

Ciências da Vida

## Antimicrobial nanomaterials

Centro de Investigação em  
Genética Molecular Humana – Polo 1



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## Objectives

The management of microbial infections constitutes a serious concern of modern societies, where the appearance and development of resistance to conventional antibiotics are a major healthcare issue. Control of food-borne pathogens is also a challenging field. The development of novel antimicrobials is absolutely mandatory for preventing and controlling microbial infections in the future.

The advent of Nanotechnology brought the possibility of using new technologies for the production of new materials. In particular, the use of noble-metal nanoparticles (NPs) to achieve control of microbial contaminations is explored.

## Methodology

A strategy for the development of novel antimicrobials is to combine the stability and pleiotropic effects of inorganic compounds with the specificity and efficiency of organic compounds, such as antibiotics.

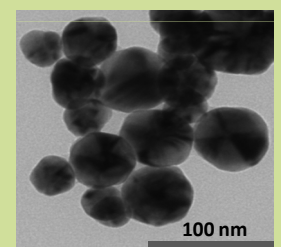
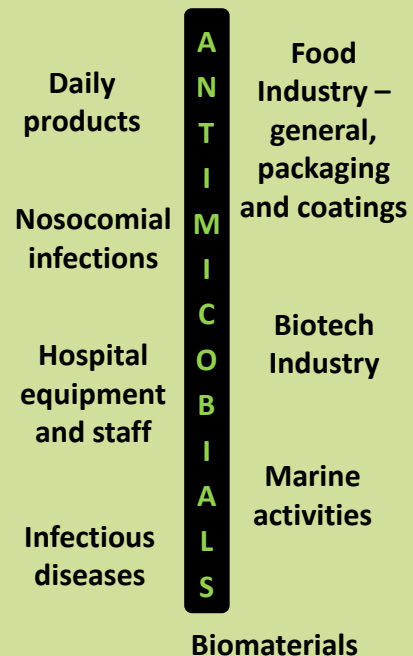
Specifically, Au:Ag-alloy NPs have been used in a variety of applications, alone or combined with organic compounds; the use of Au:Ag-alloy NPs offer the versatility of combining the well-known antimicrobial silver activity with the presence of gold, that is, in general, more amenable to functionalisation with organic molecules. Furthermore, alloy NPs may present lower toxicity to humans, which is often associated with the use of silver.

## Expected Results

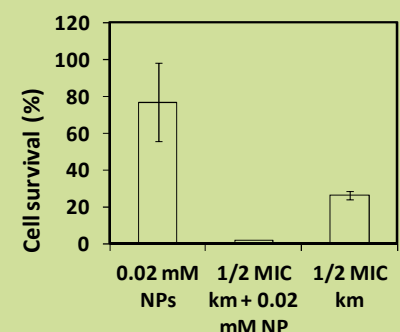
The enhancement effect of Au:Ag-alloy NPs on the antimicrobial effect of antibiotics was demonstrated for the model Gram-negative bacterium *Escherichia coli* and both a sensitive and a resistant strain of *Staphylococcus aureus* (model Gram-positive bacterium).

In nature, however, as well as in microbial contamination related to human activities, and certain diseases, microorganisms usually grow as biofilms, and control of its formation has a huge applicability in medicine (biomedical devices, implants, catheters), and in the food industry. Therefore, development of materials that can inhibit biofilm formation is currently underway.

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Ag:Au-alloy NPs



Synergistic effect of alloy NPs and kanamycin on resting *E. coli* cells