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Reproductive and developmental toxicity

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Testing of nanomaterials (NM) for effects on fertility, pregnancy and fetal development is still very much in its hypothesis generating stage. Plausible mechanisms have been proposed. From the port of entry, particles may translocate to organs with relevance for reproduction, in the adult, and to the placenta and fetus, in the pregnant organism, and here exert their effects directly. Alternatively, particle induced oxidative stress and inflammation may translate into low grade systemic inflammation, a potent modulator of reproduction, pregnancy and fetal development.

As more and more studies emerge so do indications that NM might interfere with reproduction. Recent studies in rodents support that exposure to (nano)particles may interfere with reproductive events in the male and, following gestational exposure, induce a broad range of physiological changes in the offspring, e.g., in the central nervous, male reproductive, immune and cardiovascular systems. However, female fertility has hardly been addressed relative to NM exposure.

However, the tremendous variation in study designs and tested particles hampers generalization and risk assessment. There is a need for confirmatory studies using standardized study protocols and nanomaterials. For some particles, effects are confirmed across several studies and strains, this is for example the case for effects of nanosized carbon black on the central nervous system, albeit further characterization of the functional consequences of the observed changes is warranted. For male reproduction, some well-performed studies cannot repeat findings in earlier studies – could this depend on the strain or rodent species of study?