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The Bioink: A Comprehensive Review on Bioprintable Materials

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Abstract

This paper discusses “bioink”, bioprintable materials used in three dimensional (3D) bioprinting processes, where cells and other biologics are deposited in a spatially controlled pattern to fabricate living tissues and organs. It presents the first comprehensive review of existing bioink types including hydrogels, cell aggregates, microcarriers and decellularized matrix components used in extrusion-, droplet- and laser-based bioprinting processes. A detailed comparison of these bioink materials is conducted in terms of supporting bioprinting modalities and bioprintability, cell viability and proliferation, biomimicry, resolution, affordability, scalability, practicality, mechanical and structural integrity, bioprinting and post-bioprinting maturation times, tissue fusion and formation post-implantation, degradation characteristics, commercial availability, immune-compatibility, and application areas. The paper then discusses current limitations of bioink materials and presents the future prospects to the reader.

Keywords: Bioink, Bioprinting, Hydrogels, Cell Aggregates, Microcarriers, Decellularized Matrix Components, Tissue and Organ Biofabrication

1. Introduction

Abbreviations:

EBB: Extrusion-based bioprinting

DBB: Droplet-based bioprinting

LBB: Laser-based bioprinting

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