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Metal-Based Nanoparticles' Biological Activity and Pharmaceutical Applications

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Nanoparticles have been the subject of numerous studies owing to their physicochemical characteristics. How metal-based nanoparticles interact with cells, as well as their structures and cellular metabolites, is of particular importance in their applications as drug carriers and in the diagnosis and treatment of various diseases. In this collection of papers, the biological properties of the metal-based nanoparticles are evaluated, including their antibacterial and cytotoxic effects and redox activity.

The evaluation of the bacterial activity applies traditional microbiological assays to test the bactericidal effect against some of the most common Gram-positive and Gram-negative bacteria. Cytotoxicity is commonly expressed by viability, which can be estimated from measured cellular endpoints determined in colorimetric standard endpoint assays, but also by the kinetics of the cytotoxic response. The compounds with cytotoxic effects often damage the permeability and structure of the cell membrane and/or cell metabolism. Redox activity is often measured by the effects on oxidative stress. The free radical reactions and generation of reactive oxygen species (ROS) are vital metabolic responses that ensure the body's homeostasis, functional activity, and adaptation. Any changes in ROS levels or their metabolism are particularly informative; their imbalance is a universal mechanism and cause for the development of diseases.

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