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3D Bioprinting for artificial skin development

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Skin is composed of multiple layers and is made of various types of cells. However, it is susceptible to damage, such as severe burns, injuries and other defects. 3D bioprinting is an innovative approach for the reconstruction of burned skin involving layer-by-layer deposition of cells using a scaffold material over the damaged area. It is a computer-aided manufacturing measure that accumulates living cells together with hydrogel-based scaffolds to facilitate the construction of complex tissues. The main function of 3D bioprinting is to create functional tissues/organs that can be made available for transplantation. The 3D printing process can be performed through different techniques, e.g. in situ, in vivo techniques, etc. Bioprinting allows accurate installation of cell types as well as precise and replicable fabrication of constructs to replace the injured or damaged sites. The bioprinting process involves creating a digital tissue model using 3D modelling software such as CAD (computer-aided design) or CAM (computer-aided manufacturing). Another concept of 3D printing is bio-ink which is prepared by combining living cells with compatible bases like collagen or hydrogel. Bio-ink provides a delivery medium for cells along with scaffolding for growth and nourishment. The tissue is printed using a bioprinter and as deposition takes place, the process of blending and solidification of tissue occurs with the aid of UV lights or heat. Therefore, 3D bioprinting is an effective, accurate and flexible technique for the regeneration and creation of complex organs and tissues such as skin.

Keywords: 3D printing, Hydrogel, Tissue reconstruction, Bioink, 3D modelling

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