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3D Cultures of Human Liver Cell Lines Encapsulated in PuraMatrix on a Microarray Chip Platform

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Abstract

A high-throughput cell printing technology has developed to simulate the liver tissue environment using a hydrogel-based chip platform that has potential to shift *in vivo* drug toxicity models towards *in vitro* tests. However, the hydrophobic nature of polystyrene chips is not promoting direct adhesion of hydrogels, which created a problem with spot attachment. The main goal of this research is to create a surface chemistry that helps to attach a peptide-based hydrogel, including PuraMatrix, to a polystyrene-based micropillar chip. Seven analogs of maleic anhydride co-polymers were used to coat the micropillar chip to create a functional surface. Then, six ionic solutions were tested for inducing gelation of PuraMatrix. Formation of bubbles and spot detachment on the chip platform was quantified. As a result, an optimum polymer, PMA-OD was selected for surface attachment based on its low bubble formation and high spot attachment. This polymer could easily coat the chip for better gel adhesion. In regards to the gelation of PuraMatrix, poly-L-lysine was the most favorable for spot attachment and cell viability on the chip platform. In future research, encapsulated human liver cells expressing drug metabolizing enzymes will be tested with different drugs to determine mechanisms of drug toxicity.