Website address:
https://www.gesundheitsindustrie-bw.de/en/article/press-release/nmi-tt-reutlingen-and-duesseldorf-university-womens-hospital-develop-high-precision-method-analyzing-individual-circulating-tumo

NMI TT in Reutlingen and Düsseldorf University Women's Hospital develop high-precision method for analyzing individual circulating tumor cells

Researchers led by Dr. Michael Pawlak from NMI Technologie Transfer GmbH (NMI TT) in Reutlingen and Prof. Dr. Hans Neubauer from the Women's Hospital at the University of Düsseldorf have developed a new method that enables a more precise analysis of individual tumor cells circulating in the blood. This allows not only the previously possible genomic investigation of such tumor cells, but also the focused analysis of single-cell signaling pathways at the functional protein level. The combined analysis of the mutated genome and signaling proteins opens up new avenues for more targeted treatment methods.

Combined analyses improve prediction of treatment success

The better tumor growth and underlying cell mechanisms are understood, the more targeted drugs can be developed and the more efficiently therapies can be used. Targeted tumor therapies are already in use, but are currently based primarily on knowledge of genomic changes, i.e. tumor-specific mutations.

Understanding signaling pathways means understanding the tumor better

However, the detection of a mutation does not yet provide sufficiently reliable information about how the tumor "works" and how efficient a treatment targeting this mutation can be. However, this is precisely what is important for personalized therapy selection. This is why the focus is on the signaling pathways involved in the mutation and the functional signaling proteins that control them. Focused proteomic analyses are used to answer the question of whether a signaling pathway involved was activated by a mutation or remained unchanged. This knowledge is an essential prerequisite for more targeted control and efficient treatment with drugs.

Circulating tumor cells: Rare, but with valuable information

Circulating tumor cells (CTC) carry mutation and molecular signaling information from the primary tumor. CTC are released from the primary tumor or from a metastasis into the bloodstream and can therefore be separated and analyzed from a relatively easy-to-take, non-invasive blood sample (liquid biopsy) - even though they occur in very small numbers. An analysis of biopsies from the tumor tissue of patients is also possible, but much more complex and not always feasible.

At the Liquid Biopsy Center of the University Hospital Düsseldorf, CTCs are regularly isolated and analyzed from such blood samples of cancer patients. On the one hand, their number provides information about the severity of the tumor and possible metastasis; on the other hand, these individual cells carry essential genomic and proteomic molecular information about the primary tumor or metastasis - including information about the activation states of functional signaling proteins.

"If we have this information, we can treat patients in a much more targeted and individualized way than before," explains Hans Neubauer from the University Women's Hospital Düsseldorf.

Highly precise and sensitive workflow for single cell protein analysis

The proteomic analysis of individual circulating tumor cells in particular requires a highly precise and sensitive detection method. The number of these cells is small, making them difficult to analyze. The experts working with Hans Neubauer and Michael Pawlak have now jointly developed the necessary workflow for single-cell protein and signaling pathway analyses. "The tailor-made workflow ideally complements our existing portfolio of methods for genomic sequencing and mutation detection of circulating tumor cells," says Hans Neubauer.

“Our picture of the tumor is becoming even more comprehensive”

“We are pleased that through further miniaturization, including the preparation of a single cell, we are able to obtain sufficient starting material to detect functional pathway proteins from a single, specific tumor cell. With the help of our long-established protein array approach, we are now even able to analyze several cells in parallel for several signaling pathway proteins, which makes our picture of the tumor even more comprehensive,” explains Michael Pawlak from the NMI TT.

Publication:
Miniaturized protein profiling permits targeted signaling pathway analysis in individual circulating tumor cells to improve personalized treatment.
doi.org/10.1186/s12967-024-05616-7

The NMI Technologie Transfer GmbH:

NMI Technologie Transfer GmbH (NMI TT) is a company dedicated to applied research and services. The company, based in Reutlingen, was founded in 2002 as a subsidiary of the NMI Natural and Medical Sciences Institute at the University of Tübingen. NMI TT is active in the fields of pharmaceutical services, testing services and microdevices.

Press release

06-Mar-2025
Source: Natural and Medical Sciences Institute at the University of Tübingen (NMI)

Further information

- NMI Natural and Medical Sciences Institute at the University of Tübingen