

Genotoxicity of inorganic nanomaterials used for cosmetics

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Titanium dioxide (TiO₂) is widely used as an ultraviolet-scattering substance in cosmetics. Here, we investigated effects of particle sizes and surface modifications of TiO₂ NPs on their genotoxicity to human skin fibroblast and keratinocyte cells with the micronucleus (MN) assay. Induction of DNA strand breaks and reactive oxygen species (ROS) were also measured to elucidate the mechanism of the toxicity. Three types of TiO₂ NPs (35 nm and 1000 nm) with different surface coating (Al(OH)₃-coated-, Al(OH)₃/C₁₇H₃₅COOH-coated-, and plain-TiO₂ NPs) were examined. All TiO₂ NPs induced MN in both cells in a dose-dependent manner. Plain-TiO₂ NPs (35 nm) induced more MN, DNA-strand breaks and ROS than other two coated-TiO₂ NPs. Small TiO₂ NPs (35 nm, plain) were more genotoxic than large TiO₂ NPs (1000 nm, plain). The ROS production was closely correlated with the cellular uptake of the TiO₂ NPs. These results indicate that difference in a balance of the particle size and surface properties of TiO₂ NPs affects their cellular uptake, and causes different levels of genotoxicity.