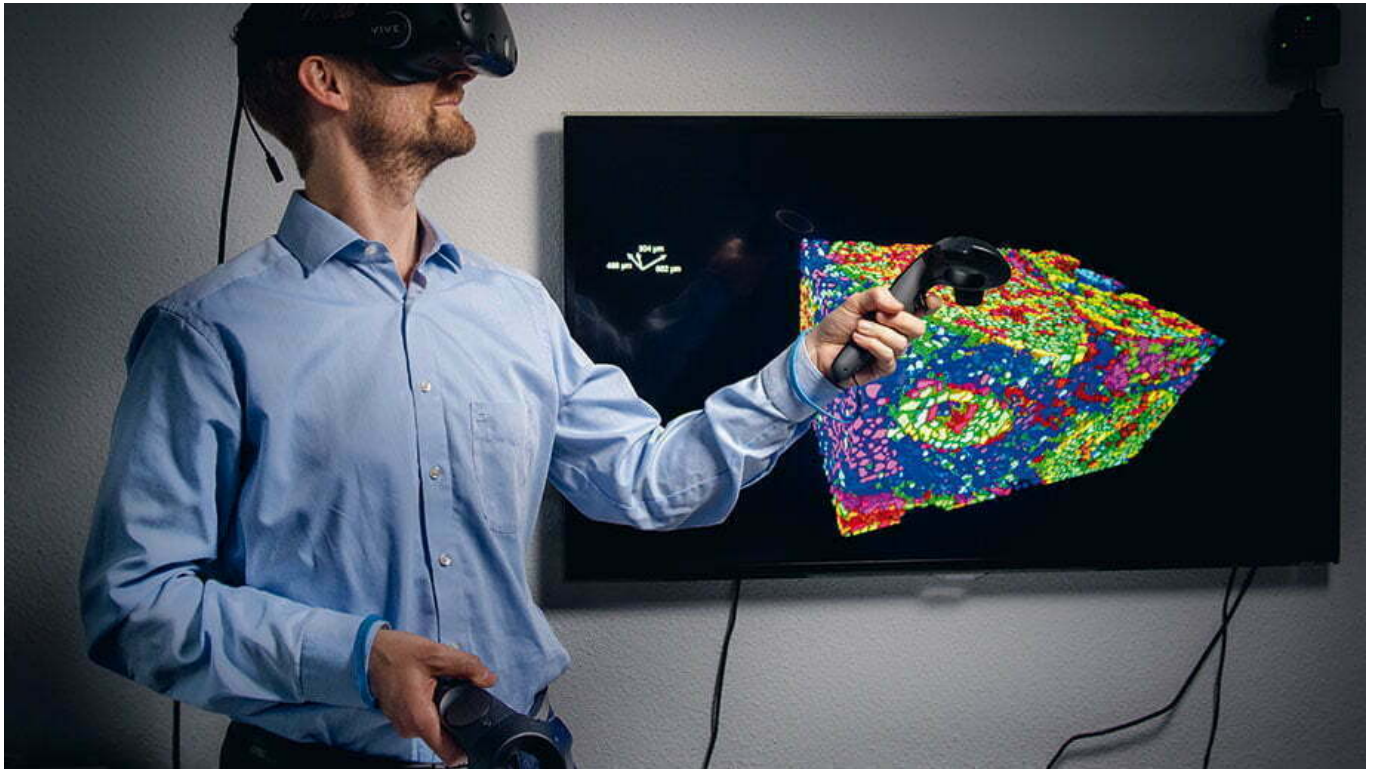# Leveraging big data for targeted cancer therapies

Quantitative biologist Bernd Bodenmiller generates spatial images of tumour tissue to analyse the interaction of the different cells in diseased tissue.
© UZH / Marc Latzel 27 June 2022

Cancer is the second most frequent cause of death in Switzerland. With new opportunities for research enabled by precision medicine, a globally unique project aims to provide therapies optimally designed to target each patient's needs.

Switzerland alone records over 42,000 new cancer patients every year. And each year sees 17,00 deaths. The particularly knotty medical challenge is that each tumour is unique and develops according to its own pattern. Scientists today look on cancer as a singular ecosystem in which a myriad of molecules and cells act in competition with the protective mechanisms of the human body, including the immune system. In the pioneering Tumor Profiler Center, researchers are now deriving from cancer patients the specific molecular profile of this individual ecosystem on which the effectiveness of cancer drugs depends.

Not only are several of the methods used new: also new is the fact that the molecular and functional characteristics of tumours are being investigated with a variety of complementary methods. The aim is to gain new insights from their combination. In conjunction with a better understanding of the molecular basis of cancer, this will mean significant benefits for patients in the foreseeable future.

Data science is a powerful tool

The studies include analyses of the genome, biochemistry, function and condition of different tumour cell types and their responses to therapies. With investigations at the single cell level, researchers also record the cellular diversity in a tumour, which includes not only tumour cells but also cells of the immune system. This results in huge amounts of data per patient that is then processed and analysed using the latest data science methods.

Information from medical imaging and other sources of patient data is also incorporated. The tumour profiling findings are then made available to doctors, who discuss them at interdisciplinary tumour board meetings. This

allows the medical staff responsible for treatment to offer personalised – and therefore potentially greatly improved – therapy recommendations.

Over 200 cancer patients have already benefited. The long-term goals of the tumour profiler project are: to improve clinical decisions made by pathologists thanks to computer models that integrate the large, multi-layered datasets; and to transform cancer from what is often a fatal disease into a treatable one. Building upon the results gained so far, clinical studies on ovarian cancer and melanoma (black skin cancer) are also planned.

Top expertise in action

Bernd Bodenmiller, Professor of Quantitative Biomedicine at ETH Zurich, is leading the entire project in collaboration with Viola Heinzelmann-Schwarz, Head of Gynaecological Oncology at the University Hospital Basel, and Andreas Wicki, Professor of Oncology at the University of Zurich and Head of Oncology at the University Hospital Zurich. In total, more than 60 experts from the fields of oncology, pathology, dermatology, molecular systems biology, biomedical informatics, quantitative and computational biology, genomics, proteomics and translational medicine are working together to give cancer research a new boost.

The Tumor Profiler Center builds upon ground-breaking technological advances achieved in the last ten years at the component research institutions. The aim is to become a national centre for precision oncology by 2025. The collaboration of institutions with expertise between them ranging from basic research to technology and clinical practice ensures that technological and biological innovations are transferred to clinics more swiftly. Such collaboration provides the ideal background for a project positioned at the interface of medicine and technology and creates excellent conditions for making significant headway in the search for more effective cancer therapies.

Support cancer research

"Our vision for the Bosch Health Campus is to have successfully met the major challenges facing the healthcare system – demographic change, digitalisation, climate change and technical innovations – by the end of the decade. We see ourselves as visible pioneers and role models for the

changes that are needed. And we can only do this in collaboration with partners, which is why we want to work with the best – such as ETH Zurich!"

Dr Ingrid Wünning Tschol
Director Robert Bosch Centre for Innovative Health and Senior Vice President Health Bosch Health Campus, Stuttgart, Member of the Board of Trustees of ETH Foundation Germany

https://ethz-foundation.ch/en/spotlight/uplift_nr10_cancer-research/