

## ANTIBACTERIAL EFFECT OF HYDROXYAPATITE AND SILVER

Alexandra AVRAM<sup>1</sup>, Aurora MOCANU<sup>1</sup>, Ossi HOROVITZ<sup>1</sup>,  
Gheorghe TOMOAIA<sup>2,3</sup>, Maria TOMOAIA-COTISEL<sup>1,3</sup>

### REVIEW

**Abstract.** *Synthetic hydroxyapatite ( $Ca_{10}(PO_4)_6(OH)_2$ , HAP) is widely used in regards to orthopedic applications due to its similarity to the mineral component in bone. However, while HAP aids with osseointegration it does nothing when it comes to orthopedic infections. Moreover, the prevalence of antibiotic resistance makes treatment even more difficult. In view of this, adding silver to hydroxyapatite has been a focus of many studies due to the combined bioactivity of HAP and excellent antibacterial properties of Ag. The present work brings a brief introduction to more recent studies regarding the HAP-silver combination and its effect on different pathogenic strains. The effect of silver on benign cells is also discussed based on in vitro cultures and in vivo studies.*

**Keywords:** hydroxyapatite, silver ions, silver nanoparticles, antibacterial activity

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### 1. Introduction

The ability of pathogens to resist treatment has become the most prevalent problem, with 700,000 people dying each year due to drug-resistant pathogens [1]. Moreover, orthopedic infections are one of the most common complications after surgery, especially when metallic implants are involved, due to the tendency of bacteria to form a biofilm on their surface. Tissue contamination and inflammation might lead to implant failure, especially since antibiotic resistance has to be taken into account, in terms of treatment. Biocompatible coatings on such metallic implants are quite common as they tend to help with the osseointegration of said implants. Thus, combining these coatings with an antimicrobial agent would be an important and useful step. In particular, one in vivo study on New Zealand rabbits [2], dealing with hydroxyapatite, HAP, and silver nanoparticles, AgNPs, deposited on a Ti6Al4V titanium alloy, revealed that the addition of silver nanoparticles influenced the implant stabilization in a positive

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<sup>1</sup> Babes-Bolyai University of Cluj-Napoca, Faculty of Chemistry and Chemical Engineering, Research Centre of Physical Chemistry, 11 Arany Janos Str., RO-400028, Cluj-Napoca, Romania

<sup>2</sup> Iuliu Hatieganu University of Medicine and Pharmacy, Department of Orthopedics and Traumatology, 47 General Traian Mosoiu Str., RO-400132, Cluj-Napoca, Romania

<sup>3</sup> Academy of Romanian Scientists, 3 Ilfov Str., RO-050044, Bucharest, Romania

\*Corresponding author: Maria Tomoaia-Cotisel, [mcotisel@gmail.com](mailto:mcotisel@gmail.com)