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Ep.1: Organ-on-a-Chip in Drug Discovery with Misti Ushio, CEO of TARA Biosystems

Rusty Ray (00:06):

Hi, I'm Rusty Ray. I'm with Alantra and I head up the US Healthcare Investment Banking team here in New York, and you're listening to Crossroads, our podcast focused on interesting technologies and services in the healthcare space all with an eye towards M&A. Today we have with us Misti Ushio. Misti was the former CEO of TARA Biosystems and we had the luxury of representing her and the company in their recent exit to Valo Health. Misti holds a PhD in biomechanical engineering, and prior to that has a background in pharma R&D as well as venture capital. Certainly look forward to her perspective on some of this technology, given her technical background and her investing background - it should be an interesting dynamic.

(00:47):

TARA was definitely an interesting client for us. The company uses stem cells to engineer artificial cardiac and skeletal muscle tissue to create models in order to test the efficacy and risk of new medicines. This is a very early stage drug discovery process, all done without using animals, probably the future of drug discovery and drug development. More unique was that this was the very first M&A transaction in the space. Valo, the buyer, was pretty keen on TARA in order to advance their mission of really data and AI driven computational drug discovery and development.

(01:25):

We are here with Misti to talk about what was the impetus and inspiration for her creating TARA Biosystems, why pharma needs this kind of data produced by these tissue models and her experience in the sale of Valo. Last, we'd like to get her thoughts on how the space will evolve over time, now and into the future.

Misti Ushio (01:44):

It's a pleasure to be here. I'm Misti Ushio, like you said, former CEO of TARA Biosystems, a background in biochemical engineering, venture capital and pharma research. Just to kind of give a little bit of what did we do at TARA, we really focused on combining the advances in stem cell science and tissue engineering to recreate heart physiology in a dish. So we were able to advance this technology and then use it to both evaluate the safety of new medicines and also the efficacy of new medicines directed at heart disease.

Rusty Ray (02:17):

So I know you spent your career starting with big pharma, eventually moving into venture, and ultimately back to TARA where you founded the company. So as someone in venture, you see thousands of companies, thousands of technologies every year. What was it about TARA's technology that made you want to really jump in and drive a commercial business and build the company from scratch?

Misti Ushio (02:42):

So interestingly, it really started as an investment thesis. I had invested in all kinds of life science technology, oncolytic viruses for cancer, sensors, platforms for diagnostics. So when I was thinking about trends, it's kind of the advances that I mentioned of kind of recreating biology in a dish, whether it was 3D biology or tissue engineering, kind of this whole world of decades of academic research that was really trying to say, "Look, what's beyond biology and chemistry?" As you bring in engineering forces, be it pressure or electrical signaling or mechanical inputs which our body needs, marrying all of that and seeing the fruits of that research saying, "Hey, we can really get to human-like physiology, which should be more predictive and enable us to evaluate drugs in a way that will increase the probability of success."

(03:42):

I was kind of talking to people in pharma and people in the industry and said, "if you had access to human heart physiology in a dish, would that be useful?" The answer was overwhelmingly yes, except no one can do it. It's too complicated. It's not sophisticated enough. We can't really interpret the data. The research and the advances seem to really be getting close. The application space seems very broad and that was what excited me.

Rusty Ray (04:11):

So having worked on this transaction with you, it was to me a watershed moment for the space because I think it was one of the larger, if not the largest transaction in the space, by Valo, and I think sets precedent for other technologies that are relevant here in the discovery space. So maybe just your perspective on what did Valo gain through the acquisition of TARA and how do you think they're going to utilize the technology going forward in their business?

Misti Ushio (04:42):

What TARA was bringing was biology platform and physiology, as I mentioned, to be able to rapidly kind of evaluate if a new medicine was going to be efficacious and safe. What Valo had developed was also platform, but a little more focused on the computational opportunities. There's many, many companies now that are using AI and machine learning. There's lots of deals going on in this space, but what's really critical is that you can predict all day long, but how do you actually evaluate what those predictions are? You really need a biological system to do that. If you have to wait to get to humans, that's really hard. So if you can have-

Rusty Ray (05:23):

And expensive.

Misti Ushio (05:24):

And expensive. How do you even get there and triage billions of molecules you can adjudicate computationally to get to the clinic? So you need this biological feedback to then go back to the algorithms and improve and iterate. At least personally, I think that's a big piece of the value that TARA brings to Valo - having this combination of not just expert computational ability but to now have the biology to evaluate it. I think the match between Valo and TARA was they were both platform companies that were looking to get the various pieces in one place to really win in combining AI machine learning with biology and then specifically in cardiovascular.

(06:13):

Cardiovascular is an area where there's been tons and tons of failures and they're catastrophic because they're really, really expensive. So there's the little gun shyness I think of pharma and other companies, but there's a huge opportunity, it's a huge unmet need. What we were also doing at TARA was developing disease models of cardiac disease where you could really look at efficacy in a way that couldn't be done before. So I think the combination of the platform aspect of TARA and the ability to really build a successful cardiovascular therapeutics pipeline I think where the big value contributors to the deal.

Rusty Ray (06:51):

Before the sale took place, your customers were largely big pharma. How were they using the technology and what did they gain out of your models? Was it really selection of drug candidate? Was it failing faster? What was the feedback you got from your customer set in terms of TARA's technology future and importance in their drug discovery programs?

Misti Ushio (07:14):

I would say there were two groups within pharma that we worked closely with. One was cardiac safety. For all drugs that fail because of safety, cardiac is the number one. So it's a huge issue and it's really expensive and the only real way to do this is in animals. So there's a huge opportunity in the safety market. So we had initially developed a healthy tissue, a healthy heart. That was really what we used to interface with the safety market. I think the need for technology like this and the interest and wanting to use these for safety testing is huge. There is a regulatory issue around acceptance of the data and all of this that I think is a future opportunity, and I know there's a lot of work with the regulators on adopting some of these more sophisticated lab-based technologies.

(07:57):

As we learn from what we did on the healthy heart tissue, we're able to apply that to developing disease models of heart failure. So whether they were genetically defined disease or environmentally induced disease, creating this disease biology in a dish was a huge advance because now you can look at efficacy and you can discover molecules that might modulate disease, slow down disease, inhibit disease. So now we were starting to really work with the heart failure drug discovery groups.

Rusty Ray (08:28):

Obviously TARA was primarily focused on cardiac. You started to dabble in skeletal muscle, but these are only two muscle types. Are there other organ-on-a-chip companies out there that you think are doing interesting work and do you see a future where there's consolidation around this space where someone can be a bit of a one stop shop or be more holistic in some of their disease models?

Misti Ushio (08:54):

I think we deliberately took a position at TARA when we started the company that we're going to focus on the heart. There was always the intent to say, "if we get this right and we can do this, we can apply everything we learned from how we did the heart models to other models." As you mentioned, our platform specifically enabled electrical and mechanical stimulation, which is required for muscle biology. We started to do projects in skeletal muscles so we could use our own platform with different processes and cells. Could you consolidate? Could you expand into other tissue areas?

(09:28):

It's a lot of work to develop the technology. For me, it was always keeping an eye on what other academic groups or other companies were developing and succeeding in generating high quality biology and physiology and other tissue types. It's very hard to recapitulate biology in a way that pharma accepts, because they're an expert and they're making really important decisions off the data you're generating, and so you really have to have high fidelity biology. Keeping an eye on who's doing that in liver, in kidney, in brain, was an important part of the landscape of what we were keeping an eye on.

(10:04):

Absolutely, if TARA had continued to grow, consolidating would've been a natural way to grow and I would say the right way to do it. We're all working with the same pharma companies, so it makes it easier for them. You have critical mass and you should be able to provide and lean on a lot more synergies even between the different technologies, whereas now they're kind of siloed.

Rusty Ray (10:25):

That was a great conversation with Misti, so happy she could join us. Really cutting-edge biology. Some interesting stuff there as to how pharma is using big data and how important it is to marry that data with biological outputs. We're really keen to see how this affects drug development and drug discovery now and into the future. This was definitely one of the more technical deals that we've done, certainly a very nuanced, detailed story we had to convey to the buyer groups. But if you'd like to talk more about how we've worked with some of the early stage biotech companies in our history, please reach out to us at Alantra.