In vitro models for the study of reproductive toxicity of engineered nanomaterials

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Nanotechnology is an expanding field in which NP are developed for several purposes including industrial and biomedical applications. Their peculiar characteristics can be exploited to improve the quality of our lives; however, evaluation of the potential risks of nanotechnology-based products on public health is propaedeutic to their use. Evidences exist indicating that NP are able to reach and cross biological barriers, including the placenta. The placenta represents a semi-permeable barrier for nutrients and gas exchange between mother and fetus. Several xenobiotics have been reported to cross the placental barrier. We have recently demonstrated that some NP are also able to cross the mouse placenta. In order to screen for the ability of NP with different physic-chemical properties to breach the placental barrier and to interfere with embryonic development, we are currently developing an *in vitro* model, which could represent a cost-effective, rapid screening system to reduce animal experimentation. To this purpose, we have derived trophoblast stem cell (TSC) lines from mouse blastocysts. TSCs are multipotent cells capable to proliferate in culture for many generation. Under appropriate experimental conditions, TSCs can differentiate in large multinucleated syncytia, resembling syncytiotrophoblast cells of the placenta. We induced differentiation of TSCs on transwell inserts to mimic the placental barrier *in vitro*, and cultured in the lower compartment mouse embryonic stem (mES) cell derived embryoid-bodies (EB). EBs recapitulate *in vitro* embryonic development (giving derivatives of all three germ layers), and are routinely used to test chemical compounds for embryotoxicity. We performed gene expression analysis for genes expressed by the endoderm, mesoderm and ectoderm on EBs cultured with or without NPs, in the presence or absence of the simulated barrier. We will present the main results obtained.