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In vitro evaluation of crosslinked polyvinyl alcohol/chitosan - gentamicin sulfate electrospun nanofibers
(2021) *Malaysian Journal of Chemistry*, 23 (2), pp. 1-10.

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Abstract
Polymeric nanofibers with good antimicrobial properties are a promising option to thwart wound infection and accelerate wound healing. Although PVA/Chitosan possesses many useful properties, its antibacterial activity is insufficient for effective wound dressing. Therefore, using a hydrophilic drug such as Gentamicin Sulfate (GS) that has a broad-spectrum activity against a wide range of bacteria can enhance the nanofibers' performance. In this study, polyvinyl alcohol (PVA) with chitosan nanofibers loaded with gentamicin sulfate was prepared using an electrospinning technique and crosslinked with glutaraldehyde for better loading efficiency and controlled drug release at the site of interest. Morphological investigation carried out using scanning electron microscopy showed smooth and homogeneous nanofibers. FT-IR was used to confirm the structure of the nanofibers. In situ crosslinking enabled penetration of the crosslinking agent into the nanofibers and improved the thermal stability and drug release performance. The thermal stability of PVA/Chitosan nanofibers was reduced with the addition of gentamicin sulfate. The kinetic release of gentamicin sulfate followed the Korsmeyer-Peppas model with release exponent, n < 0.5. Antibacterial testing of crosslinked nanofibers against Escherichia coli and Staphylococcus aureus showed good inhibition of bacterial growth. Crosslinked PVA/Chitosan nanofibers loaded with gentamicin sulfate showed multifunctional characteristics and thus may be a suitable material for controlled drug delivery and tissue engineering applications.

Author Keywords
Chitosan; Controlled release; Nanofibers; Polyvinyl alcohol

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Publisher: Malaysian Institute of Chemistry

ISSN: 15112292
Language of Original Document: English
Abbreviated Source Title: Malays. J. Chem.
2-s2.0-85110105254
Document Type: Article
Publication Stage: Final
Source: Scopus