Residual metal nanoparticles accumulated in the body induce late toxic effects and alterations in transcriptional and miRNA landscape

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Our study investigated the potential adverse biological effects of residual gold and titanium oxide nanoparticles (PEG-AuNPs and TiO_2NPs) determined in rats 28 days after a single vein tail administration. The liver was the primary organ of residual metal nanoparticle (MNP) deposits. Although the relative liver weight of PEG-AuNPs-exposed rats was significantly lower compared to control animals, no histopathological lesions in hepatic tissue were observed. However, changes in serum biomarkers associated with alteration in hepatic functions were determined. Hematological and immunological profiling revealed unintended biological outcomes of residual MNPs. In addition, integrated transcriptomic analysis was performed to get comprehensive information about potential exposure-induced effects on rat lungs, liver, and kidneys. Most deregulated genes with functional classification in lipid metabolism, cell cycle, and cell proliferation pathways were identified in hepatic tissue, mainly in PEG-AuNPs-exposed rats. The number of deregulated miRNAs was relatively low compared to mRNA expression changes. However, both MNPs deregulated miR-203a associated with liver injury, and miR-18a-5p and miR-32-5p linked to kidney damage.

Our study emphasizes the need for a more thorough biosafety assessment of poorly soluble MNPs accumulating in the body.

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