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Arsenic-copper interaction in the kidney of the rat: influence of arsenic metabolites.

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Abstract

The present study was an attempt to investigate whether the renal accumulation of Cu observed in the kidneys of rats and guinea-pigs exposed to arsenite (As-III) was an effect of arsenite alone or also shared by its metabolites--arsenate (As-V), dimethylarsinic acid and monomethylarsonic acid. The four arsenic compounds were administered subcutaneously and separately to rats for 12 days in increasing doses. Kidney, liver and blood were taken and analysed for As, Cu and other trace elements by atomic emission spectrometry. Results indicate that administration of As-V leads to renal Cu accumulation similar to that observed on administration of As-III and that the accumulation in both cases is dependent on the dose of arsenic, although higher doses of As-V were required to achieve renal Cu levels comparable to that of As-III. A constant molar As:Cu ratio independent of arsenic dose was obtained in the kidney. Dimethylarsinic acid did not affect renal Cu levels at all. Administration of monomethylarsonic acid led to a slight increase in renal Cu levels which did not increase further in spite of increased doses of monomethylarsonic acid. It is concluded from these studies that neither the metabolic transformation of inorganic arsenic to its methylated products nor its metabolites (dimethylarsinic acid and monomethylarsonic acid) caused the observed renal Cu accumulation, rather, the inorganic form of As, either in the trivalent or pentavalent form is responsible.