Reproductive toxicity of nanomaterials. Silver nanoparticles and *Drosophila* as models

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Reproductive toxicity is a significant concern among the harmful effects induced by environmental pollutants. To reduce the use of mammalian models, lower eukaryotes like *Drosophila melanogaster* serve as viable alternatives. This study addresses the gap in understanding the link between reproductive adverse outcomes and the physical presence of pollutants in reproductive organs.

Silver nanoparticles (AgNPs) were selected for their ease of internalization, detection, quantification, and widespread environmental presence due to diverse applications. A novel exposure method was developed in which adult flies were fed peach-grape juice via sponge plugs in rearing tubes. Both male and female flies were exposed to AgNPs (28±4 nm, 100 and 400 µg/mL) for one week. Internalization and bioaccumulation of AgNPs in organs were assessed using transmission electron microscopy (TEM), confocal microscopy, and inductively coupled plasma mass spectrometry (ICP-MS). Results showed substantial accumulation of AgNPs in the gastrointestinal tract, Malpighian tubules, hemolymph, reproductive organs (ovaries and testes), and gametes (eggs and sperm). The highest AgNPs content was observed in the testes. AgNPs were also detected in eggs, indicating transgenerational transfer. Exposure to AgNPs reduced ovary size and fecundity, particularly at higher concentrations, though fertility and gender ratios of the offspring were unaffected. At the molecular level, significant deregulation of reproductive-related genes was observed, particularly in males.

These findings underscore the utility of *D. melanogaster* as a model for evaluating reproductive hazards posed by AgNPs exposure. The ease of AgNPs internalization in *D. melanogaster* reproductive targets suggests potential implications for mammalian reproductive toxicity, raising concerns about the broader impacts of nanoparticle exposure.

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