labor and time. By improving the efficiency of data collection, the number of animals required for each experiment should also go down, which is beneficial from both a cost and animal welfare perspective, said Robertson.

However, the equipment does cost money to install, maintain and operate, noted Betts-Lacroix. “Overall, where we are presently is approximately on par with industry pricing.”

But Jenkins thinks the biggest value of the technology is that it provides a better predictor for probability of clinical success, especially when paired with other preclinical innovations. “Getting better at decision-making in the candidate IND space is a much bigger driver for a pharma company than costs at this stage,” she said.

“I think the Vium model will be living in a new preclinical world where we continue to desire whole-body rodent physiology and biology.” But she added that it will likely become integrated with other emerging technologies. “Increasingly, I think the Vium animal models will be aligned and coupled with newer innovations like organ-on-a-chip models to get the best preclinical picture possible. There is only so much an animal can tell you about a human.” ■

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