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DRIVING DIGITAL IN BIOPHARMA W TOM LEHMANN

VIDEO TRANSCRIPT

Guest: Julie Huxley-Jones, GSK

TIME CODE:

00:05 VO: You're listening to Driving Digital in BioPharma, a podcast from Accenture. Your host is Tom Lehmann.

PULL-QUOTE: I think one of the most exciting things that I have enjoyed about being within the GSK journey these last few years is, how we've really understood the value of data in our mission to support patients. And that means, making sure that we partner with humility to look at what are the best data sets out there, how can we understand biology in all its forms, in all its variability. And I see that manifesting in the race of the target.

Tom Lehmann: Hello and welcome to Driving Digital in Biopharma. I'm your host, Tom Lehmann. Our guest for today's episode is Julie Huxley-Jones. Julie is the Head of Research Solutions for GlaxoSmithKline.

01:03 Julie's role at GSK positions her at the intersection of science, technology, and critical business decisions. She has 15 years of experience with GSK and has held several digital-oriented roles across multiple R&D functions within the organization. A Scientist by training, Julie has always been curious about how new medicines are discovered and developed, and her passion for research is palpable throughout our conversation together.

Welcome Julie, to Driving Digital in Biopharma. It's great to have you here today.

Julie Huxley-Jones: Pleasure.

01:41 Tom Lehmann: So, why don't we get started with a big picture of you, sort of the bigger question if you will. How have you seen the digital focus and impact in the discovery research space be different than the efforts in other parts of the R&D value chain?

Julie Huxley-Jones: It's a great question. I think it's a really interesting journey in discovery research, because we've been dealing with giant data sets for a very long time. As ever since, Hi-through put screening enabled you to test millions of compounds at any point in time we've always had data sets larger than we can cope with.

02:05 At the same time, we have science moving so rapidly changing so regularly. The digitalization in discovery is a continual effort to understand new method, work out what's needed, model it, digitalize it, and then the next method comes along. So, it's a bit like painting the fourth bridge as we'd say in the UK—it's never ending.

02:33 And that's very different to how you might digitalize other parts of the R&D value chain, where you might be uplifting a process maybe that changes once every decade

or it's quite a linear process. Maybe you design a study that's a clinical you run the clinical trial you analyze the results and then you make a decision from it.

03:01 And the efforts that are needed to digitalize, discovery research are multifactorial. Lots of different techniques happening at the same time in parallel that influence each other and all therefore need to be digitalized in concert. So, it really does take a village to discover a new medicine.

Tom Lehmann: And as you work your way through that, what are some of the bigger challenges? You've mentioned probably a few in there but if you were to draw out some of the big challenges to making all this happen, what would you highlight?

03:32 Julie Huxley-Jones: I think the big one is how you flow really diverse data. You're working with biological experimentation, maybe you're doing some chemistry or biopharma or vaccine or therapy design. Data, you might be dealing with pre-clinical traditional DMPK or safety data. All of that data is described very differently with different ontologies.

04:01 It may be imaging versus text versus smile strings for chemistry. All of that information needs to be digitized and documented flowed, stored in very different needs. My favorite one is a single cell omics image. It's about a terabyte an image. Well, you've got a that real time that takes very different data impact to numbers and letters.

04:28 And so, we need to think about how we flow this highly heterogenous data types with, in a different way in an agile way and that is a huge challenge. Because it's also as I mentioned earlier continually changing. What you need for data, even two or three years ago discovery is very different to what you need now. I think also one of the challenges is how experimental activities are performed in the labs is also changing.

05:02 So, I mentioned about how the data is changing, how it's growing and how varied it is. Also, how the experiments performed in the labs are changing on different equipment is changing, at scale with the rise of automation in industry 4.0. So, as a consequence that makes it really challenging to digitalize in totality discovery, a fully digital fully automated discovery lab is really quite challenging. Because you need to enable those technologies and different experiments to change continuously also.

05:30 So, almost think of it like you a virtuous circle that's continually to evolve, and you're continually trying to digitize it. And to put that into, there's about in fact it's grown since we last spoke there's 264 applications that I currently support in the research stack at GSK.

05:55 They're all at different stages of the digital journey. There’re about 5,000 different types of equipment that we're running at GSK. All of those need to be digitalized, all of those are performing very vital different entry points into the discovery and the development of medicine, and all of those need to be connected and flowed in order to build discovery models.

06:26 So, it's a really varied world. And in the world of technology what we're talking about here is also incredibly niche. We're not talking giant products that are used in lots of different industries. We're talking about very distinct very individual scientific questions that maybe be answered by only one piece of equipment in the world on one data format in the world. And we need to flow all of those 260 odds together.

06:53

Tom Lehmann: So, if you go back in time, just say you you've been to GSK for some time and you project forward to now or are we at a pace where that degree of change is exponential in the sense that there's so much happening so quickly? Or, is it more of a linear flow if you will, but it's getting more complex, but it's at a manageable pace? What would you say, you're observing now or project a little bit into the future?

07:23 Julie Huxley-Jones: I think it's twofold. I think we are finding it as an industrial and GSK is not unique here. We're finding it easier to evolve at pace to an increased pace of evolution in drug discovery. So certainly, when I started drug discovery was about as different as it was for about 5, 8 years. And now every year or so there's a new technology, there's a new data type, there's a new algorithm, there's a new model, there's a new experimental platform, it's much faster.

07:55 But I also think we're getting much better at being able to work out what do we need to do to digitalize it. What do we need to do to bring that technology in and on and rapidly get the data flowing. And so, it's to both the good and the bad flowing at the same time for into a better state

Tom Lehmann: Okay, that makes sense. And are there at this point specific technologies that are helping to aid in that progress?

08:23 Julie Huxley-Jones: Absolutely. So, I think the first one is the rise of AML. We've been modelling for a long time in drug discovery across the industry. But the scale of the data that we're generating and acquiring through collaboration and partnership, means that we can now generate much larger models, much more comprehensive models that ask what is a good target medicine, what is the right target biology to prosecute?

08:57 Much more extensive than perhaps would have been an individual model based on individual pieces of data. So, I think that scale of AI/ML is a really important technology.

I think the second one is the migration to the Cloud. Of course, cloud has many benefits in terms of both tech delivery and how we can deliver updates much more effectively also environmental sustainability.

09:24 But partnering that with an edge strategy to make sure those 5,000 pieces of equipment all can migrate onto the cloud and receive the benefits, is another interesting technology strategy that I'm focused on.

And I think the final one is how science and drug discovery just occurs. A long time ago, when I started in the pharmaceutical industry, really, pharmaceutical companies were in the true “big pharma” era, where full stack all capabilities were developed in-house.

10:02 I think the pharmaceutical industry has got far more curious to understand that great ideas can come from anywhere. And it's about the speed of identifying a great idea the speed of generating a compelling hypothesis, and the speed of testing out. And how that manifest is company acquisitions lots of collaborations and big innovation communities both competitive and pre-competitive innovation communities, that are really important for looking at how we in total as a community accelerate drug discovery and development.

10:42 And that partnership strategy also provides interesting questions for technology for data flows for modelling and insight creation. Because those insights might come from different places than perhaps they had done beforehand.

Tom Lehmann: And do you think that the culture of the not invented here that was at times to be pervasive and maybe parts of the industry or organizations. Have those walls come down? I know for a long time there was a lot of concern that it was just if it wasn't invented here wasn't valued as much. Would you say that those days are behind us?

11:12 Julie Huxley Jones: I think they have to be. I would be surprised if they exist anywhere now. I certainly don't see them at GSK and actually I find that really curious. Because as a scientist you're trained to follow the next great idea. You're trained in the null hypothesis. You're literally trained to find a better way of doing something. So, it almost goes against science the 'not invented here' mindset.

11:42 And so, as a consequence I think it's both dead but also as an industry we've truly embraced that scientific curiosity. And it's paying dividends. Now we see really challenging diseases being tackled that have never been understood before. A pace of drug discovery and development that's unprecedented.

12:04 And obviously COVID has really exemplified that. And a hunger to really understand personalized medicine at the individual patient level. Meaning, that we have to get much smarter about new medicines and how meaningful and impactful they are to patients. And essentially the whole process has got a lot harder a lot more complicated. And that just forces you to have to think more courageously and curiously.

12:34 Tom Lehmann: No doubt, and as you said with partnerships and collaborations and recognizing that there's a level of capability and understanding you have within the organization. But in order to solve those complex challenges, you have to look outside the boundaries of the organization.

Julie Huxley-Jones: I think so and I think it also speaks to really tapping into and being okay with what you're really awesome at. And having the humility to say, well we're awesome at these things but we've only just started in this new area.

13:03 And when particularly in drug discovery and development the world is evolving so quickly. Rapidly looking at new technologies, rapidly developing partnerships to explore them is a really great way to get ahead and also enables you to de-risk some areas whilst really growing deep and perhaps competitively investing in others.

13:39 Tom Lehmann: So, maybe we could use that as a bridge to some examples. GSK certainly has been very public with some of the partnerships that it has established and interested just in the race to the target, right? A lot of conversations around genetically validated targets and thinking differently around the upstream processes to get good in high-quality clinical candidates. Can you talk a little about some examples of what you've done or what you've seen GSK do?

Julie Huxley-Jones: Absolutely. I think one of the most exciting things that I have enjoyed about being within the GSK journey these last few years is, how we've really understood the value of data in our mission to support patients.

14:08 And that means, making sure that we partner with humility to look at what are the best data sets out there, how can we understand biology in all its forms, in all its variability. And I see that manifest in the race of the target.

14:28 We've obviously very publicly made collaborations with 23andMe and the laboratory of Genomics Research. As examples are saying here's some great people out there, really looking at what it means to understand genomics at a really granular level. And if we can partner with those world experts, we can come along with our great understanding of how to make medicines and discover them and bring the two together.

15:00 And so, now we're in a place of working with people to say, well how do you pick the best target? What really is attractable protein to really design a small molecule or biopharmaceutical or a vaccine or a cell in gene therapy against a protein or a gene in that instance. And how do we rapidly get insights from data that's available in order for us to make those decisions?

15:28 So, it's less about generating and building large data sets ourselves and putting our arms around them of more about saying, what's the quickest and most effective way that we can gather and generate an insight from data that is available. And that's a very different way of approach drug discovery.

Tom Lehmann: And how have you thought about the digital tools or the initiatives that need to be in place to complement what you would get through a partnership as you mentioned 23andMe or some of the other ones. How do you make the decision on what to focus on as far as building out the digital tool set or capabilities?

16:01 Julie Huxley-Jones: I think it takes you around speed versus scale, right. So, I think the first thing is you're looking at how quickly can you make a decision? What's the information you need? What are the tools and techniques you need to help our scientists makes the decision as robustly and as quickly as possible? Because there's always a new data set coming along.

16:28 So, I think that's the first thing. It takes you much more down an agile route. I think the second thing it takes you down is, what's the technology enable you to make the killer experiment or make the killer decision. And that might mean what's the technology that you need to stop a drug discovery program, as opposed to continue to test a hypothesis until you've worked it through.

16:57 And it also looks at what is the information you need to flow end to end. If you get your target right and it's genetically validated and there's heavy data on this in the public domain, that significantly increases the probability of success in the clinic at phase two. So, therefore how do you think end to end and what technologies are needed to enable our scientific decisions to happen end-to-end?

17:26 That means you can pick the right target today and improve the likelihood of that potential medicine making a meaningful impact to patients a few years down the line. And that's about data flows, it's about decision-making, it's about taking clinical variables and using them to inform decisions that you make in discovery.

17:48 And it's about leveraging historical data that we're sat on and saying what were the critical variables that we learnt from in the past and make sure we can use those to

inform and triage new medicines as we're discovering them across both it, target validation and need optimization.

Tom Lehmann: And then ultimate Julie how are the digital tools if you will be helping to create that connection point between what you're doing in discovery and ultimately what's in clinical and the feedback of information from clinical back into discovery or perhaps other sources real world data that's out there? Like, how do you break down what are potentially been some of the boundaries in the past?

18:23 Julie Huxley-Jones: I think it's a great question. I think it starts with having an end-to-end mindset actually. Even by approaching these data sets, these data types, these technologies in those silos of discovery development clinical. You can almost limit your thinking by first intent. The second one is by making sure that the technology stacks and data flows are interoperable that you can actually get information out and join it up together.

18:59 Sounds very basic, but if there's no way to connect those ontologies together, you've just created lots of silos. And it's amazing how often I see new technologies being pitched to me at GSK and it's another island as opposed to a way of joining up an archipelago. We have to really think of that.

19:25 The second thing is about making sure that we can stream information from experiment into our data ecosystems rapidly and regularly. And that means challenging how experimental data is provisioned. How it's streamed. Many software and lab hardware providers don't have a cloud strategy. We really need one.

19:46 They might be developing their own ontology. Great, but we need to be able to link that data up with lots of other data that we've been generated. We need to be able to understand patient information in light of drug discovery, and those two languages need to connect to each other. So, a lot of the time it's about the description, the metadata and making sure that is embedded in our technologies rather than reinforcing three historical islands.

20:25 Tom Lehmann: How much of that do you think is a technology challenge, a data challenge, or a culture or just individual sort of skills and talent challenge?

Julie Huxley-Jones: Wow. I think the simple answer is it's all of them. I think it is really important that as a community of scientists and technologists we all understand the broad context of drug discovery and development.

20:51 I would love to see innovative companies who come up with new technology solutions or new hardware and lab equipment. Think about the ecosystem of that experimental capability as a totally as opposed to, I am just trying to perform that individual experiment. Innovator companies who come up with great technologies hardware or software lab equipment or great data models, that think of that broader ecosystem are the ones that we buy from, right?

21:27 It really is a live or die difference. And then I think as technologies we need to make sure that when we engage with enabling our partners as scientists, we bring that broad perspective too. So, I think what I've had the privilege of is being able to sit and work across all of those different parts of the drug discovery process. And I can see as a consequence how I can innately join things up and I would just love to see more people make that journey too. The more you can join it up, the more obvious it is.

21:55 Tom Lehmann: And how much do you think along that journey there's a mindset shift that needs to happen. You've talked a little bit about how much science and research process has changed and is ever changing. Is there also with there just a mindset shift that just has to keep pace with that?

22:26 Julie Huxley-Jones: I think there is. I think it's about realizing that everything we do now is data. When I started out, I learned computational research. I learned to program. The reality is now all drug discovery is essentially a computational effort augmented by science activity in the lab, as opposed to predominantly data generation in the lab that then you analyze. So, we have to think the other way round. We have to think what is the experiment that will inform the next step of my model thinking in order to confirm the next best action as informed by my model as opposed to here's some data I've generated in isolation.

23:04 What does it tell me? So, it forces much more systems thinking to the comment we made earlier. But it also, I think stimulates a greater appreciation on data and technology and that we're all leveraging secondary data. Right, there's no primary data generators and secondary data analyzers anymore. We're all modelling by first intent. And that means as technologists we need to speak multiple languages.

23:34 That means as scientists we need to understand data and analytics just as much as we understand what lab science. And I see that coming with the continual emerging generations of scientists coming out of university. But it needs to happen across the value chain and where I get the privilege of working with great leaders in GSK R&D. they truly get that R&D is a knowledge generating process underpinned by awesome technology. That is what's really exciting, but that mindset shift has to happen endemically across our industry and all our partners. I think there's a bit more work to do.

24:14 Tom Lehmann: Does that also then result in a shift of how you and your organization are positioned where maybe historically the technology function has been on the outside enabling or an outside supporting as opposed to almost having this embedded feel in the way that you work?

24:36 Julie Huxley-Jones: I think so. I mean, from my perspective, technology is another platform for doing science just like screening or pathology. It's another platform. There is no otherness. And I think if you embrace it that way, you think about it quite differently. I would love to see a future state where we have more technologists running bits of science and more scientists running bits of technology and we create a virtue of talent circle as well.

25:07 But it does change how you show up. If you think about it that way there's no the business. One of my personal pet thieves about the tech in we talk about the bit that we work with as the business and there is no the business, we are the business. And it's really important to think that way because then it's about okay what change can I exert in how I develop my products to make the best decision or the fastest decision on a medicine.

25:42 By thinking that way, I'm really pushing my team to think about you own part of the drug discovery process, right. Your effective products and how well develop those products to enable certain decisions in R&D are part of that drug discovery process. If

you feel it, you of course can be much more motivated to deliver faster but actually that does make you feel much more part of R&D rather than a master servant. We are another platform.

26:12 Tom Lehmann: And what's your sense from the academic preparation? You mentioned that the on the scientist side, the universities are beginning to produce a different type of entrant into the workforce (let's put it that way) that is maybe prepared more on the computational side. Are you seeing the same thing as technologists enter into the space that they are coming or they're understanding the need to better understand the science? Because I imagine it has to come from both directions…

26:40 Julie Huxley-Jones: I think it absolutely does and I am starting to see that and certainly that's where when I saw some top talent. It's the top talent can speak both languages and appreciate both worlds and realize that the sweet spots in the middle of the Venn diagram. I certainly see more technologists understanding the sheer variety of science. I think the trick is also to get technologists to understand the veracity of science as well.

27:11 Not all science is true. We're continually finding truth and sometimes we undo things that previously we thought were true. I wish, I'd had a degree where everything I had learned in my genomics degree was still true. Actually, some of it is completely irrelevant nowadays, and actually that's very different to technology which is generally about a growth on top rather than undoing. So, some of it is a mindset shift rather than just learning the science or learning the technology.

27:43 I also think that I would like to see more institutes looking at not just computational research but computational technology. There's a lot more we can do to bring data science technology and discovery science together.

28:06 It's definitely further ahead than other industries even other parts of the R&D value chain. Because as I mentioned earlier historically, we have been dealing with large data sets. There's been bioinformaticians and computational informaticians for about two decades in drug discovery. But there continues to be more work that needs to be done to bring those three communities together rapidly from early on. And the earlier on that emerging talent can have the appreciation of those three different worlds and bring them together the much more successful. This industry will be at developing new medicines for patients.

28:42 Tom Lehmann: So, maybe you put those pieces together and we'll close with a little bit of future gazing if you will. Recognizing that the talent is shifting and that mindset shift is happening. That the sources of data continue to evolve rapidly. The technology is moving at a pace that is perhaps catching up with the science. What does the next three to five years look like in your space?

29:05 Julie Huxley-Jones: I hope that we move to a place where we're really much more into event driven drug discovery. We are truly harnessing every single piece of information that we generate to inform models that guide or offer options up to our scientists on the next best action.

29:34 Our scientists' hands are freed to release their minds, to really focus on decision making based on the evidence that's presented or hypothesizing experiments. And we're really using a lot more automation in the labs to perform the activities. It won't

be fully roboticized, because the methodologies change too quickly, but it should be really augmented.

29:57 I also see much more flow across our life sciences industry whether it's pharmaceuticals or Biotech's or academia or institutes flowing knowledge and sharing it more freely. So, that we can collectively make a better difference to patients by sharing best practice on how we discover and as competitively focus on how quickly we discover.

30:26 So, I see the world of our scientists being quite different. The world of our technologists being quite different and the difference being we feel very much much more one team as an industry. Not just the sweet spot of being within GSK where we feel that. And I would love to see that partnership also happening with our software and hardware equipment providers, where they're really also looking at it at an integrated ecosystem too. That would be my hope for the next three to five years.

31:03 Tom Lehmann: I think it's a great way to finish in and a really nice way to look at again pulling all those different pieces together. So, I think it's a good wrap for the discussion. I do thank you for your thoughts. Your vision there and the perspectives around what's working and where the challenges have been, and I again really enjoyed the conversation today. So, thank you for joining. I really appreciate it.

Julie Huxley-Jones: Thanks Tom. It's been a privilege.

31:35 Tom Lehmann: A huge thank you to Julie for joining me today. We started our conversation around the unique journey of digital in the discovery and research space – and learned about the challenges in this area of the business. Those challenges are a result of: the complexity and volume of diverse data and data sources, applications, and also the lab equipment that is essential to scientific research.

31:58 And while the focus of today's discussion was really on scientific research, a theme that I noticed was the importance of connectivity—and Julie made the point that tech initiatives and research also need to translate to clinical. And she stressed the importance of making sure data flows are interoperable across the R&D value chain and not specific to one business function.

Another point she's clearly passionate about is the integration of the scientist, technologists and business mindset within research and really bringing all three of those into one.

32:26 Ultimately, multiple components need to come together at the same time to increase productivity and innovation in Discovery—from AI and ML on new types and growing volumes of data to increased use of partnerships and getting value from the cloud to an overall mindset shift. Accenture recently performed research and modelled the impact on R&D if companies truly unlock the full potential of these components by adopting them at scale and with speed at the right areas.

32:52 Interestingly, our research showed that it has the potential to bring the R&D cost for each successful candidate down from billions to millions, with close to 50% of those savings expected to come from Discovery by improving the resulting probability of technical and regulatory success (or PTRs) and a corresponding acceleration throughout clinical development

33:21

As we close out this episode, here are a few questions to consider:

- What tech trends and technologies do you see impacting your research organization the most?
- What is your partnership strategy in the research space?
- How do you see the typical role of the scientist evolving over the next three to five years?

I invite you to connect with me on LinkedIn and share your thoughts and takeaways.

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