Christer Borgfeldt: Improved Early Diagnosis of Cancer Using Plasma Volatile Organic Compounds (VOC) Analysis

Detecting cancer at an early stage can make a major difference to treatment and survival. Yet ovarian cancer is often diagnosed only after the disease has spread, and there is currently no reliable screening method. Christer Borgfeldt's research explores a new approach that could help change this: detecting cancer through the analysis of volatile organic compounds (VOCs) in blood.

Christer Borgfeldt is Professor of Obstetrics and Gynaecology at Linköping University and a specialist in obstetrics and gynecology as well as gynecological tumor surgery. He has spent much of his clinical and research career working with gynaecological cancer, combining his experience as a physician with research into the biology and diagnosis of ovarian cancer. His background in both patient care and cancer research provides an important foundation for developing a diagnostic method that could eventually be used in clinical practice.

VOCs are organic chemical compounds released into the blood by cells and tissues. The researchers use highly sensitive gas sensors, sometimes described as an "electronic nose", to detect patterns of these compounds in plasma. Artificial intelligence and machine learning are then used to analyse these complex patterns and identify signals associated with cancer.

In their initial studies, the method successfully identified patients with ovarian and endometrial cancer and was also able to distinguish early-stage disease from more advanced cancer with very high accuracy. These promising results provide a strong foundation for further research.

> "Our goal is to find a simple and reliable way to detect cancer earlier, when there are more opportunities for successful treatment. If we can identify specific patterns in a blood sample, we may be able to develop a new diagnostic tool that is both minimally invasive and easier to use in clinical practice."
> — **Christer Borgfeldt**

The next phase of the research will test whether these findings can be confirmed in larger and independent groups of patients. The researchers will investigate whether the method can distinguish malignant and borderline ovarian tumours from benign ovarian lesions, an important clinical challenge when a woman is found to have an adnexal mass. They will also study how blood samples should best be collected, stored and transported to ensure reliable results.

Another important part of the project is to investigate whether VOC analysis can detect ovarian cancer recurrence earlier than currently used markers such as CA125 and HE4. Earlier detection could provide doctors with additional information when assessing a patient's disease and treatment.

Researchers will also investigate whether the same approach can be applied to other types of cancer, including endometrial, colorectal, breast, lung and other cancers.

The long-term goal is to develop a simple, cost-effective and minimally invasive diagnostic tool that could eventually be used alongside existing methods to improve cancer diagnosis and prognosis. By combining advanced sensor technology with machine learning and artificial intelligence, Christer Borgfeldt and his team hope to create a new way of identifying cancer when it is still at an earlier and potentially more treatable stage.