

Gestational Exposure to Nanoplastics and its Effect on Maternal Behaviour, Progeny Outcome, and Sex Ratio: A Literature Review

*Ella Domingo*¹, *Caroline Fei*¹, *Yu Chen Nan*¹, *Lan Yun Wu*¹

¹Department of Pharmacology, McGill University, Montreal, QC, Canada

Keywords: Microplastics, Plastic nanoparticles, Gestational exposure, Maternal behavior, Progeny outcome, Sex ratio

Corresponding author email: caroline.fei@mail.mcgill.ca

Published: 05/05/2026

<https://doi.org/10.26443/msurj.v21i2.431>

Exposure to plastic nanoparticles has been investigated since the late 1980s and has become a growing public health concern over recent years. Among these concerns are their potential impact on fertility and reproduction, as the small size of plastic nanoparticles allows for their entry into the systemic circulation and translocation across the placental barrier, potentially affecting and disrupting reproductive processes. This literature review aims to examine how gestational exposure to plastic nanoparticles and the substances they carry can influence or alter maternal behaviour, progeny outcome, and sex ratio. We hypothesized that gestational exposure to plastic nanoparticles disrupts neuroendocrine pathways regulating maternal behaviour and offspring development. After synthesizing data from *in vitro* and *in vivo* studies in PubMed, a comprehensive review of the current scientific literature was conducted. Overall, study findings suggest that nanoparticle exposure during pregnancy can reduce oxytocin levels in both the plasma and the hypothalamus, correlating with decreased observable maternal behaviours in affected mice. Additionally, adverse outcomes have been reported in exposed progeny, including thinning of the cerebral cortex in Sprague Dawley rats and transgenerational changes in population fitness in *D. Magna* plankton. Specific sex-based vulnerabilities were identified, with some studies suggesting a potential skewing of the male-to-female ratio, with male embryos being more severely impacted. However, current evidence more strongly implicates general environmental pollution rather than nanoparticles specifically. Moreover, contemporary scientific information is limited by a stronger focus on oxytocin. While the link between environmental pollutants and oxytocin is well-documented, other critical regulators of maternal behaviour, such as placental lactogen and prolactin, remain understudied and yield conflicting data regarding nanoparticle interference. The importance of this investigative literature review lies in the urgency to understand the mechanisms by which nanoplastics impact reproductive health, and to prevent the adverse effects of nanoparticle exposure on our ecosystems and our future generations.

© The Authors. This abstract is published under a CC-BY license:

<https://creativecommons.org/licenses/by/4.0/>