medical sciences forum

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Abstract

Cyclodextrin-Based Cryogels for Controlled Drug Delivery †

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† Presented at the 8th International Electronic Conference on Medicinal Chemistry, 1–30 November 2022; Available online: https://ecmc2022.sciforum.net/.

Keywords: cyclodextrin; cryogel; drug delivery; wound healing; sponge

Cryogels are macroporous hydrogels prepared by cryo-gelation: a green technique that involves radical polymerization using water as a solvent. This method generates an interconnected pore structure that confers to material sponge-like properties. For this peculiarity, cryogels can be used as drug delivery platforms [1].

Due to their hydrophobic cavity, allowing the non-covalent host-guest inclusion complexation with many hydrophobic molecules, cyclodextrins are well-known and FDA-approved drug delivery carriers [2].

In this context, we report the preparation of original super-macroporous cryogels starting from HEMA (2-hydroxyethyl methacrylate) and acrylic or styrylic functionalized α, β, or γ-cyclodextrin [3]. The macroporous structure cryogels were synthesized by free-radical polymerization in a frozen aqueous system, then purified and dried. All the materials have been extensively characterized by IR, scanning electron microscopy, and thermal gravimetry.

The carriers were successfully tested for the controlled release of antibiotics, anti-inflammatory, and antifungal drugs in the skin for wound healing. For this purpose, the cryogels were loaded with lomefloxacin, piroxicam, and fluconazole drugs. The release of the drugs was efficiently performed in the saline buffer (pH = 7.4) and acidic solution (pH = 3), and the biocompatibility of the newly synthesized sponges was assessed over human fibroblasts. The system has several advantages: it is low cost, environmentally friendly, and has high stability and great versatility since it can be applied to several drugs.

Supplementary Materials: The presentation material of this work is available online at https://www.mdpi.com/article/10.3390/ECMC2022-13449/s1.

Author Contributions: Conceptualization, C.Z., A.R. and S.C.; methodology, A.C., C.Z., T.M., V.P.; validation, C.Z., G.F., A.C., G.C.; formal analysis, T.M., V.P.; K.M., G.C.; investigation, C.Z., A.C., T.M., G.F., V.P.; re-sources, S.C.; data curation, A.C., C.Z., A.R., G.F., K.M., G.C.; writing—original draft prepara-tion, C.Z., T.M., S.C.; writing—review and editing, C.Z., A.C., S.C., T.M., G.F., V.P., A.R.; su-pervision, C.Z., T.M., A.R., S.C.; project administration, A.R., S.C.; funding acquisition, S.C. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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Citation: Zagni, C.; Coco, A.; Patamia, V.; Floresta, G.; Curcuruto, G.; Mangano, K.; Mecca, T.; Rescifina, A.; Carroccio, S. Cyclodextrin-Based Cryogels for Controlled Drug Delivery. *Med. Sci. Forum* **2022**, *14*, 150. https://doi.org/10.3390/ECMC2022-13449

Academic Editor: Maria Emília Sousa

Published: 1 November 2022

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