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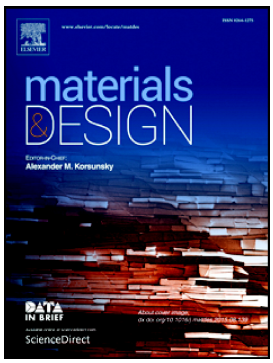

3D bioprinting of gellan gum and poly (ethylene glycol) diacrylate based hydrogels to produce human-scale constructs with high-fidelity

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3D bioprinting of gellan gum and poly (ethylene glycol) diacrylate based hydrogels to produce human-scale constructs with high-fidelity

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Abstract: 3D bioprinting, a promising technology by precisely positioning cell-laden biomaterials to fabricate complex functional artificial tissues and organs, has potential applications in regenerative medicine and drug discovery. However, the printing of large-scale constructs with high structural fidelity is still a major challenge. One of the main bottlenecks is the development of bioink materials. Herein, a double network hydrogel that combines the superior shear-thinning and recovery properties of gellan gum (GG) with rapid UV cross-linking capability of poly (ethylene glycol) diacrylate (PEGDA) was formulated for extrusion based 3D bioprinting with cells. Printability was investigated by rheological properties and structure fidelity. Excellent rheological properties enabled the printed constructs to retain the shape stably after deposition without additional support, making it possible to subsequently UV crosslink for mechanically property improvement and permanent stabilization. Furthermore, human-scale tissue constructs such as human ear and nose were printed. BMSCs and MC3T3-E1 cells encapsulated in GG/PEGDA hydrogel exhibited high viable cell percentages above 87% during a long-term 3D culture of 21 days. This study