

FreezeO –Advancing Personalized Cancer Therapy with Patient-Derived Organoids

As three-dimensional in vitro models, patient-derived organoids (PDOs) closely mimic the original tumor's phenotypic and genotypic characteristics. We present FreezeO –the Biobank for Human (Tumor) Organoids, an initiative at the University Medical Center Freiburg dedicated to the isolation and culture of PDOs from tumor biopsies. FreezeO addresses a critical need for personalized therapy recommendations in advanced cancer.

The FreezeO core team primarily collects tumor samples from Molecular Tumor Board patients, generating three-dimensional PDO cultures and providing these valuable resources to researchers worldwide. Using standardized protocols, FreezeO enables rapid, personalized drug testing to identify patient-specific drug sensitivities. This approach holds significant potential for guiding clinical decision-making and improving patient outcomes.

To date, we have successfully biobanked PDOs from nine cancer types, including colorectal cancer (CRC), non-small cell lung cancer (NSCLC), and rare malignancies such as jejunal carcinoma. Notably, most PDOs originate from metastatic lesions, highlighting their potential benefits for late-stage cancer patients.

As an example, we present the case of FreezeO-21, a 46-year-old female patient with metastatic colorectal cancer (CRC) whose disease progressed over 5.5 years despite multiple treatments. A biopsy from a lung metastasis identified driver mutations in KRAS, SMAD4, and TP53, which remained stable across PDO passages, demonstrating the model's robustness. Targeted drug testing identified highly effective combination therapies, which were validated using Western blot analysis and RNA sequencing.

Preferred type of presentation

Primary author: WERNER, Tanja (Deutsches Krebsforschungszentrum, DKTK Freiburg, University Medical Center Freiburg)

Co-authors: NIETERS, Alexandra (DKTK Freiburg, University Medical Center Freiburg); HAU, Caleb (DKFZ, DKTK Freiburg, University Medical Center Freiburg); BERLIN, Christopher (DKFZ, DKTK Freiburg, University Medical Center Freiburg); VLADIMIROV, Georg (DKTK Freiburg SOO, DKTK Freiburg, University Medical Center Freiburg); BECKER, Heiko (Department of Medicine I, Medical Center- University of Freiburg, Faculty of Medicine, Freiburg, Germany); KRÖMER, Lea (DKFZ, DKTK Freiburg, University Medical Center Freiburg); SCHÖMIG, Linus (University Medical Center Freiburg); FREIBURG, MTB Netwrok (University Medical Center Freiburg); HESS, Mari-a-Elena (Institute of Medical Bioinformatics and Systems Medicine, Medical Center - University of Freiburg, Faculty of Medicine, University of Freiburg, Freiburg, Germany); BÖRRIES, Melanie (Institute of Medical Bioinformatics and Systems Medicine, Medical Center-University of Freiburg, Faculty of Medicine, University of Freiburg, German Cancer Consortium (DKTK) and German Cancer Research Center (DKFZ), Partner Site Freiburg); QUANTE, Michael (DKTK Freiburg, University Medical Center Freiburg); METZGER, Patrick (Institute of Medical Bioinformatics and Systems Medicine, Medical Center—University of Freiburg, Faculty of Medicine, University of Freiburg, Freiburg, Germany); KLAR, Rhena (Deutsches Krebsforschungszentrum, DKTK Freiburg, University Medical Cen-

ter Freiburg); SLOBODA, Tamara (DKTK Freiburg, University Medical Center Freiburg); BRUMMER, Tilmann (Institut für Molekulare Medizin und Zellforschung)