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The influence of size and exposure duration of gold nanoparticles on gold nanoparticles levels in several rat organs *in vivo*

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Background: The bioaccumulation and toxicity of gold nanoparticles (GNPs) in several organs of rats becomes of more necessity prior to using them in drug delivery, diagnostics, and treatment. The use of GNPs for detecting and treating the cancer is a new and exciting field of research. The current methods of cancer diagnosis and treatment are costly and can be harmful to the body. GNPs, however, offer an inexpensive route to targeting the cancerous cells. GNPs are particularly promising since they are relatively easy to be produced in various shapes and can be conjugated with peptides/proteins for targeting to specific molecules. In addition, GNPs undergo plasmon resonance when excited by light, whereby the gold electrons resonate in response to the incoming radiation, causing them to both absorbs and scatters light. The small size of GNPs implies that they could get close to a biological target of interest. The particle size-dependent distribution of GNPs by organ has been studied *in vivo*. Orally administrated GNPs appeared in various organs in mice and the absorbance and distribution was inversely correlated with particle size. The small size of GNPs results in physical and chemical properties that are very different from those of the same material in the bulk form. These properties include a large surface to volume ratio, enhanced or hindered particle aggregation depending on the type of surface modification, enhanced photoemission, high electrical and heat conductivity, and improved surface catalytic activity.The GNPs levels in several rat organs *in vivo* have not been previously documented. This study was aimed to evaluate the influence of size and exposure duration of GNPs on the GNPs levels in several organs of rats *in vivo*.

Methods: Thirty rats were divided into a control group (NG: n=10), group 1 (G1A: infusion of 10 nm GNPs for 3 days; n=5; G1B: 10 nm GNPs for 7 days; n=5) and group 2 (G2A: 50 nm GNPs for 3 days; n=5; G2B: 50 nm GNPs for 7 days; n=5). 50 µl of GNPs dissolved in aqueous solution were administered intraperitoneally every day for 3 and 7 days.

Results: The GNPs levels were evaluated in several rat organs by Inductively coupled plasma-mass spectroscopy (ICP-MS) and Atomic absorption spectroscopy (AAS). In comparison with the control group, the GNPs levels increased in all the examined organs with G1A, G1B, G2A and G2B. The highest percentage normalized increase in the liver and lung organs were 468.6% and 273.4%, respectively with 10 nm GNPs after administration period of 7 days. The highest percentage normalized increase in the kidney and heart organs were 258.7% and 242.6%, respectively with 10 nm GNPs for administration period of 3 days.

Conclusions: Our results might indicate that GNPs are mostly taken up and accumulate in organs, suggesting the toxic effects induced by the smaller GNPs. These conclusions are further supported by histological investigation suggesting that the highest toxic effects were induced by the smaller GNPs and related to the time exposure of GNPs.

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An update on cervical cancer

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Cervical cancer generally grows slowly due to uncontrolled cell growth and take many years for dysplasmia to cancerous stage in the tissues of the cervix if left untreated. 80 per cent cases belong to squamous cell carcinoma while adenocarcinoma is less common type of cervical cancer. Gardisil vaccine is available to prevent and treat it since 2006. Human papillomavirus infection is strongly related with the cervical cancer which is the most common gynecological malignancy. Different risk factors exaggerate the onset and progression of cervical cancer to malignant and metastatic state. Recent results of identifying the underlying molecular pathways and mechanisms involved in cervical cancer provide clues regarding the new bio markers that proved to be supportive in monitoring the lesion with a high risk of progression in cytological smears and histological specimens.

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