CASE STUDY

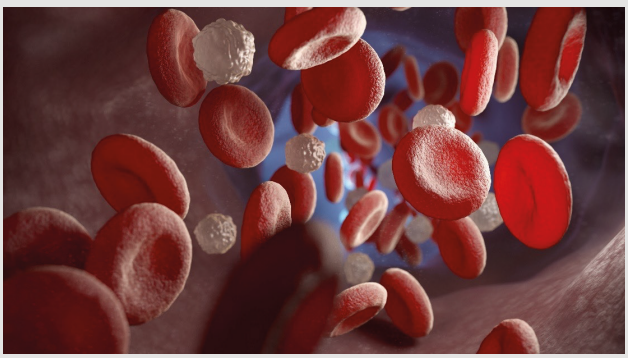
UNIVERSITÉ DE FRIBOURG
UNIVERSITÄT FREIBURG

XEMPERIA®
bio-inspired diagnostics

BLOOD TEST FOR BREAST CANCER DETECTION AND MONITORING

Problem – Challenge

Breast cancer is the leading cause of cancer-related mortality in women. Currently, mammography screening is the primary method for breast cancer detection, however, it has some significant drawbacks, such as limited specificity and sensitivity, unpleasant procedure, low compliance, and the risk of X-ray-induced DNA damage. Additionally, as more and more effective therapies for advanced breast cancer are entering clinical practice, there is a growing need for detecting relapses as early as possible to effectively adapt therapy, but no specific tests exist for this purpose. The absence of such testing approaches often leads to an (unnecessary) overtreatment and delays in adjusting the therapy, causing unwanted consequences not only for the patients but also for physicians and the healthcare system. To fill these gaps, the team – led by Prof. Curzio Rüegg, MD – is currently working on a first-in-class blood test for the early detection of breast cancer and active monitoring of post-cancer treatment evolution.



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Solution

The project aims at introducing a new generation of advanced diagnostic solutions in medicine for benefitting patients and society as a whole. In collaboration with clinical partners, the University of Fribourg team has been addressing this outstanding challenge by setting up a novel multi-omics approach to identify biomarkers associated with the presence of primary or metastatic breast cancer. This is a ground-breaking idea compared to the traditional method of detecting cancer-derived biomarkers.

The test is based on multiple cancer-induced alterations in blood leukocytes in response to the tumour. The organism's response is detected by monitoring protein and gene expression changes in circulating immune cells. In order to enhance target detection, advanced bio-inspired nano-sensors based on DNA-origami nanotechnology were developed by the team. These nanosensors allow for the detection of multiple targets (multiplexing) at pico-femtomolar concentrations with minimal preanalytical processing and preparation, and with fluorescence readouts that are compatible with the existing diagnostic equipment, such as fluorimeters.

This blood-based screening test for breast cancer has significant and numerous implications. Such a novel screening test can revolutionize the breast-cancer screening process. The screening could be performed more frequently without any radiation exposure risk, and with increased specificity and sensitivity compared to mammography. Also, the test could serve as a complementary method to traditional mammography and other imaging approaches. Importantly, the test would be integrated into the existing follow-up protocols for monitoring patients during and after adjuvant therapy to rapidly detect potential breast cancer relapses. As new drugs and protocols are being developed to effectively treat relapses, there is a strong interest and need to detect relapses as soon as possible to maximize the efficacy of these novel treatments.