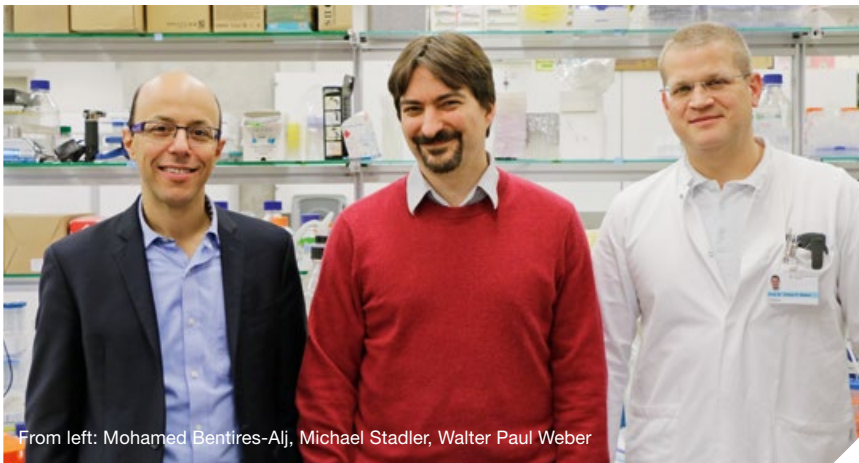


## 1. MetastasiX – Cellular analysis of breast cancer

The incidence of breast cancer is on the rise all over the world. In Switzerland, over 5,000 women contract the disease every year. Thanks to progress in therapy and diagnostics, around 80% of these patients survive. However, for a fifth of the affected women, the disease is still fatal. In their cases, either the therapy is ineffective or resistance emerges. In the end, metastases are the predominant cause of death.



Walter Paul Weber, professor and Head of Breast Surgery at the University Hospital Basel, leads the MRD Project MetastasiX. Together with his research colleagues involved in the project, he aims to understand the pathogenesis of fatal cases. “Some breast cancer cells roam around the body, entering the bones, liver, lungs, brain and skin. We want to find out which tumor cells do this and what gives them the ability to spread into other organs and grow again,” says Weber.

The scientists working on the MetastasiX project are using a systems approach to determine the cellular and molecular factors contributing to the growth, resistance and metastasis of breast cancers. The mechanisms and dynamics behind these processes have so far hardly been investigated.

Mohamed Bentires-Alj, professor in the Department of Biomedicine at the University of Basel and co-PI on the project, describes the group’s approach as follows: “What we do is single cell analysis to understand tumor heterogeneity. We examine how a particular cell differs from the others within the primary tumor, then within the metastases, and then we look at what

happens during the progression from primary tumor to metastases. This is a new approach; before now, scientists hadn’t analyzed breast cancer at the single cell level. With these results, we will have expression profiles of single tumor cells and will be able to look for proteins or other factors that might be responsible for seeding metastases.”

This novel approach should enable the researchers to identify the cellular and mo-

lecular factors in breast metastasis, which would not only make it easier to estimate a patient’s risk of developing metastases at an early stage of the disease, but in the best case would also help treat patients with existing metastases.

The interdisciplinary collaboration across institutional boundaries is new for most of the involved researchers. Michael Stadler, co-PI and Head of Computational Biology at the Friedrich Miescher Institute in Basel, summarizes: “Since we all come from very different disciplines, we first had to find a common language. But the collaboration is very exciting, as it allows us to carry out research with much more relevance to clinical applications than usual.”

In the first half of the project, the scientists were able to discern some interesting differences between the tumor cells and the metastases. A closer examination and classification of the collected data will be carried out in the second part. For Weber, the way forward is clear: “In the field of medicine, we need to make a progression from diagnosis toward prediction, and the systems biology approach plays a huge role in achieving this.”

### MetastasiX at a glance

**Principal investigator:** Prof. Walter Paul Weber, Head of Breast Surgery, Tumor Center, University Hospital Basel

#### Research groups:

- Prof. Gerhard Christofori, Department of Biomedicine, University of Basel
- Prof. Bernd Bodenmiller, Institute of Molecular Life Sciences, University of Zurich
- Dr. Michael Stadler, Friedrich Miescher Institute, Basel
- Dr. Maria Rodriguez Martinez, IBM Zurich Research Laboratory
- Prof. Mohamed Bentires-Alj, Department of Biomedicine, University of Basel

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