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Gentamycin loaded halloysite nanotube reinforced polycaprolactone electro-spun nano fibrous scaffold for tissue engineering applications

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Background: Polymer based skin scaffold is an effective tissue engineered material for wound dressing. Electrospinning is a novel technique which is used to fabricate artificial scaffolds. Incorporating antibiotic into scaffold is an added advantage as it prevents microbial contamination.

Objective: To fabricate gentamicin loaded Halloysite Nanotube (HNT) incorporated polymer based electro-spun skin scaffold for burn wounds.

Method: Gentamicin was loaded into HNT (G-HNT) by vacuum evacuation and entrapment efficiency was determined by UV-VIS spectroscopy. G-HNT was mixed with polycaprolactone polymer solution in different ratios (G-HNT 2.5, 5 and 7.5% w/v) and electrospin technique was employed to obtain fibrous mat. The produced scaffolds were characterized by optical microscope and FTIR to analyze the morphological characteristics and physical interactions respectively. In-vitro release kinetics of final scaffolds were determined by UV-VIS spectroscopy. Water absorption capacity and antibacterial activity of synthesized scaffolds were evaluated against *E. coli, P. aeruginosa, B. subtilis* and *S. aureus*. The cytotoxicity, live and dead cell assays of the final scaffold were performed with human-embryonic kidney cells and Chinese-hamster ovary cells respectively.

Results: The presence of the G-HNT into to the scaffold was revealed by FTIR studies. Entrapment efficiency of gentamicin was 34±4%. Water absorption capacity showed G-HNT-PCL scaffold has ability to absorb exudate by thirteen folds of its initial weight. The G-HNT-PCL scaffolds scaffold showed promising antibacterial activity against both Gram-negative and Gram- positive bacteria tested. A burst release up to 35% within first 20 minutes and then sustained release up to 80% within 24 hours were examined. The cytotoxicity, live and dead cell assays concluded that the scaffolds are non-toxic, biocompatible and enhance cell adhesion and cell division.

Conclusion: Promising antibacterial action, biocompatibility and sustained release were achieved from these fabricated scaffolds which absorbed high amounts of exudate. It can be used as an effective tissue engineered artificial extracellular matrix for wounds.

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