# Nanotech particles affect brain development in mice

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Maternal exposure to nanoparticles of titanium dioxide (TiO2) affects the expression of genes related to the central nervous system in developing mice. Researchers writing in BioMed Central's open access journal *Particle and Fibre Toxicology* found that mice whose mothers were injected with the nanoparticles while pregnant showed alteration in gene expression related to neurological dysfunction.

Ken Takeda led a team of researchers from the Tokyo University of Science, Japan, who carried out the tests. He said, "Nanotechnology and the production of novel man-made nanoparticles are increasing worldwide. Titanium dioxide in its nanoparticle form has a high level of photocatalytic activity, and can be used for air and water purification and self-cleaning surfaces. Our findings, however, add to the current concern that this specific nanomaterial may have the potential to affect human health".

For this study, the researchers injected pregnant mice with $Ti0_2$ nanoparticles. The brains were obtained from male fetuses/pups on the 16th day of gestation and at several points after birth. Comparing these brains to those of control animals, the researchers were able to demonstrate changes in expression of hundreds of genes. According to Takeda, "Diseases associated with these genes include those we normally consider to develop in childhood, such as autistic disorder, epilepsy and learning disorders, and also others that arise mainly in adulthood or old age, such as Alzheimer's disease, schizophrenia and Parkinson's disease."

Nanotechnology deals with engineering at the molecular scale. Materials reduced to nanoparticles behave in ways dissimilar to those we're used to - altering their reactivity, surface area to volume and any number of other properties. While larger $TiO_2$ particles are commonly used in paints and sunblocks, nanoparticles of $TiO_2$ are specially created for new applications in coatings and self-cleaning surfaces and their effects on living tissue are only beginning to be understood. It should be noted that this gene expression data cannot be interpreted as a direct health effect. In addition, the nanoparticles were deliberately injected at a high dose, so the relevance to real-life exposure may be limited.

More information: Maternal exposure to nanoparticulate titanium dioxide during the prenatal period alters gene expression related to brain development in the mouse, Midori Shimizu, Hitoshi Tainaka, Taro Oba, Keisuke Mizuo, Masakazu Umezawa and Ken Takeda, *Particle and Fibre Toxicology* (in press), www.particleandfibretoxicology.com/

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