STUDIES ON THE ENCAPSULATION OF MODEL ACTIVE SUBSTANCE USING THERMOSENSITIVE POLYMERIC NANOCARRIERS

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Introduction
Currently, polymers are very important in human life, from everyday use to technologically advanced plastics. Stimuli-sensitive polymers are applied as intelligent systems for different purposes, namely thermosensitive polymers are notably widely used in biomedicine and pharmacy as drug delivery systems. The controlled release allows to deliver a drug to a specific location of the disease, reduce doses and side effects, shorten the time intervals when taking a drug (e.g. once a day), better protect the active substance and, as a result, increase the pharmaceutical and biological availability. Moreover, thermosensitive polymers are particularly interesting, because temperature changes can be applied there in a non-invasive way. An aqueous thermosensitive polymer solution exhibits reversible sol-gel transitions near the body temperature, which regulate the release rate of the introduced drug along with maintaining its physical-chemical stability and biological activity [1-5].

Materials and Methods
The carriers based on N-isopropylacrylamide were prepared by one-stage emulsion polymerization. The initial synthesis was the reaction of N-isopropylacrylamide with N, N'-methylenebisacrylamide in distilled water. After that, the chemical structure of the obtained polymeric particles was confirmed using FT-IR spectroscopy and the conversion was analyzed using UV-Vis spectroscopy. The average particle size of the thermosensitive carriers was determined based on the analysis of DLS results. Finally, the encapsulation of the model active substance – salicylic acid, was carried out. The salicylic acid belongs to nonsteroidal anti-inflammatory drugs with antiseptic and analgesic properties. In the next stage, the encapsulation efficiency was assessed and the average particle size of the carrier – drug system was analyzed. Additionally, SEM images of thermosensitive polymeric carriers before and after encapsulation were presented, and the chemical structure was compared on the basis of FT-IR spectra.

Results and Discussion
On the basis of the obtained DLS histograms we can conclude that the particle size of the carrier-drug system increased, but only slightly (in the range of 300-400 nm), compared to the polymer carrier - 118 nm, which was difficult to gain. The results regarding the encapsulation efficiency exhibited that the higher efficiency (about 45%) was obtained for samples prepared by sonication and using a lower concentration of salicylic acid.

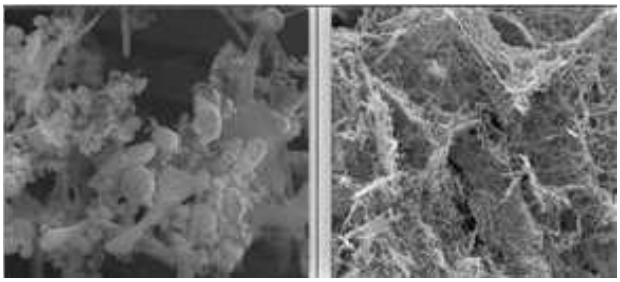

FIG. 1. SEM images of thermosensitive polymeric carriers before and after encapsulation.

Conclusions
The main goal of the research was the development of an effective method of the encapsulation of the model drug using thermosensitive polymer carrier. The conditions of encapsulation were selected and its efficiency was determined, which allowed to assess the percentage of the introduced salicylic acid. In addition, various studies were carried out using the following research techniques: SEM, DLS, UV-Vis and FT-IR, which allowed to analyze both the carrier and the carrier-drug system.

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