LOW DOSE MERCURY EXPOSURES IN HUMAN RENAL PROXIMAL TUBULAR (HK-2) CELLS

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Abstract: Inorganic mercury is one of the most environmentally abundant toxic metals and among the chemical forms of mercury the most potent and selective nephrotoxicant. Renal proximal tubular cells represent the primary target site where highly reactive inorganic mercury ions are proved to rapidly accumulate and induce cell injury. Moreover, the binding interactions of inorganic mercuric ions with various extracellular and intracellular thiols have been shown to directly influence their cell uptake, accumulation, as well as toxicity. Low dose mercury toxicity has been shown to affect renal systems because the kidneys accumulate the highest levels of mercury compared to the brain and liver. Studies have shown that mercuric ions with a low concentration range that does not predispose to necrotic cell death, nonetheless specifically impairs thiol-dependent signal transduction processes which may increase the susceptibility of the kidney cells to cytotoxic effects of other endogenous or exogenous agents. However, the mechanisms and functional consequences of these effects remain to be demonstrated. This study was specifically designed to examine low dose inorganic mercury toxicity in human renal proximal tubular cells. Cell viability was measure by the MTT assay and cells were treated with serial dilutions of 0-6 µg/ml. The LD50 value was found to be 4.65 ± 0.6 µg/ml indicting that mercury is highly toxic to the cells. The trypan blue exclusion assay and the alkaline comet assay were used to assay the low dose toxicity of inorganic mercury to human renal proximal tubular cells. Cells were treated with (0, 0.38 µM, 0.75µM, and 1.5µM) respectively. In the comet assay cells were treated for 3 hrs and in the trypan blue exclusion assay they were treated for 24 hours. Both results indicated a dose response with no significant differences in the comets or the trypan blue exclusion assays. These results point out that those low doses of inorganic mercury are impacting the cells and that the mechanisms and functional consequences need to be demonstrated.

Key Words: Renal epithelial cells, low dose mercury toxicity, nephrotoxicity, mercuric ions