Digitisation of nature presents huge opportunities - and some risks

by Simon Carpenter, Chief Technology Advisor at SAP Africa

The field of bio-engineering is not new, despite its recent prominence: humans have been domesticating and selectively breeding animals since as far back as 12 000 BC. More recently, advances in technology have enabled genetic modification and bio-engineering at an unprecedented scale.

From DNA sequencing to gene editing, the human ability to adapt and engineer nature has grown exponentially, creating a promise of a healthier, more predictable natural world. This has created new opportunities to solve prevailing medical and biological challenges: from curing cancer to addressing mental health issues, from developing new drought resistant crops and eradicating common diseases such as malaria, the field of bio-engineering is undoubtedly one of the shining lights of our near future. However, this is not without its risks. Even in something as simple as developing antibiotics, humans have unwittingly created potentially larger problems, such as drug-resistant super bugs.

The rise of the super bugs

One British study calculated that 700 000 people die every year because of antimicrobial resistance. By 2050, this could grow to 10 million deaths and cost the global economy as much as $100 trillion. This has prompted the World Health Organisation to warn that, without urgent coordinated action by a multitude of stakeholders, the world could be heading to a post-antibiotic era, in which even common infections and minor injuries would become untreatable - and lethal.

Following the outbreak of the Zika virus in South America, and the prevailing risks of malaria in many regions, some

scientists have proposed radical steps to safeguard humans from the estimated 100 species (out of a total of more than 3,500) of mosquito known to carry parasites that cause human disease. More than a million people, mostly from developing nations, die each year due to mosquito-borne diseases such as malaria, dengue fever, and yellow fever.

This has prompted the question: would it not be easier and safer to simply eradicate the insect entirely? There are however hugely important questions around the environmental impact of such an action: what type of organism, for example, would fill the void left by mosquitoes. Would it pose a lesser, equal, or even greater risk to our health? Moral and philosophical questions around the ethics of taking such a drastic step also gives us pause.

Encouragingly, scientists are taking these risks and concerns seriously: one group of scientists have created a strain of transgenic mosquito that is designed to reduce the Zika-carrying mosquito population by passing a lethal gene to their offspring, naturally reducing the risk of the disease spreading. In Australia, scientists are using a naturally occurring bacteria to reduce the ability of mosquitoes to pass dengue between people. And scientists in London are developing a sensor that can detect each different species of mosquito by their distinctive wing beat. They plan to equip rural villagers in South East Asia with wearable acoustic detectors to track disease-bearing mosquitoes and helping them manage future outbreaks.

The combinatorial nature of new technologies

For us, the question now is how do we use some of the new technologies to deliver better healthcare in Africa? According to one study, Africa has 24% of the world's occurrence of disease, but only 3% of its healthcare workers, and less than 1,5% of global healthcare budget is spent on African soil.

As smartphones become more prevalent, citizens may be able to take photos of for example a skin lesion, upload it to a central cloud database, and receive a remote diagnosis. Iris scanners could identify signs of diabetes, while drones could be deployed to deliver urgent medical supplies to remote areas.

Our greatest opportunity lies in the combinatorial nature of these technologies. The answer to better healthcare in Africa does not rest on the success of any single technology: instead, it is in how we put different pieces together to develop solutions that are relevant, affordable, and effective in Africa.

The bits and bytes of biology

Biology is at its heart an information science. As we increasingly convert nature's code into a stream of signals that includes the bits and bytes of genes, DNA, proteins and more, we gain the ability to analyse and process the data to find patterns and understand how these patterns work in different environments. Here, technology companies such as SAP have an opportunity to provide the technology platform that can process and analyse the data in faster and different ways. That is our contribution to the advance of science: a cloud-based, in-memory computing platform running advanced analytics and machine learning capabilities that equips medical professionals with the power to help solve some of our greatest challenges - and take advantage of the immense benefits of this digital future.