Website address:
https://www.gesundheitsindustrie-bw.de/en/article/press-release/3d-microtumors-could-revolutionize-treatment-decisions

3D microtumors could revolutionize treatment decisions

Chemotherapy is often a central component of treatment for advanced colorectal cancer. However, not every therapy is equally effective for every patient. Researchers from the German Cancer Research Center (DKFZ), the HI-STEM* stem cell institute, and the biotech company Xilis in Utrecht, Netherlands, have now developed a new method for selecting the most effective drug before treatment begins. The method is based on tiny 3D tumor models that can be tested in high throughput.

Knowing for sure which chemotherapy will be effective for a patient could save valuable time, especially in the case of aggressively growing tumors. This would spare patients unnecessary side effects and the healthcare system avoidable costs. Medical professionals therefore see an urgent need for scalable and reproducible methods to perform personalized drug testing at high throughput.

The German-Dutch team from the DKFZ and the biotech company Xilis tested so-called MicroOrganoSpheres (MOS) for this purpose – tiny, three-dimensional tumor models that are produced in the laboratory from the tumor tissue of individual patients.

These microtumors are obtained from tumor cell suspensions, which are broken down into tiny droplets using microfluidics and embedded in a gel matrix. MOS have the great advantage that they can be tested automatically in a high-throughput process with various drugs. Using modern image analysis and artificial intelligence, the researchers then measure how strongly the tumor cells respond to the respective drugs.

The droplet structures, which are approximately 300 micrometers in size, enable rapid growth, high reproducibility, and improved nutrient supply, surpassing conventional organoids in precision medicine and drug development.

High hit rate

The researchers examined MOS obtained from tumor samples from 21 patients with advanced colorectal cancer. In 83 percent of cases, the MOS's responses to drugs corresponded to the actual treatment success. When the MOS were obtained from the primary tumor rather than the metastases, the prediction accuracy was as high as 100 percent.

Furthermore, patients whose MOS responded to the chemotherapy tested in the laboratory remained disease-free for longer on average. The method was also able to reveal differences within a single tumor, thereby identifying particularly resistant groups of cancer cells.

A step toward functional personalized cancer medicine

In the future, the new MOS technology could help patients receive the best therapy for them more quickly. Compared to previous organoid methods, the test is standardized, can be automated, and can be performed within a few days—prerequisites for later use in everyday clinical practice.

“In the long term, we see MicroOrganoSpheres as an important component of tailored, more precise cancer treatment,” says study leader René Jackstadt. However, the method must first be further tested in larger patient groups in clinical trials.

Publication:
Roán Gobits, Nikolai Schleußner, Gavin R. Oliver, Michael Rutenberg Schoenberg, António Miguel de Jesus Domingues, Pavan Ramkumar, Sylvia W. F. Suen, Mandy P. M. Koomen, Francesca Paolucci, Kilian Martens, Aitana Guiseris Martinez, Julia Volk, Carolin Artmann, Manuel Mastel, Kyanna S. Ouyang, Matthias Kloor, Eric Daniel Bankaitis, Hayden Eric Stoub, Jens Puschhof, Kevin Brown, Sebastian Pretzer, Daniel A. Nelson, Eric Struminger, Amelia Zessin, Amanda Brown, Corey Evans, MSc, Daniel Yetsko, Mackenzie Harrington, Gabriel Salg, Martin Schneider, Thomas Schmidt, Elena Helman, Dennis Plenker, Carlton Barnett, Ryan T. Jones, Bruno Köhler, Else Driehuis, Rene Jackstadt:
Functional precision medicine using MicroOrganoSpheres for treatment response prediction in advanced colorectal cancer.
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Further information

- German Cancer Research Center (DKFZ)