Are silver nanoparticles harmful?

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Silver nanoparticles cause more damage to testicular cells than titanium dioxide nanoparticles, according to a recent study by the Norwegian Institute of Public Health. However, the use of both types may affect testicular cells with possible consequences for fertility.

Nanotechnology is increasingly used in consumer products, medicines and building products. The potential risks of using engineered nanoparticles need to be monitored so that the industry can develop products that are safe for humans and nature.

Previous research has shown that nanoparticles can cross both the blood-brain barrier and blood-testes barrier in mice and rats, and are taken up by cells. This study aimed to see if silver and titanium dioxide nanoparticles had any effect on human and mice testicular cells.

The researchers found that silver nanoparticles had a toxic effect on cells, suppressing cellular growth and multiplication and causing cell death depending on concentrations and duration of exposure. The effect was weaker for titanium dioxide nanoparticles, although both types did cause cell type-specific DNA damage, with possible implications on reproduction as well as human and environmental health.

"It seems that the type of nanoparticle, and not the size alone, may be the limiting factor" says Nana Asare, primary author of the study published in *Toxicology*.

Further studies using in vivo models are needed to study the impact of nanoparticles on reproductive health.

The researchers used cells from a human testicular carcinoma cell line and testicular cells from two strains of mice, one of which is genetically modified to serve as a representative model for human male reproductive toxicity. The cells were exposed to titanium dioxide nanoparticles (21nm) and two different sizes of silver nanoparticles (20 nm and 200nm) over different concentrations and time periods. Both sizes of silver nanoparticles inhibited normal cell function and caused more cell death than the titanium dioxide nanoparticles. In particular, the 200 nm silver particles caused a concentration-dependent increase in DNA damage in the human cells.

More information: Asare N, Instanes C, Sandberg WJ, Refsnes M, Schwarze P, Kruszewski M, Brunborg G. Cytotoxic and genotoxic effects of silver nanoparticles in testicular cells. *Toxicology*, 291: 65-72 (2012)

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