

Hemocompatibility study of ZnO nanoparticles

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Abstract

The interactions of nanomaterials with membrane cells are an important research area because such interactions are critical in many applications such as biomedical imaging, drug delivery, disease diagnostics and DNA/protein structure probing [1]. More and more nanomaterials are designed for biological applications, and this raises new concerns about the safety of nanotechnology [2,3]. Among the various types of nanomaterials that have been developed, nanostructured metal oxides have recently aroused much interest in biomedical applications. ZnO is biomimetic and exhibits high electron transfer property, a relevant property for potential applications in biosensors. In recent years, various ZnO nanostructures have been widely used for enzyme immobilization. The antimicrobial potential of ZnO has also been well explored in the past [4].

In this study, we have evaluated the hemocompatibility of ZnO nanoparticles (50 and 100 nm) and microsized ZnO. Hemocompatibility of biomaterials refers to the degree of mutual adaptation between the materials and blood. This property arises from the interactions between each component of blood and the surface character of biomaterials, as well as the consequences of and effects produced by interactions [5]. The assays included the effects on blood coagulation, which were centered on prothrombin time (PT) and activated partial thromboplastin time (APTT), adsorption of plasma proteins and erythrocyte hemolysis test.

Results show that ZnO is capable to modify blood coagulation time (Figure 1), and this effect is related to particle dimensions. Similarly, we concluded that ZnO can form a certain complex with albumin (BSA), which is the most abundant protein in blood plasma, attending the diminution of fluorescence in the presence of ZnO (Figure 2). Finally, we found that ZnO nanoparticles are more haemolytic than microsized ZnO after 24h incubation.

References

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Figures

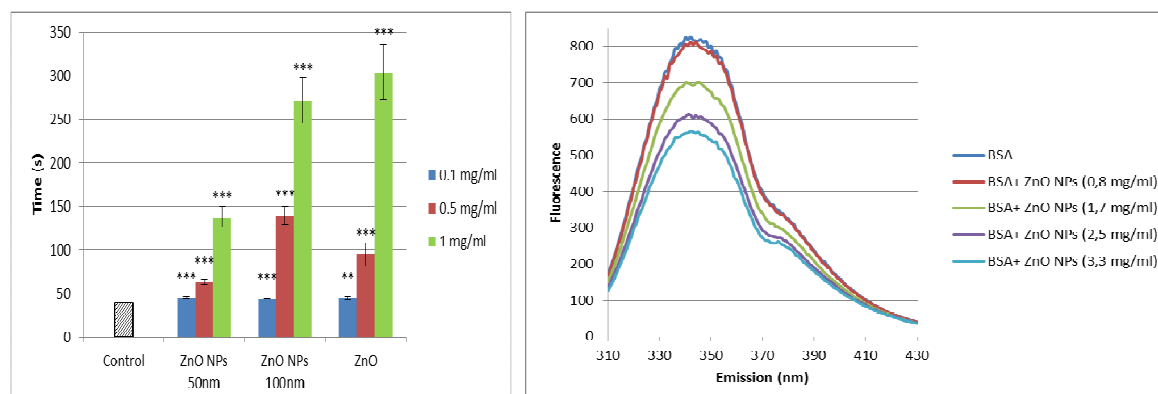


Figure 1. Effect of ZnO and ZnO nanoparticles (NPs) on blood coagulation time. **Figure 2.** Fluorescence spectra of BSA in absence and presence of ZnO nanoparticles (100nm) at different concentrations after 30 min incubation.