Multifunctional Topical Gel Platform Based on *Lacticaseibacillus casei*–Derived Paraprobiotics in Chitosan or Carbopol Gels: A Pharmabiotic Approach

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Topical drug delivery systems for compromised skin require biocompatible carriers capable of providing both protective and functional benefits [1]. In this study, a cell-free paraprobiotic solution derived from *Lacticaseibacillus casei* fermentation was incorporated into polymeric gel systems as a novel dermal delivery approach. The paraprobiotic solution was produced by controlled fermentation followed by filtration and sterilization to eliminate viable bacterial cells. In vitro evaluation demonstrated measurable antimicrobial activity against selected microorganisms (inhibition zone: 2.4±0.4 – 8.6±0.3 mm; MIC: 40000–10000 µg/mL) together with notable antibiofilm capacity (51.94-42.35% at 10000 µg/mL) [2]. Based on these findings, an optimized dose was incorporated into gel formulations prepared using chitosan- or carbopol-based carriers, providing bioadhesion, film-forming capacity, and formulation stability. Both formulations exhibited skin-compatible pH values and acceptable physicochemical properties after paraprobiotic loading, with no visible instability during preliminary evaluation [3]. Overall, these findings demonstrate the feasibility of incorporating *L. casei*–derived paraprobiotics into polymeric gel systems and highlight their potential as multifunctional topical drug delivery platforms. Further pharmaceutical characterization and advanced in vitro skin-related studies are ongoing to confirm the performance of the developed systems. This study was supported by Anadolu University Scientific Research Projects Commission (Grant No: YTT-2024-2606).

Keywords: Paraprobiotic, *Lacticaseibacillus casei*, Antimicrobial activity, Antibiofilm activity, Topical drug delivery, Polymeric carriers.

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CERTIFICATE OF ATTENDANCE

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