525

Colorectal cancer organoid-on-a-chip for drug sensitivity testing

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The development of advanced *in vitro* models has been critical in improving cancer drug screening. Widely used traditional 2D cell cultures have many limitations, such as the absence of tumor heterogeneity, lack of tumor microenvironment complexity, and lack of 3D architecture. Here, we propose that the most promising approachable models are cancer organoid-on-a-chip models, which combine 3D cancer organoids with microfluidic devices. These systems provide the tumor microenvironment and organ-level physiological responses, providing a more accurate and controlled environment for drug testing. The fluidic microenvironment allows for dynamic, real-time drug exposure to tumor cells, more accurately reflecting physiological drug exposure in human patients.

Colorectal cancer is now the third leading cause of cancer-related death in women and men, mainly because of the high incidence of cancer metastasis and chemotherapeutic treatment inefficiency. Therefore, *in vitro* cancer models are important to evaluate the efficacy of compounds, identify drug resistance mechanisms, and explore therapeutic targets. Cancer organoid models more closely mimic the structure of tumors *in vivo*, including cell-cell and cell-matrix interactions, and allow for the creation of drug-resistance niches.

ATCC provides over 300 next-generation cancer models, manufactured, characterized, and validated in-house, available for academic and commercial use to aid in cancer research and drug discovery, including 78 expanded colorectal cancer organoids. These models are provided through the Human Cancer Models Initiative (HMCI).

In this study, we demonstrate that colorectal cancer organoid-on-a-chip are used for drug sensitivity test to deliver compounds to *in vitro* cancer models in the real physiological drug exposure. Data suggest that novel tumoroid-on-a-chip microfluidic system mimics the real microenvironment of a specific tumor to the complex organ-level physiological and pharmacological responses.

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526

ASPIS academy: Early-stage researchers in next-generation toxicology

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Led by ESR representatives and guided by experienced researchers, the ASPIS Academy cultivates an inclusive and collaborative environment where diverse perspectives thrive. Through its initiatives, the ASPIS Academy is shaping the future of chemical safety assessment in the European Union, driving scientific excellence, and contributing to a sustainable transition away from traditional animal models.

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