Genomics can improve cancer survival rate

The Council for Scientific and Industrial Research (CSIR) has teamed up with the University of Cape Town to understand the genetic mutations that characterise some cancers and use this to identify chemotherapeutic agents that will provide the best clinical outcomes.

Chemotherapeutic drugs are the heavy artillery in the fight against cancer, but they are still highly toxic to all rapidly-dividing cells in the body, leading to immune suppression, hair loss, and inflammation. According to the CSIR's Dr Musa Mhlanga, chemotherapy drugs vary in their ability to target specific cancer cells.

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"That means most people need to have two or three rounds of chemotherapy, because the first round kills those cancer cells that are susceptible to the drug, but allows the others to escape," he says. "You actually establish a new set of stronger tumour cells that you have to target differently, and it increases the risk of the cancer spreading."

Traditionally, doctors have used cellular anatomy and molecular markers to choose between the many first-line chemotherapeutic drugs available to treat tumours. Now, genomic advances are making it possible to improve the survival for local cancer patients.

New tools, new treatment options

"The tools of cell biology, such as imaging and stem cell biology, are making it possible to diagnose and identify treatment options for cancer. To make the most of these advances, the CSIR has teamed up with the University of Cape Town (UCT) to establish the Biomedical Translational Research Initiative (BTRI).

Based at UCT's Institute for Infectious Diseases and Molecular Medicine (IDM), the BTRI will work with clinicians to understand the genetic variations that characterise a particular cancer and tie these to effective chemotherapeutic agents, in order to recommend better treatment approaches to doctors.

"The idea is to use some of the molecular tools that we've been working on and developing at the CSIR - aspects of stem cell biology, imaging and microscopy - to provide molecular diagnostics and targeting of tumours in clinical contexts where they can be highly effective," explains Mhlanga, who is the BRTI Technical Manager and has a background in molecular biophysics and molecular genetics.

"Our research informs us of what mutations or variants are driving a tumour, and allows us to prescribe specific drugs that are tailored to work against those mutations."

A cancer biobank

Mhlanga has ambitious plans to turn the BRTI into an invaluable resource for clinicians, researchers and pharmaceutical companies. Perhaps the most noteworthy of these is the concept of a living cancer biobank, which will hold a large number of tumour samples that are genetically and physically well-characterised, and will be accessible to researchers, pharmaceutical companies and biotech startups.

Mhlanga goes on to explain that a biobank would hold value for a pharmaceutical company developing cancer drugs. "Using the biobank, they can know which drugs work for which type of tumour, and the genetic sequences of those tumours," he says, adding that it will also benefit preclinical drug trials.

"If we identify a mutation that is unresponsive to current drugs, researchers could use the biobank to test a new drug against that specific variant, which might occur primarily or exclusively in SA."

The BTRI aims to attract young researchers from around the country to receive training in translational medicine, further showing that its establishment is an important step towards improving South Africa's competence in this field and reducing the impact of cancer on the South African population.