ECMC 2023

MDPI

Abstract

Biopolymeric Hydrogels as Transdermal Delivery Systems†

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† 9th International Electronic Conference on Medicinal Chemistry, online, 01-30 November 2023

Abstract: Biopolymeric hydrogels have gained significant recognition as versatile transdermal delivery systems in recent years. These hydrophilic three-dimensional networks, composed of natural polymers like chitosan, alginate, and hyaluronic acid, offer an innovative approach to enhance the percutaneous absorption of therapeutic agents. This abstract delves into the multifaceted role of biopolymeric hydrogels in transdermal drug delivery, discussing their formulation strategies, properties, and diverse applications. One of the primary advantages of biopolymeric hydrogels is their ability to maintain a moist environment on the skin's surface, promoting efficient drug permeation while minimizing skin irritation. Their tunable physicochemical properties allow for controlled drug release, ensuring prolonged therapeutic effects and reduced dosing frequency. Moreover, these hydrogels can be tailored to encapsulate a wide range of drugs, including hydrophobic and hydrophilic compounds, proteins, and peptides. This abstract also addresses the challenges associated with biopolymeric hydrogel-based transdermal delivery, such as optimizing drug release kinetics and ensuring long-term stability. However, their potential to revolutionize transdermal drug administration, particularly for chronic conditions, makes biopolymeric hydrogels a compelling area of research in pharmaceutical and biomedical sciences. In the present study, polymeric materials based on polyvinylpyrrolidone containing protein carriers were obtained. For this purpose, a photopolymerization process was used using poly(ethylene glycol) diacrylate as a crosslinking agent and 2-methyl-2-hydroxypropiophenone as a polymerization initiator, respectively. The obtained systems were then subjected to physicochemical analysis. Significant sorption capacities of the obtained systems were proved (sorption coefficient of about 3 g/g). Subsequently, surface analysis confirmed the obtaining of a material with a well-developed structure and high homogeneity. In addition, it was proven that the hydrogel systems show 14-day stability in fluids simulating the environment of the human body, without any degradation processes.

Keywords: hydrogels; transdermal systems; drug release

Citation: Lastname, F.; Lastname, F.; Lastname, F. Title. *Med. Sci. Forum* **2023**, *2*, x. https://doi.org/10.3390/xxxxx

Academic Editor: Firstname Lastname

Published: date

Supplementary Materials: poster_sciforum-081462

Author Contributions: Conceptualization, K.S. and B.T.; methodology, K.S., M.B.; software, B.T. validation, K.S., M.B.; formal analysis, K.S., M.B., W.B.; investigation, K.S., M.B., W.B..; resources, B.T.; data curation, K.S. and M.B.; writing—original draft preparation, K.S., M.B., and W.B.; writing—review and editing, K.S., M.B., and W.B.; visualization, K.S.; supervision, B.T.; project administration, B.T.; funding acquisition, B.T. All authors have read and agreed to the published version of the manuscript.

Funding: This research was carried out within the SMART-MAT Functional Materials Science Club of the Faculty of Materials Engineering and Physics of Cracow University of Technology as part of the 3rd edition of the program "Student research clubs create innovation" through the project titled „Transdermal systems in targeted therapy of skin cancer" financed by the Ministry of Science and Higher Education (grant no: SKN 157/568410/2023).

Institutional Review Board Statement: Not applicable

Informed Consent Statement: Not applicable

Data Availability Statement: Data sharing is not applicable for this article.

Acknowledgments: This research was carried out within the SMART-MAT Functional Materials Science Club of the Faculty of Materials Engineering and Physics of Cracow University of Technology as part of the 3rd edition of the program "Student research clubs create innovation" through the project titled „Transdermal systems in targeted therapy of skin cancer" financed by the Ministry of Science and Higher Education (grant no: SKN 157/568410/2023).

Conflicts of Interest: The authors declare no conflict of interest