

Fighting Cancer on All Front Lines

CREATE Health, a Strategic Centre for Translational Cancer Research in Lund, creates a substantial social impact for patients, through direct application of research for selection of optimal, individually-based, cancer diagnoses and treatments.

CREATE Health (Strategic Center for Clinical Cancer Research using Emerging Advanced Technologies for Health) is a multi-disciplinary strategic research centre at Lund University started almost ten years ago. The centre, today mainly located at Medicon Village, integrates clinicians with researchers from the Faculties of Medicine, Natural Sciences and Engineering at Lund University, using a superbly equipped and integrated 'omics' platform.

"All competencies are needed to fight cancer," says Research Coordinator, Dr Ulrika Andréasson.

The centre uses an integrative approach to develop novel diagnostics and therapeutics, based on identified markers and molecular signatures.

Early Diagnosis

One of the centre's main focus areas is early diagnosis. There's a lot to be gained from an early discovery of cancer since early diagnosis is a key to the outcome of a cancer treatment. For example, pancreatic cancer is generally detected at a very late stage and the five-year survival rate is only 3-4%. The late detection is due to unspecific symptoms and lack of markers for early diagnosis. One of CREATE Health's most important achievements during last years is the discovery of a serum biomarker signature that identifies pancreatic cancer in a blood sample, forming the basis for an early diagnostic test.

"The biomarker signatures consist of 18-20 proteins, which give us a much more precise indication than individual proteins do. The biomarker signature accurately distinguishes between pancreatic cancer patients and healthy controls and has also the capacity to distinguish cancer from inflammation in the pancreas," Ulrika Andréasson comments.

The project is led by the centre's director Professor Carl Borrebaeck, who has published articles and reviews in the research fields of antibody engineering, immunotherapy, and affinity proteomics.

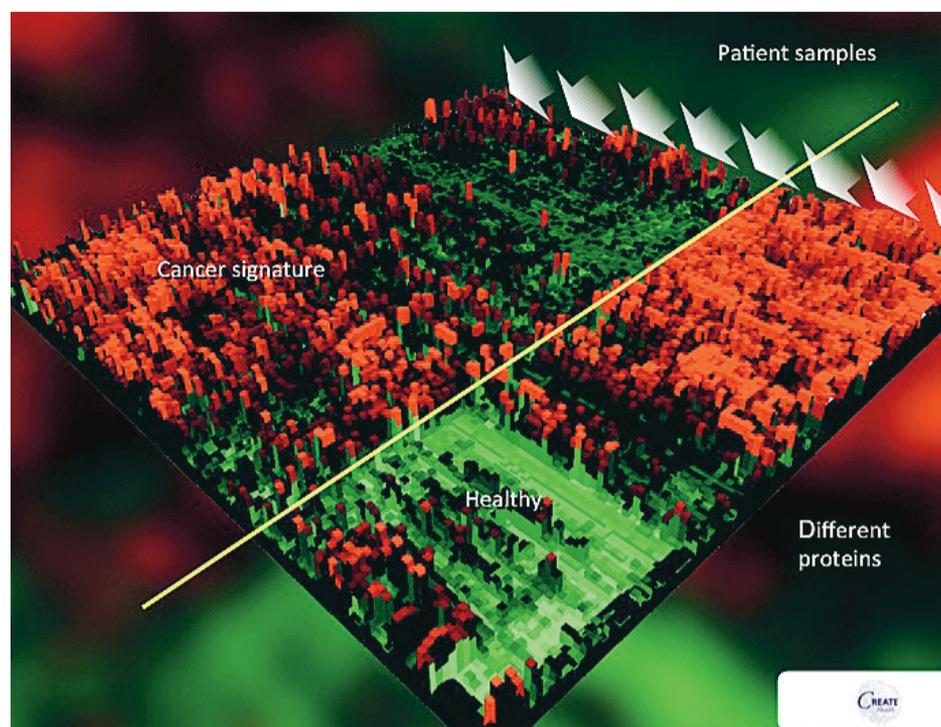
The SCAN-B Initiative

A project that was initiated and is led by another of the centre's principle investigators, Professor Åke Borg, is the breast cancer project SCAN-B. It's a multi-centre collaboration that started in 2010, today between hospitals in Malmö, Lund, Helsingborg, Växjö, Halmstad, Kristianstad, Karlskrona and Uppsala, and continues to include more hospitals.

The long-term goals of the project are to develop new diagnostic, prognostic, and treatment-predictive clinical tests for breast cancer. These goals



Dr. Ulrika Andréasson, Research Coordinator.



Blood samples divided into healthy controls and cancer patients based on the expression of different proteins in the blood sample. Red colour equals a large amount of the protein and green colour equals a small amount of the protein

will be accomplished using the latest advanced genomic technologies to study the molecular profiles of breast tumour samples from patients on a prospective basis.

All patients with suspected or diagnosed primary breast cancer, in the southern healthcare region of Sweden, are eligible and may be enrolled in the study, following informed consent. Participation means that a blood sample is drawn prior to surgery; then following surgical removal of the cancer, a small piece of the patient's tumour is sent for genomic analysis.

"Today, samples from nearly 5,000 patients have been collected. RNA and DNA sequencing give the molecular profile of the tumour. Cancer is really a collective term for hundreds of diseases, breast cancer alone can be divided into several subgroups," states Ulrika Andréasson.

Due to the large heterogeneity of the disease, analysis of thousands of molecular profiles of individual patient tumours are needed to be able to develop the most effective and beneficial treatments and diagnostic tests to improve patient survival

Prof. Carl Borrebaeck, Director of CREATE Health.



and quality of life.

"In the first phase, we have commenced whole-transcriptome gene expression profiling using massively parallel sequencing of tumour RNA (RNA-seq). The aim is to develop new valuable biomarkers and provide them to the clinic on a routine basis," tells Prof. Åke Borg.

As an example, patients with HER2-positive breast cancer, one of the most aggressive forms, are treated with targeted drugs towards HER2. Some patients benefit from these drugs, others need more or other treatment. By identifying the different subgroups physicians can optimise the clinical handling and researchers can develop targeted treatments that are more effective.

"Cancer treatment is expensive, so giving the right treatment to the right patient will save a lot of public spending and, even as important, save patients from unnecessary suffering," Åke Borg adds.

The SCAN-B project is made possible by funding provided by the Berta Kamprad Foundation, Swedish Cancer Society and CREATE Health.

Database of Breast Tumour Proteins

In the SCAN-B project, the cancer genome is analysed. However, the researchers at CREATE Health are also about to publish the first version of their Breast Cancer Index. It's a database of all the proteins found in the breast tumour tissues. The data is collected by mass spectrometry and the aim is to understand the proteins' functions, signal pathways and why the tumours respond differently to the same treatment.

Principal investigator of the Breast Cancer Index is Professor Peter James, who holds several patents in proteomics methodologies and is engaged in the research field of protein analysis with a focus on protein-protein interaction, non-gel proteomics, membrane proteins and methods development for clinical proteomics.

Conclusion

The research teams at CREATE Health have made several significant achievements. Future work with a diagnostic test for pancreatic cancer will now be performed by Immunovia AB, a spin-out company, potentially having a test on the market within a couple of years. The mapping of breast cancer, both the genes (SCAN-B) and the proteins (Breast Cancer Index), is crucial for improving diagnosis and treatment of breast cancer patients in the future.

In addition, Ass. Professor Sara Ek at CREATE Health has identified the protein SOX11 as a potential tumour suppressor in mantle cell lymphoma and ovarian cancer. SOX11 shows a great potential to be used as a clinical relevant biomarker especially to diagnose and stratify mantle cell lymphoma patients.

Professor Sven Pålman, one of CREATE Health's PIs, has identified the protein HIF-2 α as a marker of and therapeutic target for neuroblastoma stem cells.

"The goal is to target HIF-2 α to fight neuroblastoma as well as the related tumours paraganglioma and pheochromocytoma," says Sven Pålman.

MAD for Cancer

Cancer research is not a one man's job and one recent and larger initiative is the MAD (Make A Difference) for Cancer programme, a unique concept bringing several different faces of cancer biology from four different faculties at Lund University together in a multifocal approach to fight cancer.

MAD for Cancer is based on the insight that a tumour cannot be regarded as merely a collection of cancer cells, but that it constitutes an organ in itself. Hence, the strategy to fight cancer is to combine know-how from areas involving all parts of the tumour environment; such as, genomics, proteomics, chemical biology, cancer stem cells, and stromal biology.

Website: www.createhealth.lth.se

Facts:

CREATE Health was established in 2006 after a grant from the Swedish Foundation for Strategic Research (SSF). CREATE Health was able to continue the work after the five initial years after a grant from VINNOVA.