

Safety evaluation of nanoparticles used for cosmetics; Association of physical/chemical properties and safety

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Nanoparticles, particularly TiO₂, ZnO and SiO₂ are frequently used for cosmetics such as foundation and sunscreen. Although the nanoparticles are useful materials for cosmetics, toxic effects are also reported. In the present study, cellular influences of TiO₂, ZnO and SiO₂ nanoparticles were examined. ZnO nanoparticles showed strong cytotoxicity on human keratinocyte HaCaT cells. ZnO nanoparticles also caused oxidative stress, induction of cytokines and cell membrane damage. On the other hand, cellular effects of TiO₂ and SiO₂ nanoparticles were small. Zn²⁺ released from ZnO nanoparticles was the most important factor for the cytotoxicity of the ZnO nanoparticles. Gene expression of metallothionein (MT) was enhanced by ZnO nanoparticle exposure in HaCaT cells and 3D skin model. ZnO nanoparticles caused induction of cytokines on 3D skin models. These results suggest that ZnO nanoparticles have cytotoxic potential. And the MT gene expression may be a promising biomarker for the toxic effect of nanoparticles on cosmetics.