

Assessment of the biological effects of silver nanoparticles in cultured human cellsNobuhiko Miura and Shinji Koizumi*(Dept. Health Effects Res., JNIOOSH, Kawasaki, Japan)*

Silver nanoparticles (nano Ag), whose antimicrobial properties are well known, have been extensively used as antibacterial agents and deodorants. Despite the widespread use of nano Ag products, relatively few studies have been undertaken to determine the biological effects of nano Ag exposure. We evaluated the toxicity of nano Ag and examined influences on the expression of several genes by nano Ag. We observed apparent cytotoxicity in HeLa cells exposed to nano Ag (5-10 nm) or silver nitrate for 24 h. The IC₅₀ values for nano Ag and silver nitrate were 92 and 17 µg Ag/ml, respectively. Furthermore, nano Ag as well as silver nitrate induced apoptosis in HeLa cells. These results indicate nano Ag possesses an obvious cytotoxic ability. To obtain the clue to the mechanism of action, we examined the expression of typical stress response genes coding for metallothionein-2A (*MT-2A*), heme oxygenase-1 (*HO-1*) and 70 kDa heat shock protein (*HSP70*) after nano Ag exposure. Nano Ag induced the expression of *MT-2A* and *HO-1* almost as effectively as Cd, known to be a strong inducer of these genes. *HSP70* expression was slightly increased by nano Ag. These results may suggest the occurrence of metal ion, oxidative stress and/or protein denaturation by nano Ag exposure.