MATERNAL EXPOSURE TO NANOPARTICLES ENHANCES THE RISK OF NEURODEGENERATIVE DISEASES IN OFFSPRING

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Introduction: Various nanoparticles are produced with development of nanotechnology; however, the safety is not confirmed precisely at present. We have already reported that nanoparticles from diesel engine exposure to pregnancy animal exert severe influences on brain of offspring.

Aims: Influence on brain of offspring that exposed to various nanoparticles (Titanium dioxide; TiO₂, Carbon black, Carbon nanotube and Fullerene) in fetal period was examined morphologically.

Methods: Brains from ICR mice born from each nanoparticle-exposed and normal mothers were examined under light and electron microscope. To detect apoptosis, immunohistochemical staining for caspase-3 was performed, and to detect metal particle (TiO₂) transferred from mother to the fetus, brains of offspring were observed by energy-dispersive X-ray spectroscopy (EDS). The storage of abnormal structures, which are characteristic of neurodegenerative diseases, was detected with immunohistochemical staining.

Results: All mice with nanoparticles exposure showed swelling of astrocytes’ endfoot, apoptosis of endothelial cells. Brain of TiO₂-exposed groups, in which EDS detected TiO₂, showed many apoptosis in olfactory bulb. Some capillaries were stenosis and the neighboring parenchyma had degenerative changes.

Conclusions: These findings indicate that nanoparticles transferred from pregnant mice has a severe impact on fetal brain, carries the multiple infarctions and atrophy, a great risk of vascular dementia in offspring. Moreover, apoptosis in olfactory bulb relates to the hypoactivity of olfaction, and may relate to Alzheimer's disease. Our result should be a grave warning that nonparticles exposure is one of risk factors on some neurodegenerative diseases.