Photopolymerization as a Method for Synthesis Hydrogel-Based Transdermal Systems

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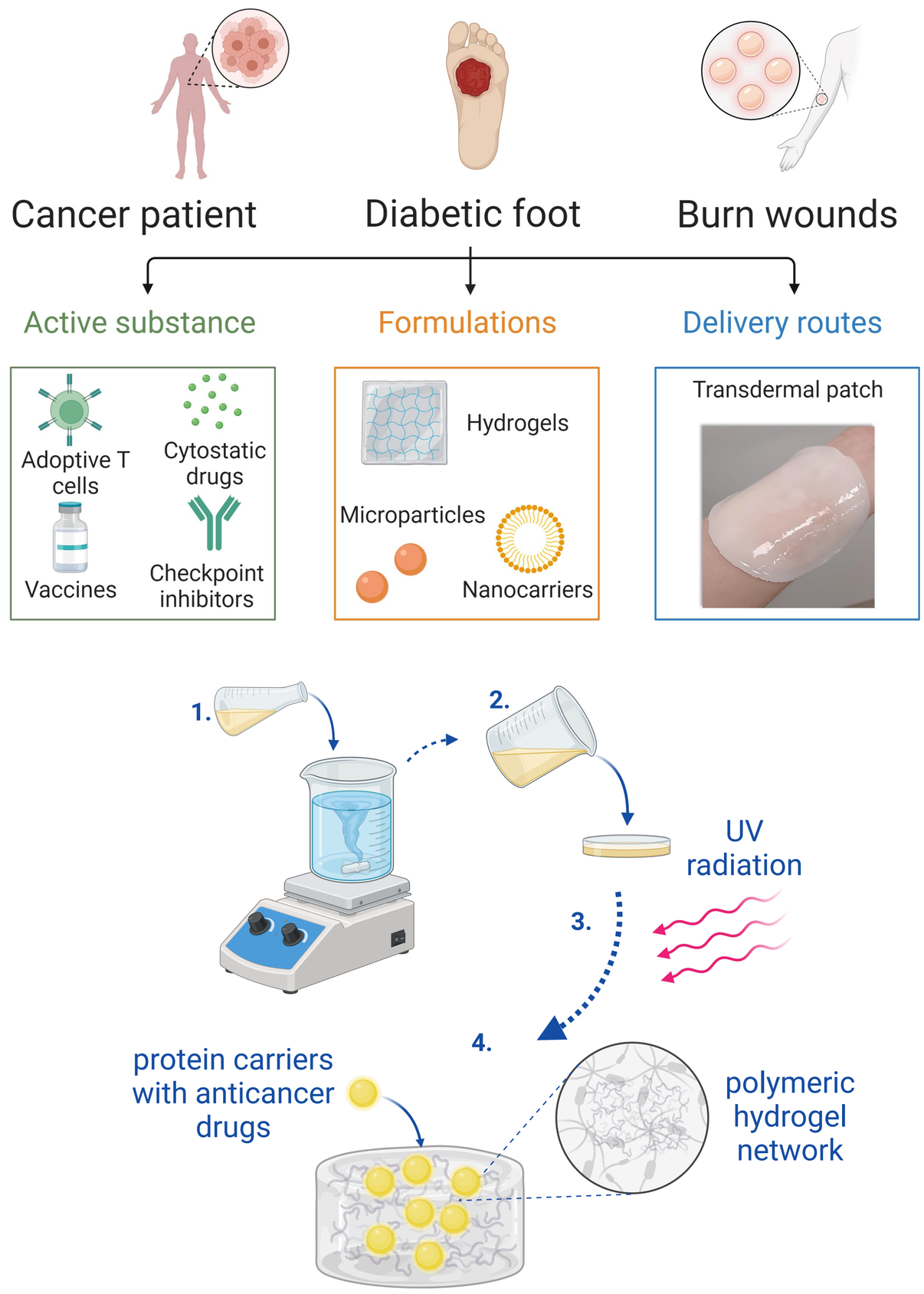
INTRODUCTION

Photopolymerisation has emerged as an effective technique for designing transdermal hydrogel-based drug delivery systems. This innovative method uses light-induced chemical reactions to create cross-linked hydrogel networks, offering precise control over drug release and improved therapeutic outcomes. The aim of the project was to investigate the role of photopolymerisation in the formation of transdermal hydrogel systems, discussing its principles, advantages and various applications. One of the main advantages of photopolymerisation is its ability to rapidly gel on demand. This facilitates the incorporation of a wide range of therapeutic agents, including hydrophobic drugs and biologics, into the hydrogel matrix. Additionally, the spatial-temporal control provided by photopolymerisation enables the creation of gradient drug release profiles, optimising drug penetration through the skin. Moreover, photopolymerization is a very fast process. Within seconds or minutes, materials can undergo curing, leading to significantly shorter production times compared to other methods. The potential of photopolymerisation to revolutionise the field of transdermal drug delivery, by providing precise dosage control and minimising skin irritation, makes this an exciting area of research in pharmaceutical sciences and biomaterials.

MATERIALS AND METHODS

In this study, the photopolymerization method was used to determine the effect of different types and amounts of crosslinking agents on the properties of the obtained hydrogel materials. In addition, the crosslinking agent poly(ethylene glycol) diacrylate was used. Then the obtained systems were characterized by determining their physicochemical and strength properties. The chemical structure was determined using FTIR, then the sorption properties of these materials were also determined. In addition, surface morphology and structure were identified using microscopic techniques.

RESULTS



SUMMARY

Photopolymerization is an effective and precise method to obtain hydrogel biomaterials. The process uses light at the appropriate wavelength to activate photoinitiators, resulting in a rapid polymerization reaction, leading to the formation of a three-dimensional polymer network in biomaterials. By controlling the timing and intensity of the light, photopolymerization makes it possible to fine-tune the structure and properties of the material, such as flexibility and hydrophilicity, which is extremely important in the context of biomedical applications such as drug carriers, implants or artificial tissues.

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