Alejandra Rodriguez-Contreras et al., J Bioproces Biotechniq 2016, 6:7(Suppl)
http://dx.doi.org/10.4172/2155-9821.C1.010

Antibacterial biopolymer coatings for titanium implants

Alejandra Rodriguez-Contreras[1], José María Manero[2], Elisa Ruperez[2], María Soledad Marqués-Calvo[3]
[1]Université de Montréal, Canada.
[2]Universitat Politècnica de Catalunya-Barcelona TECH, Spain
[3]Universitat Politècnica de Catalunya-Barcelona TECH, Spain

Biomaterial-associated infection is a serious complication of modern implantation surgery. Bacterial adhesion to biomaterials and the presence of biofilms are the main causes to the pathogenesis of implant-associated infections. Therefore, the improvement of implant surfaces is required to avoid the first stage for biofilm formation, bacterial adhesion. The current research addresses this issue by developing drug delivery systems (DDS) consisting on antibiotic-loaded polyhydroxyalkanoates (PHAs) coatings on titanium (Ti) implants. Dip-coating technique was used to achieve optimal coatings with the biodegradable biopolyesters, polyhydroxybutyrate (PHB) and its copolymer, polyhydroxybutyrate-co-hydroxyvalerate (PHBV), testing relevant factors such as drug concentrations and number of immersions. The characterization of the generated coatings was carried out by analysing their wettability-contact angle, topography, thickness and roughness. Studies of drug delivery, toxicity, antibacterial effect, and cell adhesion were also performed. For both biopolymers, results show partially covered surfaces with 1 and 3 dip-coatings, and completely covered ones with 6, showing porous topographies (∅≅50 μm). From both biopolymer coatings, the antibiotic gentamicin is released above the minimum inhibitory concentration-MIC without cell toxicity for more than two weeks. Although both biopolymer coatings assure the protection against bacteria populations (bacterial growth inhibition with 1, 3 and 6 dip-coatings), it is considered that the coatings made with PHBV are closer to the desired release profile; a faster degradation of PHBV provides higher and more constant concentrations of drug released in the period of time desired compared to the PHB coatings. The use of coatings with different drug concentration per layers results in more controlled and homogeneous releases. The DDS designed not only assure avoid the first stage of bacterial adhesion and the biofilm formation, but also their proliferation, since the biopolymer coatings with antibiotic degrade with time under physiological conditions, guaranteeing a controlled drug release.

Biography

Alejandra Rodriguez-Contreras has completed his Ph.D. degree in Polymers and Biopolymers from Technical University of Catalonia-Barcelona Tech in June 2013. After specialise in electron microscopy, she is currently a postdoctoral fellow at the University of Montreal, in the Laboratory for the Study of Calcified Tissues & Biomaterials. She has published several papers in leading international journals on biotechnology, microbiology and biomaterials.

sandra8855@hotmail.com

Notes: