

Pavel Rössner

Department of Nanotoxicology and Molecular Epidemiology
Institute of Experimental Medicine, CAS

Nanotechnologies: risks and safety

Nanomaterials (NM) are widely used in many areas of human life, including e.g. industrial applications, medicine, food and beverages or consumer goods. Additionally, nanoparticles (NP) are released to the environment during the production of NM, or in waste. As a result, human organism is in constant contact with NP of various physico-chemical properties. Despite the widespread presence of NM, the impacts of NP on human health are not systematically investigated. Given the fact that NP may induce oxidative damage to macromolecules, their presence in the organism may increase the risk of various diseases. In this talk, biological mechanisms of negative health effects of NP will be explained, along with the description of the methods used to detect the impacts of NP on the organism.

The results of the studies conducted at the Institute of Experimental Medicine will be presented. The possible adaptation of the human organism to long-term exposure to NP will be discussed.

Sources of nanoparticles



Table 1. UFPs/NPs (< 100 nm), natural and anthropogenic sources.

Natural	Anthropogenic	
	Unintentional	Intentional (NPs)
Gas-to-particle conversions	Internal combustion engines	Controlled size and shape, designed for functionality
Forest fires	Power plants	Metals, semiconductors, metal oxides, carbon, polymers
Volcanoes (hot lava)	Incinerators	Nanospheres, -wires, -needles, -tubes, -shells, -rings, -platelets
Viruses	Jet engines	
Biogenic magnetite: magnetotactic bacteria, protists, mollusks, arthropods, fish, birds, human brain, meteorite (?)	Metal fumes (smelting, welding, etc.)	
Ferritin (12.5 nm)	Polymer fumes	
Microparticles (< 100 nm; activated cells)	Other fumes	Untreated, coated (nanotechnology applied to many products: cosmetics, medical, fabrics, electronics, optics, displays, etc.)
	Heated surfaces	
	Frying, broiling, grilling	
	Electric motors	