COMPARATIVE STUDY OF THE SWELLING BEHAVIOR OF POLYMER PATCHES BASED ON GELLAN GUM AND AGAR-AGAR

Kuldanova A.A.
Akhelova A.L.
Asfendiyarov Kazakh National Medical University,
Almaty, Republic of Kazakhstan
e-mail: kuldanova03@mail.ru, tel. +7 775 519 2003
https://doi.org/10.5281/zenodo.17328551

Relevance: In recent years, natural polysaccharides have been extensively studied as promising components for the development of dosage forms with controlled release. Gellan gum, derived from *Sphingomonas elodea* bacteria, and agar-agar, extracted from red algae, are characterized by a high ability to form gels and stable three-dimensional structures. These properties make them attractive for use in biocompatible materials intended for drug delivery. The incorporation of chitosan enhances biocompatibility and adhesive properties, while glutaraldehyde ensures chemical cross-linking and increases the mechanical strength of the obtained patches. Thus, the investigation of polymer compositions based on gellan and agar modified with chitosan and glutaraldehyde is of interest for the development of new materials with prolonged therapeutic action.

Purpose of the Research: To investigate the swelling behavior of polymer patches based on gellan gum and agar-agar, modified with chitosan and glutaraldehyde.

Materials and methods: To obtain film samples, two natural polysaccharides — gellan gum and agar-agar — were used. Polymer solutions were prepared in distilled water by heating until complete dissolution of the components, followed by cooling and casting on a flat surface. Samples of standard mass were immersed in distilled water and, at predetermined time intervals, were weighed after removal of surface moisture with filter paper. The swelling degree was calculated as the ratio of the mass increase of the sample to its initial mass.

Results: Gellan-based samples (G1, G2) exhibited rapid swelling during the first 40 minutes but showed reduced stability under prolonged water exposure. Agar-based samples (A3, A4), in contrast, demonstrated uniform water absorption and high stability against hydration.

Conclusions: The obtained results confirm that the nature of the initial polysaccharide and the degree of chemical modification significantly influence the swelling behavior and stability of polymer patches. Further research will focus on incorporating medicinal extracts into the patch structure and investigating their release kinetics, which will allow assessing the potential of the developed systems as carriers for controlled delivery of biologically active substances.