Multiplexed Dosing Assays by Digitally Definable Hydrogel Volumes - DTU Orbit (08/11/2017)

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Stable and low-cost multiplexed drug sensitivity assays using small volumes of cells or tissue are in demand for personalized medicine, including patientspecific combination chemotherapy. Spatially defined projected light photopolymerization of hydrogels with embedded active compounds is introduced as a flexible and cost-efficient method for producing multiplexed dosing assays. The high spatial resolution of light projector technology defines multiple compound doses by the volume of individual compound-embedded hydrogel segments. Quantitative dosing of multiple proteins with a dynamic range of 1–2 orders of magnitude is demonstrated using fluorescently labeled albumins. The hydrogel matrix results from photopolymerization of low-cost poly(ethylene glycol) diacrylates (PEGDA), and tuning of the PEGDA composition enables fast complete dosing of all tested species. Dosing of hydrophilic and hydrophobic compounds is demonstrated using two first-line chemotherapy regimens combining oxaliplatin, SN-38, 5-fluorouracil, and folinic acid, with each compound being dosed from a separate light-defined hydrogel segment. Cytotoxicity studies using a colorectal cancer cell line show equivalent effects of dissolved and released compounds. Further control of the dosing process is demonstrated by liposomal encapsulation of oxaliplatin, stable embedding of the liposomes in hydrogels for more than 3 months, and heat-triggered complete release of the loaded oxaliplatin.

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