**LabMed Podcast Ep4 - Tahir Pillay - FINAL**

MUSIC JINGLE

**VO - Welcome to *Life in the Lab*, brought to you by the Association for Laboratory Medicine. I'm Kamiljit Chatha, and I'm a Consultant Clinical Scientist at University Hospitals Coventry and Warwickshire NHS Trust. In this series, we bring you inspiring stories of clinical scientists and medics working in laboratories in the UK and around the world.**

**Today, we're chatting with Professor Tahir Pillay. He's Chief Specialist, Professor and Head of the Department of Chemical Pathology at the University of Pretoria.**

**Tahir's research covers a wide range, from insulin signaling and insulin resistance to developing new diagnostic tools using DNA technology.**

**But beyond all his work, here’s one of his proudest accomplishments:**

HIS MUSIC AS DJ KEMP

I've always enjoyed listening to music. About eight years ago when I was on a long haul flight, I was bored and I had no more movies to watch or books to read, and was too tired to sleep in an uncomfortable seat. I started playing around with GarageBand. And I started to enjoy listening to what I had created and I started to see the possibilities. And I ended up creating my first piece and released it and things kind of just took on their own life from there.

HIS MUSIC AS DJ KEMP

It was so democratising that what would have taken a multi million dollar studio to produce 20 years ago, you can do on a laptop. So, that's really been quite enlightening.

**Tahir is also passionate about the democratisation and accessibility of chemical pathology, but we’ll get into that a little later. He’s also a big fan of cross-disciplinary research - and to him, science and music go hand in hand!**

The creative processes of an artist and a scientist in pathology, although they might seem quite divergent, both of them, in trying to find a deeper understanding and expression, they're relying on a blend of curiosity, observation, experimentation, and intuition. So, in both of them, there's pushing boundaries, connecting ideas and exploring the unknown.

Cross specialty work or cross disciplinary research is vital for advancing knowledge and fostering innovation. It's important to combine expertise from diverse disciplines, especially in areas where the questions might be quite difficult to answer.

If we look at what artificial intelligence is doing for medicine, for example. Certainly with medical imaging, you can use artificial intelligence to assist radiologists and pathologists.

And then also, I work in an area called chemical pathology that generates a lot of data, a lot of numbers, and there's a lot of analysis that has to be done. Myself and my colleagues in my discipline, we're not trained in mathematics, but we have to somehow acquire the assistance of experts in those areas in order to make sense of what we are doing.

And so that's another example of this interdisciplinary approach which I cannot overemphasise in the modern world.

**His current work on nanobodies brings together a mix of experts from all sorts of different fields.**

Nanobodies… They can be made in a laboratory, but they need to be grown in bacteria. So, you need the microbiological expertise to be able to do that. You're also working with DNA. So, you need some kind of molecular biology background to be able to work with these things and actually produce them. So, that's an example of where you've got to pull skills and expertise from different areas outside your traditional daily work to accomplish something that could be of use within medicine, for example, or within pathology.

**Let’s rewind a bit here, and talk about nanobodies - these are single-domain antibodies or antibody fragments. They were discovered a few decades ago, and ever since then, they’ve been a big fascination for Tahir.**

My interest in nanobodies comes from being interested in antibodies. So, antibodies are produced in the human body, they're really like the soldiers of the body. And they're produced in response to invaders such as bacteria and viruses. So, we were always literally bombarded by microbial organisms. And some of them are harmless and some are harmful. Often it's the harmful ones that we need to produce antibodies against. So, the antibodies are produced by the immune system and basically designed to neutralise things such as bacteria and viruses.

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When I was a PhD student, we used to make antibodies in rabbits. So, basically you have to take the rabbit, whatever protein that you want to make an antibody against or whatever target, you've got to take some of that protein and basically introduce it into the body of the rabbit.

So, that body reacts because it sees this protein as being foreign and it produces these antibodies. Then you've got to take some blood from that animal and then isolate the white blood cells which produce the antibodies. And once you've got the antibody producing cells, you can then find the gene that produces that antibody. And then once you've got the gene, you can then produce the antibodies forever.

The other thing about antibodies, they're also used for diagnostic tests. You know, for example, like your pregnancy test. Your pregnancy test uses an antibody against a very specific protein that's produced by the placenta. And that's how you can diagnose in the early stages that someone is pregnant.

Now, the normal antibody is a very complex molecule, which has multiple parts and can be a bit big and clunky. So, nanobodies, on the other hand, are like slimmed down, compact versions of antibodies. They're much, much smaller and simpler in structure, but they can actually have the ability to bind to the same bacteria and the same viruses that the regular antibodies can.

**It was nanobodies that brought Tahir back to South Africa after spending over 20 years working abroad. What was his dream? To start producing them on a large scale. And with the potential for affordable land and production costs, his home country seemed like the perfect place to make it happen.**

In the initial years, it was difficult because there was a company that held a patent on it, probably for the first, I'd say 10 years or so, until the patent expired. Once the patent expired, it became an open field for anybody to work in. And also, I was fortunate to make contact with one of the original scientists from Belgium. Dr. Serge Muyldermans. I then was able to get hold of some of the reagents to actually start this.

Now, nanobodies, interestingly, they're only produced in certain animals such as camels and llamas and alpacas, and actually also in sharks. People started making them in camels, but camels are difficult. They're large animals, so it would be expensive to look after them. Alpacas are much smaller, more domesticated, cheaper to feed and house, etc.

So, people use alpacas. I've also been interested in using sharks. But not the big sharks. But rather the smaller fish that are members of the shark family. And one example is the dogfish. And since we have a coastline here where dogfish are abundant, it's also possible that that can be used.

And so, those are the things I've been trying to investigate and really set up. So, I think the dogfish certainly looks promising because you could have an aquarium basically.

**It’s not just the size of nanobodies that’s got Tahir thinking about building aquariums for dogfish… but also their simplicity. Nanobodies are surprisingly easy to produce, which makes them even more exciting to work with.**

You don't need a fancy laboratory or fancy equipment to produce them. So, you can literally produce them with an infrastructure that's no more sophisticated than say a modern kitchen would be. So, very cheap to produce, also very stable. Antibodies present a problem because they need to be refrigerated. So, you can imagine when you transport them, they have to be kept cold all the time and a lot of developing countries are in hot climates. Nanobodies, they don't need to be kept in the fridge. They can survive high temperatures.

And because of their size, they can get into places that the big antibodies cannot enter. And that's another reason that they're likely to become much more useful than, say, the regular large antibodies.

You may know people who have specific diseases and there are lots of different monoclonal treatments available now for various diseases. For example, rheumatoid arthritis, psoriasis, they're being used for some cancers. But they're phenomenally expensive because of the cost of producing them, which is why you probably find that these kinds of treatments are commonly mostly available in wealthy countries and less so in developing countries. And so, if you could create a nanobody that can do the same thing, you could produce it at a fraction of the cost.

MUSIC INTERLUDE

**This is where democratisation comes in. Tahir’s vision is to make health services more accessible and available to everyone, everywhere.**

You think back to the pregnancy test - so, with the pregnancy test, it has been made possible for consumers to access very easily. You can go and buy a little strip from the chemist and you can do self testing.

So, in developing countries, it creates the opportunity for affordable self testing. It costs very little and can be accessible to every person. And remember, it's not just those people that don't have access, but even people in London. If you wanted a test, you'd have to make a special arrangement to go and have a test.

But if you can go and take a self test, that's a lot more convenient. Now, in developing countries, you don't have the option of a laboratory. You might be in a rural area. There's no laboratory within 100 miles of you and you have a diagnostic issue that you want to solve. Certainly for COVID, we developed a cheap way of diagnosing COVID just by detecting the virus in the saliva.

Prostate cancer, which is traditionally considered to be a problem of men over 60, is actually occurring in younger and younger men. And I have a colleague who is 52 who's just basically been diagnosed with metastatic prostate cancer. Had no idea. So, once it's metastatic, it's spread, it’s almost impossible to cure. So, I would like to advocate for testing in men in their forties, although traditionally it's not tested for until you're about 60.

And this is what accessibility and cost would do. If you can create a very affordable test that anyone can buy, and you can make it available and people can test themselves periodically, it would be a very important public health initiative to detect early disease.

You can detect in the early stages, you can cure it. Democratising self testing and making it available for everyone.

I think that would be the end goal.

**The goal is definitely ambitious, but like with any groundbreaking research, it needs financial support to turn into reality.**

You have to convince people of the idea such that they can throw money at it. And there are people who will do that, but you just have to find them.

I have been able to get some funding from a couple of government agencies but it's certainly not enough to continue and develop into a larger enterprise. The real investment has to come from venture capitalists, I think.

MUSIC INTERLUDE

In my field, the challenges come every day and the whole process of applying creativity towards trying to solve a problem - and especially if it's an interesting scientific problem - there's no end to the scientific problems that humans will face from now going into the future.

So, there are plenty of creative, intellectual, scientific challenges to keep us busy. And that's the main thing that keeps me going, that I really relish those kinds of challenges.

**Throughout his decades-long career, Tahir has stuck to his passions and his mission to improve public health.**

**So, for new chemical pathologists coming into the field and trying to figure out what their own passion might be, does he have any advice?**

Finding one's passion is a journey of exploration and self discovery. I think the one thing to do is to experiment broadly. So, try different things, look at different professions, shadow professionals, observe people in different roles.

There's a saying that you're a reflection of the five people that are closest to you. You internalise things from people that are closest to you. So, if you want to be a good tennis player, you need to hang around tennis players who are better than you are, and that's the only way you'll improve. So, their experiences and insights and encouragement can be invaluable.

So, it's that kind of thing.

The other thing to remember is that you need to be patient. Self discovery is a process and it can take time to find out what you really want to do. And I think once you've found something you're passionate about, turning it into a career or life path will need some kind of planning because it won't happen automatically.

Sometimes it might, but often it won't. You know, start small and build up gradually and always just be adaptable. There will always be failures along the way - treat those as learning opportunities and experiences, you just need to stay flexible.

And I think just embrace the journey and celebrate the milestones.

**For a transcript of this episode or for more about Tahir Pillay and his work, visit our website at** [**www.labmed.org.uk**](http://www.labmed.org.uk)**/podcasts**

**This podcast is brought to you by the Association for Laboratory Medicine. Produced and edited by Caroline Bacle, sound mixed by Daniel Fletcher. Special thanks to Avi Surskas and everyone in the LabMed team.**

**And we’ll be back next time for more stories of *Life in the Lab*.**

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