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Distribution and Biological Effects of Fullerene C60, Titanium Dioxide and Silver Nanoparticles after Single and Multiple Intra-gastric Administrations to Rats

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Abstract: Investigations of the biological effects of nanomaterials, their biodistribution in target organs and tissues after different dosage and routes of exposure are important for assessing the risk of nanotechnology products.

The present work is an in-depth study, including the investigation of the localization of fullerene C60, titanium dioxide and silver nanoparticles (NPs) after intra-gastric exposure of rats under conditions of acute (single administration) and sub-acute (multiple administrations) toxicity, the observation of the status of experimental animals, pathomorphological analysis of their internal organs, and measurement of the dynamics of key hematological and biochemical parameters. NPs localization in organs of the exposed rats was revealed by means of different analytical techniques: atomic absorption spectroscopy, transmission electron microscopy, and HPLC with spectrophotometric detection.

It was shown that singly or multiply administered NPs absorbed from gastrointestinal tract with infiltration into the bloodstream and translocation into secondary organs. Some biochemical parameters and hematological indices of the treated rats changed in comparison to control animals. However, the exposure did not cause lethality, substantial behavior deviations, water and food consumption, pathomorphology of the internal organs. The amounts of NPs accumulated in organs and tissues are far smaller than the administered dose that is the indication of their efficient excretion.

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