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Biosynthesis of Polyhydroxybutyrate and its Copolymers and Their Use in Controlled Drug Release

Füsun TÜRESİN
Zeynep GÜMÜŞYAZICI
Fatma N. KÖK
İhsan GÜRSEL
N. Gürdal ALAADDİNOĞLU
Vasıf HASIRCI
Middle East Technical University, Department of Biological Sciences, Biotechnology Research Unit, 06531 Ankara - TURKEY

Keywords
Authors

medsci@tubitak.gov.tr

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Abstract: Our aim was to prepare antibiotic loaded rods with biotechnologically produced biodegradable polymers and use them in the treatment of osteomyelitis by providing a high local dose of antibiotic at the infected site. For that purpose, first the production of PHB and its copolymers (P(3HB- co-3HV) and P(3HB- co-4HB)) by Alcaligenes latus and Alcaligenes eutrophusin the shake-flask cultures and in a fed-batch fermenter and their purification and characterization were performed. The polymers were then used in the preparation of the sulbactam-cefoperazone loaded rods. To predict the in vivo behavior of the controlled release system, the in vitro release kinetics of the rods were studied in PBS at 37¡C. Release from 50 % w/w loaded P(3HB- co-3HV) and P(3HB- co-4HB) rods showed that the drug was completely released in less than 3 days. To retard the rate, dip coatings of these rods using the same polymer solution were done and the release profiles were obtained. After coating, cumulative release was about 70 % of its initial content at the end of 12 days. It was concluded that PHB and its copolymers may be a promising alternative to the materials of petrochemical origin in the treatment of osteomyelitis, due to being biodegradable, and eliminating the need for a second operation.

Key Words: polyhydroxyalkanoates, Alcaligenes latus, Alcaligenes eutrophus, osteomyelitis, controlled drug delivery

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