Ying-Jan Wang, J Nanomed Nanotechnol 2016, 7:4(Suppl)
http://dx.doi.org/10.4172/2157-7439.C1.037

Investigation of the uptake and cytotoxic mechanisms of amine-modified silver nanoparticles

Ying-Jan Wang[a]
[a]National Cheng Kung University, Taiwan

Nanoparticle-induced toxicological mechanisms have become one of the most studied topics in toxicology during the last few years. Because of their excellent antimicrobial activity, silver nanoparticles (AgNPs) are recognized as a promising nanomaterial with widespread applicability. However, the impact of AgNPs on biological systems, regarding their possible effects and fate in living cells are still limited. In this study, we found that AgNPs can be taken into cells through endocytosis. The internalized AgNPs eventually accumulate in lysosomes or autophagosomes. Smaller size of AgNPs (SAS) was more toxic than larger size (LAS). Our results implied that SAS led to more lysosomal dilatation, arrested autophagy and cell death. The mechanisms of AgNPs-induced autophagy could be mediated by activation of oxidative stress and ER stress signaling pathways in NIH 3T3 cells. AgNPs treatment can trigger the expression of the ER stress and autophagy markers (IRE1 & LC3-II). However, the autophagy substrate p62 was accumulated in AgNPs-treated cells, which indicates that the function of autophagy may be damaged. Our results clarify the mechanism by which AgNPs induce autophagosome accumulation and reveal the effect of AgNPs on lysosomes. This work illustrates the influence of AgNPs on biological systems and may provide insights to guide the development of protective measures for biomedical applications of AgNPs.

Biography

Ying-Jan Wang has completed his PhD from National Taiwan University and Post-doctoral studies from National Taiwan University, College of Medicine. He is the Director of Department of Environmental and Occupational Health, College of Medicine, National Cheng Kung University. He has published more than 120 papers in reputed journals and has been serving as an Editorial Board Member of *PloS ONE*.

yjwang@mail.ncku.edu.tw

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