



FABRICATION OF HALAL GELATIN SPONGE FOR FUTURE USE AS BIOACTIVE SKIN TEMPLATE

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SUMMARY

Current challenge of natural biomaterial post-transplantation is faster degradation especially gelatin, in order to mimic the extracellular matrix (ECM) organization of native skin. Thus, the exploration in controlled-degradation of smart biomaterial in current technology is a precedence via intervention of various crosslinking agents. In this study, a high grade of halal gelatin (IFANCA certified) produced from buffalo bones has been used to fabricate three-dimensional (3D) bioscaffolds and its biocompatibility towards the primary skin cells. Briefly, gelatin solution was poured into the desired mould and pre-frozen at -30 °C and -80 °C for 3 hours followed by the freeze-drying. Gelatin sponge (GS) was chemically post-crosslinked with genipin (GP; natural), carbodiimide (EDC; synthetic) and double-crosslinked of both (GPEDC), and also physically crosslinked by dehydrothermal (DHT) at 140 °C for 48 hours. Its physico-chemical properties, mechanical strength and biocompatibility were evaluated. Physico-chemical changes in the gelatin was assessed using spectroscopic methods (XRD, EDX and FTIR analysis). The crosslinking degree was evaluated by quantification of amino acids via ninhydrin assay. The selected fabricated bioscaffolds with appropriate physio-chemical properties were further evaluated for the cellular compatibility via MTT assay, fluorescence staining and scanning electron microscopy (SEM). The results showed majority of crosslinked sponge scaffold have uniform porous structure with pore size range between 100 and 200 μm, high water uptake capacity (>1000%), and the degradation range in between 57.2 and 86.9%. The gelatin sponge crosslinked with GP and GPEDC showed lesser toxic effect towards skin cells compared to the EDC-crosslinked gelatin sponge where the cells demonstrated apoptotic morphological features. The EDC and DHT crosslinked gelatin sponge showed lower cell proliferations as compared to the other groups. In conclusion, the GP and GPEDC crosslinked gelatin sponge have better potential as bioactive skin template for future use in skin tissue engineering.