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Genotoxicity Induced by Nanoparticles on Human Lymphoblast Cells (TK6)

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Abstract : The use of nanoparticles is increasing worldwide and there are many nanotech-based daily products available in the market. The toxicity of nanoparticles results from their extremely small size which can be transported easily into the blood stream and other organs. We aimed to study the genotoxicity of two nanoparticles, Titanium dioxide (TiO2-NPs) and Zinc oxide (ZnO-NPs), in TK6 cells by micronucleus assay. The cells were tested at 8, 24, and 48 hours after exposed to 0.10, 0.25, 0.50 and 1.00 µg/mL of TiO2-NPs particles size < 25 nm and < 100 nm and to ZnO-NPs at 1, 10, 50, and 100 µg/mL, particles size < 50 nm and < 100 nm. At 24 hours of incubation transmission electron microscope (TEM) revealed that the nanoparticles TiO2-NPs at 1.00 µg/mL and ZnO-NPs at 10 µg/mL were able to be taken into the cells and induced the production of increasing amount of micronucleus in dose-dependent manner. The effect of the two nanoparticles on chromosome aberration indicated that TiO2-NPs and ZnO-NPs are genotoxic. In addition, the toxicity of TiO2-NPs was found to be 10 times more toxic than ZnO-NPs after 24 hours exposure. Analysis showed that the TiO2-NPs induced formation of micronucleus was both time and dose dependent, whereas the genotoxicity of ZnO-NPs was only dose dependent. In conclusion, TiO2-NPs and ZnO-NPs were able to transport through the cells membrane and directly genotoxic to TK6 cells in dose-dependent manner.

Keywords : nanoparticles, genotoxicity, human lymphoblast cells (TK6), micronucleus
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