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The role of trace elements in health: from healthy environments to healthy living organisms

ABSTRACT BOOK

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P-03. Titanium chloride and titanium oxide nanoparticles cause metallothionein hypermetalation in a single and combine with bisphenol A exposures

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The major direction of the utilizing of nano-TiO_2 (n-TiO_2) is relating to its unique properties of photocatalist of organic substances. This activity is applied in wastewater purification due to relatively low cost and high stability. Therefore, the aim of this study was to evaluate the biological responses to n-TiO_2 in the co-exposure with phenol compound bisphenol A (BPA) that is most widely used chemicals in commerce. Since the known signs of the n-TiO_2 and BPA toxicity are associated with the oxidative damage (n-TiO_2) and metabolic disorders (BPA), the focus in this study was put on the metallothionein (MT) metal binding and potential scavenging activities of cellular thiols. The specimens of bivalve mollusk *Unio tumidus* were subjected to 14-day exposure to n-TiO_2 (1.25 μM), BPA (0.88nM), n-TiO_2+BPA, or $TiCl_4$ (Ti, 1.25 μM, as a positive control for n-TiO_2). The concentration of MT was detected from the level of thiols and metal concentrations (Zn, Cu). Exposure to all Ti-contained compounds (single and combine) resulted in the elevated metalation of MT without the increase in their thiol concentration (MT-SH) and increase in the lactate/pyruvate ratio. However, the oxidative stress responses were distinct. While Ti induced oxidative stress (increased superoxide dismutase activity and ROS generation), n-TiO_2 in the single exposure caused the down-regulation of ROS and increasing of GSH level by two. In opposite, co-exposure to n-TiO_2 and BPA caused the depletion of MT-SH and GSH and decreasing in the GSH/GSSG (by three) and lactate/pyruvate ratios. Hence, thiols were not the specific molecular targets for Ti and n-TiO_2. The unusual state of MT supermetalation in all Ti-related exposures could be related to the particular properties of Ti (IV), which coordinates with proteins and nucleic acids through oxo-bridges. In any case, this property of Ti(IV), could confirm its specific behavior exploring in the anticancer treatment.