MEASUREMENT OF IONIC CADMIUM BY ICP-AES FROM LIVER AND KIDNEY SAMPLES OF RATS EXPOSED TO CdSe NANOPARTICLES

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Abstract: Cadmium selenide nanoparticles exhibit bright and stable emission that makes potential candidates for optical sensing in biomedical diagnostics. However, tiny particles (2-6 nm) of CdSe readily penetrate through skin into blood stream and cells. In a previous we have found that CdSe nanoparticles mainly accumulate in liver and kidney of rats. Most importantly it was found that particles (CdSe QDs) dissociate to their building blocks as ionic Cd²⁺ and Se²⁻. This phenomenon elevates the risks associated with exposure to CdSe nanoparticles as ionic Cd is highly toxic. In an attempt to provide conclusive evidence to the presence of ionic Cd²⁺ in the liver and kidney samples of the rats that were exposed to CdSe nanoparticles, we investigated separation of ionic Cd²⁺ from organs of rats without altering nanoparticle composition. Several solvents have been examined to elucidate the stability of CdSe nanoparticles during sonication, including water, ethanol and dilute HCl and HNO₃. Acid concentration is sonication medium was varied from 0.1 to 1%. It was found that QDs aggregate even in 0.1% HCl and HNO₃, but were stable in water and ethanol. Interestingly it was also found that sonication did lead to any significant dissociation of CdSe QDs to ionic Cd²⁺ and Se²⁻ in dilute acids and the aggregated dots were simply separated from the ionic aqueous portion by centrifugation and then filtration through 0.2 µm filters. For organs, 0.1 g portions of liver and kidney were homogenized by sonicating 2 min in 1% HCl medium. Homogenates were centrifuged at 12,000 rpm for 30 min and then aqueous layer was collected. The residual tissue containing the intact QDs was digested in HNO₃. Both portions were analyzed by ICP-AES. Results were compared with those obtained from ICP-MS analysis of the organs to total Cd levels.

Keywords: CdSe nanoparticle, separation, sonication, accumulation, ICP-AES.

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