

Probing ZnONPs Cytotoxicity: Insights from Human Erythrocyte “in vitro” Model

Erion Sukaj

Fatbardha Buzo, Caterina Faggio, Valbona Aliko
University of Tirana, Faculty of Natural Sciences, Tirana, Albania
erionsukaj@gmail.com

Abstract

Zinc oxide nanoparticles (ZnONPs) have garnered significant interest for their potential applications in the field of medicine. Their unique physicochemical properties make them suitable for various biomedical purposes such as drug delivery, antibacterial and antifungal activity, wound healing, anticancer applications, and anti-inflammatory effects. However, it is crucial to consider their potential toxic effects to ensure safe use. In this study, we explore the hidden potential of human erythrocytes as an innovative in vitro model system to investigate the cytotoxicity of ZnONPs and establish important connections with human health. Human erythrocytes, or red blood cells (RBCs), play a critical role in maintaining human health by facilitating oxygen transport and maintaining overall physiological balance. Thus, studying the cytotoxic effects of ZnONPs on erythrocytes provides insights into their potential impact on human health. The unique characteristics of erythrocytes, such as their abundance in the bloodstream and membrane composition, make them an attractive model for evaluating nanoparticle interactions with cells in circulation. Our findings reveal dose-dependent cytotoxic effects of ZnONPs on human erythrocytes, mirroring the potential adverse effects on circulating red blood cells in vivo. The observed cytotoxic effects on erythrocytes, coupled with alterations in membrane integrity and morphology, emphasize the need for a comprehensive understanding of the potential risks associated with ZnONP exposure. Ultimately, this research contributes to the development of strategies to mitigate adverse effects and protect human health in the context of emerging nanotechnologies.

Keywords: Zinc oxide nanoparticles, Human erythrocytes, Cytotoxicity, Cell viability, Membrane integrity

References

- [1] Yang H., Liu C., Yang D., Zhang H., Xi Z., Comparative study of cytotoxicity, oxidative stress and genotoxicity induced by four typical nanomaterials: the role of particle size, shape and composition. *J. Appl. Toxicol.*, 2009, 29(1), 69–78.
- [2] Salami, Maryam, Khosravi, Maryam and Zarei, Mohammad Hadi. "Comparative toxic effect of bulk zinc oxide (ZnO) and ZnO nanoparticles on human red blood cells" *Main Group Metal Chemistry*, vol. 45, no. 1, 2022, pp. 219-224.