Hemolytic Effects Induced by Certain Types of Nanoparticles (Fe_2O_3, $ZnFe_2O_4$, ZnO, GaN, GaN/Fe) on Erythrocytes

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Nanomaterials development is of high interest for the progress in nanomedicine. The purpose of this project was to evaluate to what extent and in what quantities different types of nanoparticles can be accepted by the human blood, so that later they can be safely used as alternative solutions in biomedical applications, like contrast agents, drugs or even cells delivery systems etc. To achieve this goal common and newly developed nanoparticles of ZnO, $ZnFe_2O_4$, Fe_2O_3, GaN, GaN/Fe with dimensions between 50-100 nm have been investigated. All of them had been characterized using electron microscopy, suspended in sterile buffered solution and homogenized using an ultrasound bath. Under proper laboratory conditions, human blood has been exposed to different concentrations of nanoparticles (1 mg/ml, 100 µg/ml and 10 µg/ml) and incubated in standard conditions under continuous agitation. The lithic effect on erythrocytes was analyzed by using tetramethylbenzidine spectrophotometry at different time intervals (2h, 4h, 24h). The results shows that ZnO has a toxic effect at high concentrations but it's not toxic at concentrations below 100 µg/ml, while the iron-containing nanoparticles tend to agglomerate forming bigger clusters and preventing hemolysis. In addition, GaN-based nanoparticles show low hemolytic effect. Therefore, the obtained results come to complement some previous studies on nanoparticles toxicity, where very specialized cells have been studied in contact with nanoparticles. One can use hemolysis test as an cost-effective tool for cytotoxicity screening while developing nanoparticles-based applications.