DIGITAL LEADERSHIP BLOG

"Healx using artificial intelligence to find combination drug treatments for COVID-19"

Coulter Partners recently talked to Dr David Brown, Co-founder and Chairman of Healx, about digital disruption and talent in drug discovery.

***Ian** - You sit at a fascinating intersection of Biotech and pure technology. When you look at your organisation, what parts of it feel or look like a Biotech company and which look or feel like a pure tech company?*

Dave: During my 30 years working for the likes of Glaxo, Pfizer, Roche and what is now Astra Zeneca, technology was usually seen as more of a bolt-on rather than central to company strategy. In fact, I built a great deal of the technology during my days with Pfizer - the computational biology and chemistry and the protein x-ray, which were in some ways a precursor to what we're doing in Healx today. Here though tech is fundamental to our strategy. It forms the bottom three layers of a pyramid with drug discovery flowing out at the top. This contrasts completely with the big pharma approach and I think they will find it very difficult to use technology effectively in the short to medium term without a massive restructuring of their organisations and thinking. At Healx at least half of our staff are technology specialists, with another 25% in drug discovery and 25% support staff. This ratio is very different from the balance of skills you would find in a big pharmaceutical company or even in a traditional biotechnology company.

***Ian** – What are the differences in your approach?*

Dave: Most AI for drug discovery companies are trying to fix individual parts of what is, in my view, a broken drug discovery process They are trying to fix the problem of identifying the right biochemical targets to work on, trying to get a good chemical lead, optimise that lead, or work out how to avoid toxicity for a molecule that is discovered. They're trying to service the drug discovery approach used in the pharmaceutical industry.

Healx is radically different in its approach. We are trying to invent what I would call 3rd generation drug discovery, rather than choosing a target and getting a lead in the traditional way. We are moving beyond the old phenotypic and target-based approaches to the next generation of drug discovery methods. We're using modern AI technology and modern genomics and particularly transcriptomics, so the RNA rather than the DNA. We are trying to do this in an agnostic way, without human bias, by matching drugs to disease mechanisms.

***Ian** - Data sits at the heart of so much of the transformation of drug discovery and development. What are some of the challenges you face around data?*

Dave: Data was of course central even to the old process of drug discovery and development but the scale of data that is available now is infinitely greater than it was even 5 to 10 years ago. Drug discoverers can no longer analyse data such as DNA and RNA as effectively by relying on the human brain alone. Faced with a mass of peaks, troughs and

data points, they need computation to make any sense of it. The challenge we have is around the quality of this data. A great deal of the data available is very “noisy” and we may find it necessary to abandon 80 to 90% of what we can access from public sources. The backbone of our business therefore are our data curators, who make up around 10% of our staff. Their important role is to sort and select the data we should use, but this is still a largely manual process that we hope to speed up by automating.

Fragmentation of data and limited availability worldwide in a competitive landscape create further challenges and restrict what can be achieved with the very powerful algorithms now in use. We are generating our own data to combat this and although it has been an expensive process, methods are becoming rapidly more cost effective.

There is also a danger of unconscious bias at all stages of our decision making. The selection of data and how that data should be curated may be influenced by human prejudices. Healx has several drug matching algorithms and when we make choices, we have to stand back and ensure we are not skewing an outcome in some way.

Ian *- Given the possibilities of AI in everything from drug discovery to diagnosis to patient care, what are the biggest barriers to accelerating the ability technology has to change people’s lives for the better?*

Dave: The quality of data that's required for AI needs to be of a higher standard than is often published and I think that scientists submitting publications, referees and editors all need to get together and consider what the appropriate standards are. This alone could speed up the advance of AI enormously and reduce waste of time and money in many laboratories.

Data security particularly around clinical data is also key. So far, we have been talking about pre-clinical data – DNA, RNA, cell-based and animal-based data. But human clinical data is far less prevalent, much more important and just not being shared on a scale that's required. We need a global consensus on what data can be shared, who should have access and how it can be effectively blinded. Maybe blockchain technology is a way forward? I think this could take 5 to 10 years to achieve, but it could really accelerate progress.

Ian *- In all areas of data in Life Sciences and Pharma, we see a shortage of talent. What are the areas you feel this in most and are you seeing ways to port talent over from other industries?*

Dave: As I alluded to earlier, we are starting to think about developing AI for clinical development and we need deep expertise in drug registration, orphan drug designation and competitive analysis. We need people who understand how to automate all this. The whole chain from the very basic science right through to the marketplace requires data. Big pharma companies contract a lot of this out and it's very expensive, inefficient and influenced by human bias. AI could vastly improve the way data gathering is managed, but we still need human experts who have the domain knowledge and are highly experienced. It is critical that a company like Healx has a diverse and experienced team, aged from 20 to 80! We need not only tech specialists straight from university but also people who understand how the world works and how the industry works, who can guide the gathering of appropriate data and the development of appropriate algorithms for analysing that data.

We are lucky in Cambridge and have had no trouble in recruiting people, although it may be more difficult outside Cambridge, London and Oxford. It’s still early days and company and employment prospects are going to scale. We may discover there is a skill shortage soon, but so far so good!

Our biggest skills gap has been in finding business development people in fact and that has always been a weakness of biotech in the UK. We've always been good at the basic research and the drug discovery here, but UK biotechs generally haven't done clinical development and taken drugs all the way to the market in the same way that has happened in the US. There just isn't the experience around for this reason. There are signs of change in Cambridge, nevertheless.

Lisa - *Are your data curators where you believe the domain expertise should reside or can there be a blend on the team and how do you approach that?*

Dave: Many of our data curators have PhDs and are excellent scientists from our best universities. They also need to be creative, however and it's not simply a backroom job. Their role takes deep understanding of the biology, how the data was generated, the models we use and their relevance to what we're trying to do. Extensive training and deep expertise are needed for data curation at all stages in the drug discovery process.

Lisa *- What are the most critical skills you are looking for generally?*

Dave: We start with people who are enthusiastic about our mission and it is difficult to fake that! We always try and recruit the best at any level. Even with very talented staff, success or failure will depend on the leadership of maybe just two or three strategic leaders who work effectively together. It's all about leadership and we are very specific in what we are looking for. The C-level team is so important and that is my main focus now as chair of the company, as I step back from being Chief Scientist and work on this together with Tim Guilliams, our CEO.

We need both scientific and technical skills and at this stage we're bringing in very experienced people at C-level. Our new Chief Medical Officer that **Coulter Partners** recruited for us, has huge expertise in this space and understands it incredibly well. We are putting together a fantastic team! They have all seen what works, what has failed, and are creative leaders with extensive experience. I think that's very different from most tech companies. Facebook and Microsoft were built by people fresh out of university, but pure tech just doesn't have the same complexity as healthcare.

The other side of the coin is that "experienced" people may be stuck in the old mindset! So, we're looking for people who are really enthused by our mission, who want to work with patient groups and make a real difference in reducing human suffering. We're also looking for senior leadership that's absolutely on board with AI, who understand the technology well enough and aren't frightened by it!

Ian *- What's your view of the role that Big Tech companies are going to play?*

Dave: Over the years many have predicted that healthcare could become dominated by the tech giants like Apple and Google. IBM tried to use AI when they had no in-house domain experience of healthcare and drug discovery and it was no surprise that they were unsuccessful. The human body and human health are infinitely more complex than tech. It's still unclear whether the big transformation may come from the tech giants or whether it's going to be a bottom-up process where smaller companies like Healx suddenly make it big. Maybe a combination of the two?

More about Healx: https://healx.io/