BIODEGRADATION AND ANTIMICROBIAL ACTIVITY OF GUANIDINE-CONTAINING POLYETHYLENE OXIDE HYDROGEL

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Biodegradation of various materials in the environment is important because many synthetic materials are stable for a long time. At the end of the service life, the materials must be involved in the natural cycle and decompose. In modern polymer chemistry, one of the promising areas is to obtain and study the properties of hydrogel systems, among which a significant place is occupied by polyethylene oxide hydrogels. The aim of the study was to determine the biodegradation of guanidine-containing polyethylene oxide hydrogel under the action of bacteria and to study its antimicrobial properties.

The antimicrobial activity of a guanidine-containing oligomer and its newly synthesized polyethylene oxide hydrogel was studied by a disco-diffusion method. The enzymatic activities of bacteria were determined by spectrophotometry. To study the resistance of guanidine-containing polyethylene oxide hydrogel to microbial destruction, bacteria were grown in Tauson's liquid medium with the addition of meat peptone broth at a temperature of 28±2 °C. Changes in the chemical composition of the studied materials were analyzed by infrared Fourier spectroscopy of the Tensor 37 (Bruker) and 1H NMR spectroscopy.

The antimicrobial properties and biodegradation of guanidine-containing polyethylene oxide hydrogels were determined, which were obtained by reacting oligoxyethylene glycol MW 6000 with toluene diisocyanate and guanidine-containing oligomer, which acted as a crosslinking, ion-containing and antibacterial-agent. The synthesized hydrogel showed antimicrobial activity against gram-positive and gram-negative bacteria. The biodegradation of hydrogels under the action of various bacterial strains and enzymes that they synthesize was studied. The presence of the tested materials lead to a decrease in the enzymatic activity of bacteria in 1.4 – 2.5 times compared with the control. Synthesized guanidine-containing polyethylene oxide hydrogel showed antimicrobial activity against the studied test cultures. The introduction of the studied materials into Tauson's environment as additional sources of carbon and energy helped to reduce the catalase and lipase activities of hydrocarbon-oxidizing bacteria. Under the influence of the studied bacteria, the hydrogels were destroyed with 88.4% from the initial value.
**Key words:** Guanidine-containing polyethylene oxide hydrogel, antibacterial properties, gram-positive and gram-negative bacteria, catalase and lipase activities, biodegradation, IR spectra.

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