Review Article

A COMPREHENSIVE REVIEW ON "THE ROLE OF BIOPRINTED TUMOR MODELS IN PERSONALIZED CANCER DRUG DEVELOPMENT AND TESTING"

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Bioprinted tumor models are rapidly advancing the field of personalized cancer drug development by offering highly customized, three-dimensional platforms that mimic the cellular architecture and tumor microenvironment (TME) of human cancers. Unlike traditional two-dimensional cell cultures and animal models, bioprinted tumor models incorporate multiple cell types, including cancer, immune, and stromal cells, as well as extracellular matrix components, making them uniquely suited to reflect patient-specific tumor conditions. This review examines the current role of bioprinted tumor models in precision oncology, with a focus on their applications in drug screening, efficacy testing, and the study of drug resistance. Additionally, the development of patient-derived bioprinted models enables personalized testing of chemotherapies and immunotherapies, improving the ability to predict individual responses to treatment. These models also provide valuable insights into the TME's influence on drug resistance mechanisms and immunotherapy efficacy. While challenges in reproducibility, scalability, and regulatory acceptance persist, ongoing advancements in biomaterials, bio-inks, and automated bioprinting techniques are driving bioprinted models closer to routine clinical and pharmaceutical application. This article discusses these innovations, their potential to enhance precision medicine, and the future prospects of bioprinted tumor models in revolutionizing cancer drug testing and development.

Key Words: bioprinted tumor models, tumor microenvironment (TME), Bioprinting.

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