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Chitosan/Bioactive Glass Composite Foams: An Investigation into Fluid Handling Capabilities for Enhanced Wound Dressing Solutions

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Biocomposite foams can be used as wound dressings; however, to achieve rapid and full healing while avoiding dermatoproliferative diseases and secondary infections, wound dressings must include regulated wound exudate adsorption, handling, and vaporization. In this study, we conducted a comprehensive assessment of the fluid handling capacity, water vapor transmission, and cell cytotoxicity associated with newly developed, highly porous chitosan/bioactive glass composite foams. Employing an accessible and rapid approach fabrication method, these foams exhibited remarkable features, boasting up to 59.7% porosity and an interconnected porous network. Furthermore, the investigation revealed no cytotoxic effects on L-929 mammalian fibroblast cells, affirming the biocompatibility of the fabricated foams. A notable fluid-absorption capability of up to 160%, with improved efficiency noted in samples characterized by increased levels of bioactive glass.. Furthermore, were conducted a thorough assessment of dressing absorbency and permeability through fluid handling capacity analysis. The results indicate that the developed dressings present the capability to efficiently absorb and transfer moisture from wounds, particularly those associated with burns and bedsores. This underscores their potential utility in addressing diverse clinical scenarios. The water vapor transmission assay also confirmed that the composite foams could be applied on wounds with a high rate of exudate elimination. Results suggest that chitosan/bioactive glass chitosan are promising candidates for application as wound dressings.