Ceren Peksen et al., Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C1-014



## *In Vivo* behaviour of $Ag^+$ ion doped calcium phosphate based ceramic powder coating on $Ti_6Al_4V$ implants

**Ceren Peksen[1], Remzi Caylak[2], Nusret Kose[3]** and **Aydin Dogan[4]**
[1]Ondokuz Mayis University, Turkiye
[2]Private Ortopedia Hospital, Turkiye
[3]Osmangazi University, Turkiye
[4]Anadolu University, Turkiye

Long-term survival and favorable outcome of orthopaedic implant use are determined by bone-implant osseointegration and absence of infection near the implants. To enhance resistance to colonization, implant materials may be modified with antimicrobial coatings. The mechanism of the antimicrobial action of silver ions is closely related to their interaction with thiol groups. In this study, $Ag^+$ ion doped calcium phosphate based ceramic nanopowder coated $Ti_6AlV$ implants were evaluated to prevent implant-related infection by comparing hydroxyapatite (HA) coated and uncoated titanium implants in vivo. $Ag^+$ ion doped calcium phosphate based nano-powder were deposited on $Ti_6Al_4V$ implants by using elestrospray deposition technique. Electrospray coated samples were sintered under high vacuum by RF (radio frequency). After sintering process surface morphologies of implants were observed with scanning electron microscope. Prior to surgery, rabbits were randomised to receive either coated implants or uncoated implants. First group of the implants were coated with $Ag^+$ ion doped nano size calcium phosphate based ceramic powder. Second group of the implants were coated with hydroxyapatite(HA), and the remaining implants (Group 3) were used without any coating. Implants were inserted left femurs of animals from knee regions with retrograde fashion. Before implantation of implants 50 µl solution containing $10^6$ CFU/ml methicillin reistance *Staphylococcus aureus* (MRSA) injected intramedullary canal. Rabbits were monitored for 10 weeks. At the end of the 10 weeks animals were sacrificed and rods were extracted in a sterile fashion. Swab cultures were taken from intramedullary canal. Bacteria on titanium rods were counted. Histopathological evaluation of bone surrounding implants was also performed. In conclusion, $Ag^+$ ion doped calcium phosphate based ceramic nano powder coated $Ti_6Al_4V$ implants may prevents bacterial colonisation and infection compared with those for implants without coating and HA coated implants.

**Recent Publications:**

1. Kose N, Otuzbir A, Peksen C, Kirmitçi A, Dogan A (2013) A silver ion-doped calcium phosphate-based ceramic nanopowder coated prosthesis increased infection resistance, Clinical Ortopaedics and Related Research, 8:2532-2539.
2. Kose N, Caylak R, Peksen C, Kiremitci A, Burukoglu D, Koparal S, Dogan A (2016), Silver ion doped ceramic nano-powder coated nails prevent infection in open fractures: in vivo study, Injury, 47:320-324.
3. Bostancıoglu B, Peksen C, Genc H, Gurbuz M, Karel F, Koparal S, Kose N, Dogan A, Koparal A (2015), Amnalyses of the modulatory effects of antibacterial silver doped calcium phosphate based ceramic nano-powder on proliferation, survival ande agiogenic capacity of different mammalian cells in vitro, Biomedical Materials, 10: 045024.
4. Yang, CY et al. (1997) In vitro and in vivo mechanical evaluations of plasma-sprayed hydroxyapatite coatings on titanium implants: The effect of coating characteristics, Journal of Biomedical Materials Research Part A, 37: 335-345.
5. Zhao, L et al. (2009) Antibacterial coatings on titanium implants, Journal of Biomedical Materials Research Part B: Applied Biomaterials 91: 470-480.

### Biography

Ceren Peksen received the B.E. degree in ceramic engineering from the Dumlupinar University and the MSc and PhD degrees in ceramic engineering from the Anadolu University Institute of Science, Turkiye, in 2006 and 2012, respectively. In 2014, she joined the Department of Ceramic and Glass, Ondokuz Mayis University, as a lecturer and became an Assistant Professor. Her current research interests include ceramic powder synthesis, ceramic surface coatings, bioceramics, antibacterial materials and materials characterization.

cpeksen@omu.edu.tr