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Sustainable seaweed derived antibacterial nanofibrous patches for chronic wounds

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Natural polymer derived nanofibrous wound dressings have gained much attention because of their biodegradability, high surface area, bioactivity and resemblance to the extracellular matrix. Agarose, a natural polymer from red seaweed, has been used in hydrogel form for angiogenesis, cartilage formation and wound healing applications. However, due to the difficulties in electrospinning agarose, only limited studies have been attempted on fabricating agarose-based non-woven wound dressings. Thus, the present study deals with the fabrication of agarose/polyvinyl alcohol based multifunctional nanofibrous patches. Additionally, zinc citrate was used as a potential antibacterial agent to overcome wound infections. The fabricated dressings exhibit ~400-550% swelling (in phosphate buffer saline) and enhanced mechanical strength (~9 MPa) intended suitable for most wound healing applications. The fabricated dressings maintained the structural integrity for the intended period (~3 days) of application and ~18% degradation was observed after two weeks due to their biodegradable nature. *In vitro* studies depicted an increased migration and proliferation of L929 mouse fibroblasts with agarose-based samples. The

fabricated dressings displayed antibacterial activity against *Staphylococcus aureus* (Gram-positive) and *Escherichia coli* (Gram-negative) bacterial strains. Hence, multifunctional and natural product-based sustainable (in terms of cost and biodegradability) patches were successfully fabricated as a substitute for potential wound dressing material.

Recent Publications

1. Latiyan S, Kumar TSS, Doble M. Fabrication and evaluation of multifunctional agarose based electrospun scaffolds for cutaneous wound repairs. *Journal of Tissue Engineering and Regenerative Medicine*. 2022 Jul;16(7):653-664.

Biography

Sachin Latiyan is a doctoral candidate in the metallurgical and materials engineering department at the Indian Institute of Technology Madras, India. He pursued M.Tech in materials science and engineering in addition to M.Sc. in organic chemistry. Presently, he is pursuing a Ph.D. in biomaterials under the expert supervision of Prof. T.S. Sampath Kumar and Prof. Mukesh Doble.

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