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Dissolving Tumor Heterogeneity in the CAM Model

Intratumoral heterogeneity (ITH) arises during tumor progression as a consequence of clonal evolution and is a key contributor to therapy resistance in colorectal cancer (CRC). ITH results in remarkable cellular plasticity, particularly in relation to tumor invasion patterns. The chorioallantoic membrane (CAM) assay enables the transplantation of tumor cells onto the highly vascularized CAM, which serves as a natural bioreactor enriched with growth factors. Harvested tumors can then be analyzed either as fresh or formalin-fixed tissue to study tumor growth dynamics, invasion behavior, and metastatic potential. Additionally, the CAM model offers a powerful tool for spatially resolving tumor heterogeneity, especially by comparing the tumor center with the invasive front. In my presentation, I will begin by showing a video that illustrates the key experimental steps involved in tumor transplantation onto the CAM. I will then present several examples demonstrating how we have used this model to generate hypotheses, interpret in vitro findings, and validate our results in a biologically relevant in vivo context. Finally, I will highlight our recent study aimed at identifying novel cancer-associated genes within collectively migrating tumor cell clusters at the invasion front, using a spatial transcriptomic approach (NanoString). Since chicken embryos are not legally classified as animals before hatching, the CAM assay complies with the 3Rs principle—Reduce, Replace, and Refine—making it an ethically sound alternative to conventional animal experimentation in cancer research.

Keywords

CAM model, 3R, tumor heterogeneity, tumor invasion front, spatial resolution, colon cancer

Biography

Prof. Regine Schneider-Stock, PhD, is the Head of Experimental Tumor Pathology at the University Hospital Erlangen (UKER), Friedrich-Alexander University Erlangen-Nürnberg (FAU), Germany. Her research focuses on molecular cancer biology, with special emphasis on programmed cell death mechanisms and therapeutic resistance. She has authored numerous peer-reviewed publications and is a recognized expert in translational cancer research. She leads multidisciplinary projects integrating tumor pathology with innovative treatment strategies.