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C'Nano 2020

The Nanoscience Meeting

TOULOUSE

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December, 8, 9 and 10



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Basal Ti level in the human placenta and meconium and evidence of a materno-foetal transfer of food-grade TiO₂ nanoparticles in an *ex vivo* placental perfusion model

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Titanium dioxide (TiO₂) is broadly used in common consumer goods, including as a food additive (white pigment, E171 in Europe). The E171 contains TiO₂ nanoparticles (NPs), partly absorbed in the bloodstream and accumulating in several systemic organs^{1,2}. Prenatal exposure to TiO₂-NPs in rodents resulted in alteration of placental functions and a materno-foetal transfer, with toxic effects on the foetus³. However, no human data are available for the potential materno-foetal transfer of food-grade

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TiO₂-NPs. We analysed Ti(O₂) content of human placentae at term and meconium (first stool of newborns) using inductively coupled plasma mass spectrometry (ICP-MS) and scanning transmission electron microscopy (STEM) coupled to energy-dispersive X-ray (EDX) spectroscopy. Using an *ex vivo* placenta perfusion model, we also assessed the transplacental passage of food-grade TiO₂ particles.

ICP-MS analysis evidenced the presence of Ti in all placentae (0.01 to 0.48 mg/kg of tissue) and in 50% of the meconium (0.02-1.50 mg/kg), suggesting a materno-foetal transfer of Ti. STEM-EDX observation confirmed the presence of TiO₂-NPs in placental tissues and meconium, in addition to iron, tin, aluminium, silicon and zinc. In placenta perfusion experiments, confocal imaging and SEM-EDX analysis of foetal exudate confirmed a low transfer of food-grade TiO₂ particles to the foetal side, barely quantifiable by ICP-MS, with 70% to 100% of the TiO₂ particles < 100 nm.

Altogether, these results show a materno-foetal transfer of TiO₂ particles, food-grade TiO₂ being a potential source for foetal exposure to NPs. These data emphasize the need for risk assessment of chronic exposure to TiO₂-NPs during pregnancy.

References (max. 5):

1. Pele et al. 2015
2. Heringa et al. 2018
3. Rollerova et al. 2015

Acknowledgment: