

Effect of oral administration of hot water infusion of black tea (*Camellia sinensis* L) on serum toxic heavy metal concentrations in rats

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Like many other plants, toxic heavy metals [arsenic (As), lead (Pb) and mercury (Hg)] which cause toxic implications in human, could be found in manufactured black tea (*Camellia sinensis* L). In the present study, such metals in black tea samples obtained from major agroclimatic elevations (low-, mid- and high-grown) in Sri Lanka and the percentage transferred into their infusions were determined using the Atomic Absorption Spectrophotometer coupled with hydride vapor generation kit. Blood serum content of these metals in rats (n=9/group) orally administered with different doses (equivalent to 1½, 3 and 12 cups respectively: one cup is 170±10 ml) of tea infusions was measured at three days prior to the treatment, 30 days intervals for 90 consecutive days. Acute effects were assessed by orally loading the rats with metal solutions (100mgL⁻¹) followed 15 minutes later by treatment with tea infusions. Experimental rats were observed daily for any overt signs of toxicity and for the presence of erythrocyte toxicity, renotoxicity and hepatotoxicity.

Results revealed that, significantly (P<0.05) high arsenic was found in low grown (0.17±0.02 µgg⁻¹) than mid-(0.10±0.02 µgg⁻¹) and high-grown (0.09±0.01 µgg⁻¹) tea. Whereas, lead contents in mid-(0.41±0.03 µgg⁻¹) and high-(0.38±0.04 µgg⁻¹) grown tea were significantly lower than the low grown (0.49±0.05 µgg⁻¹) tea. Black tea Hg content was in the range: 0.01-0.03 µgg⁻¹ independent of the agroclimatic elevation. The percentages released to infusions for arsenic were: 0.85%, 0.75% and 0.72% in low-, mid- and high-grown tea respectively and Pb in the range: 0.32-0.37%, but Hg was not detected in any infusion. Recoveries in the infusions were low when black tea was spiked with metal solutions (1ml of 1000 mgL⁻¹per 2g): for As, 59%, 39% and 37%; for Pb, 39%, 47% and 43% and for Hg, 17%, 27% and 23% in low-, mid- and high-grown respectively. In the in-vivo experiments significantly inhibited As and Hg absorption dose- dependently ($r^2=0.9635$ and $r^2=0.9868$ respectively) and Pb absorption dose-independently (46-54%) by the tea infusion. In the chronic treatments; As, Pb and Hg contents in blood serum of rats were not altered at any measured point. Detected levels of metals in blood were below the limit declared by the FAO/WHO. Observations revealed that, no signs of toxicity in any of the black tea treated rats during the study period.