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Thermophilic Exopolysaccharide-derived Films for Topical Drug Delivery

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Microbial exopolysaccharides (EPSs) exhibit diverse functionalities and offer a variety of structural options that can be altered to fit a specific purpose. Recent decades have seen the utilization of EPSs as a potential option to assist in the field of drug delivery. Commonly used synthetic polymers have been related to issues regarding toxicity, immunogenicity, unwanted polymer-drug interactions, drug loading, and harmful degradation products, escalating the need for an alternative. More so, purification is a common and vital procedure that adds to the cost of development. Microbial exopolysaccharides (EPSs) have been noted to degrade within the body via natural biological processes, are known to be non-cytotoxic, and most are inherently antimicrobial. EPSs can degrade within the body by natural biological processes, and polysaccharides are regarded as generally safe. More so, microbial EPS is replicable from several known, inexpensive, and plentiful sources, along with their unique rheological properties that allow for continuous production regardless of negative environmental influences. This preliminary investigation explores the capabilities of 5% wt/wt drug-loaded films constructed from the crude EPS extracted from the strain Geobacillus sp. WSUCF1. Human keratinocytes and human skin-tissue fibroblasts maintained, on average, above 93% cell viability over 72-hours when exposed to the amikacin-loaded film. The drug release profile of both whole films revealed a steady release of the drug up to 12 hours. The amikacin eluted by the EPS film was seen to be active against Staphylococcus aureus, maintaining above a 91% growth inhibition over a period of 48 hours. Overall, this study demonstrates the potential of a 5% drug-loaded EPS film as a viable option for topical delivery.

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