APPLIED NANOTECHNOLOGY IN PERIPROSTHETIC INFECTIONS IN ORTHOPAEDICS

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Abstract

The aim of this dissertation is to review coating types that use nanotechnology to inhibit infection and allow faster osteointegration of total joint arthroplasties. Number total joint arthroplasties are constantly increasing over the years due to the increase of the general population life expectancy. However, as the number of implants increases, the number of revisions due to implant failure because of loosening or infection. Periprosthetic joint infection (PJI) and biofilm formation by resistant bacteria such as Staphylococcus aureus or Staphylococcus epidermidis is a common cause of failure. To inhibit biofilm formation and increase implant osteointegration, nanotechnology applications improve the surface coating of the implants in order to make them more biocompatible. There are mainly three coating types with different beneficial properties each. Passive coating helps faster osteointegration, active coating helps biofilm formation inhibition, and intraoperative hydrogel use is an anti-bacterial attachment for a short period of time. To perform these coatings, laboratory techniques were used with high technology machines to form the implant surface in nanoscale. Forming an implant surface or coating it with nanoparticles is intended to make the implant more biocompatible and increase the implant's life expectancy within the human body. The aim of this dissertation is to review the current nanotechnology applications in vivo, in vitro or in situ regarding total arthroplasty implants, as well as the future perspectives that occur from these experimental applications.