By Johan Fourie

FUTURE

The future of healthcare

A new vaccine trial is just one of many exciting developments in the field of biotechnology.

In early February 2021, the findings of a new vaccine trial were announced. While the news was only picked up by a few South African news outlets, the implications could be more profound for SA's future than any Covid-19-related news. This is because the trial 1 results of the vaccine candidate showed a breakthrough in producing rare immune cells necessary to prevent the deadliest of pandemics in southern Africa, one that has ravaged the subcontinent for almost three decades: HIV/Aids.

Statistics SA estimates that about a quarter of all annual deaths in SA – around 125 000 people – is attributed to Aids. Those numbers suggest that an HIV vaccine would improve the lives of millions of South Africans, raising life expectancy, reducing morbidity and the consequent (private and public) expenditure on healthcare and increasing incomes and quality of life. This is a good news story that ought to make the headlines of every news outlet.

And the good news did not stop there. The researchers now plan to team up with biotechnology company Moderna to use their messenger RNA (mRNA) technology to produce a vaccine. Instead of producing recombinant proteins (the stuff of traditional vaccines), mRNA technology instructs a patient's own cells to produce proteins that prevent, treat and cure disease. This allows for much faster development and roll-out of vaccines.

An HIV vaccine manufactured at scale by Moderna would do more than just improve living standards: It would showcase the incredible advances in biotechnology and its future possibilities. Moderna's mRNA technology is just one example of these new biotechnologies. CRISPR technology has the potential to allow gene editing and therapy, providing scientists with the opportunity to treat lifelong genetic diseases. Nanorobots can deliver tiny doses of medicines to where they are needed in the body. Synthetic biology can help to remodel humans' natural biological systems. 3D bioprinting can print drugs or living cells. Big Biodata can recognise patterns and make medical predictions. Tissue engineering can regenerate skin, bones and muscles.

Investors are noticing the commercial potential of biotech. Illumina, a company which provides sequencing and array-based solutions for genetic and genomic analysis, has seen a 50% increase in its share price in the last four months. The share price of Editas Medicine, a clinical stage genome editing company, has more than doubled since November 2020. And Bionano Genomics, a company which provides ultra-sensitive structural variation detection in the search for new diagnostics, saw its share price rise from 50c in early December to $12 per share by the end of January, an increase of more than 2 000%.

Fuelled by these technological advances and investor interest, biotech start-ups are proliferating. The good news is that this is happening in SA too. BioCODE is a Stellenbosch-based company that has developed a smart sensor that can detect novel circulating inflammatory molecules in the blood. I asked CEO Resia Pretorius why combating inflammation is important: "Annually, more than 70% of deaths worldwide are caused by cancer, cardiovascular disease and diabetes. The golden thread that links cancer, diabetes and cardiovascular disease is inflammation. Chronic inflammation can wage a slow and subtle war on the body, sometimes even long before symptoms manifest."

Resia Pretorius
CEO of BioCODE and professor and head of the Department of Physiological Sciences at Stellenbosch University

The BioCODE sensor detects inflammation at an early stage, allowing patients to change their behaviour and mitigate the onset of more serious diseases. Says Pretorius: "The main risk-factors of inflammation are chronic stress, bad dietary choices and a lack of physical activity and exercise. These risk-factors result in an increase in circulation inflammatory biomarkers that can be detected in blood long before severe disease manifests. Detecting inflammation early enough, before patients progress to severe disease, could save millions of lives and cut healthcare costs significantly."

Pretorius is not only CEO of BioCODE but also full professor and head of the Department of Physiological Sciences at Stellenbosch University. How difficult is it to take a product from the lab and commercialise it?

"The most difficult issue that we need to navigate constantly, is that the founders have a day job (lecturing, research, postgrads), where other start-ups have a dedicated team of entrepreneurs working full time and long hours exclusively on realising the company goals. But there are advantages too. As university researchers, we have wonderful resources around us. These include equipment and our labs, the LaunchLab and Innovus (a university-owned company responsible for commercialisation). We also have a plethora of young postgrads, willing to dedicate their time and effort and open to learn and explore the wonderful world of entrepreneurship with us.

"But funding remains a major challenge. We have been fortunate to receive some seed funding, but more is needed. Government can also do more. Our traditional avenues for research funding have been severely impacted over the past few years. The National Research Foundation and the Medical Research Council funding have virtually grinded to a halt. This will have a far-reaching impact on all areas of innovation and novel discoveries."

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I asked Pretorius about the future of biotech. "The aim should be to accelerate the collaboration between seemingly unrelated fields, such as data science, engineering and medicine. These collaborations will lead to better diagnostics and earlier and more accurate disease identification.

"Peter Drucker once said: 'If you can't measure it, you can't improve it.' I would argue that you cannot change human behaviour unless you provide the individual with the tools to measure how healthy they are. With the rapid advancements in biotechnology, we will soon live healthier, longer lives, to some extent, at least, thanks to a global pandemic." ■

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