

Investigation of Accumulation of Heavy Metals in Bovine Blood and Milk in Human CKDu prevalent areas of Sri Lanka

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Heavy metal toxicity has been a major public health concern specially in developing countries. The human chronic kidney disease of unknown (CKDu) etiology is a controversy remaining with arguments in Sri Lanka. One of the most probable causes of human CKDu is the heavy metals entering through food chain and water. Several studies have shown that livestock products are playing a major role in human heavy metal toxicity in other developing countries. Therefore, the objective of this study was to determine the concentration of three heavy metals (As, Cd and Pb,) and five trace elements (Zn, Mn, Cu, Co, and Fe) in lactating cows reared in human CKDu prevalent areas of the country. The samples were collected from cows owned by the farmer families having at least one person diagnosed and/or undergoing treatments for CKDu. The blood and milk samples were collected from Jugular vein to a vacutainer and from teat to a sterile sample bottle respectively from lactating cows in Padaviya (Blood: n=20, Milk: n=20) and Thambuththegama (Blood :20 , Milk :20) veterinary ranges and as a control, a total of 20 samples (Milk, n=10 and Blood, n=10) were collected from one location Kandy area where CKDu is not identified as prevalent. The samples were digested under microwave digestion procedure for blood and milk. Then digested samples were analyzed through Inductively Coupled Plasma Optical Emission Spectrophotometry (ICP-OES) of the heavy metals, the Cd and Pb concentrations in milk were significantly ($P < 0.05$) different in three locations showing the highest concentration in Thambuttegama and lowest in Kandy. The As concentrations were not significantly ($P > 0.05$) different in three locations but it was higher than the CODEX permissible level ($0.015 \mu\text{g/mL}$) for milk in all three locations. In Padaviya, As concentration was 0.78% and 24.16% higher in milk than that of Thambuttegama and Kandy respectively. Arsenic concentrations in blood from Padaviya and Thambuttegama were not significantly ($P > 0.05$) different from that of Kandy. The As concentration in blood from Thambuttegama was 18.9% and 24.9% higher than that of Padaviya and Kandy respectively. The Cd and Pb concentrations in blood were significantly ($P < 0.05$) different in three locations being highest in Thambuttegama and lowest in Kandy. Out of the total population 76%, 52%, 28% showed higher [As], [Pb], [Cd] in milk than blood respectively. This investigation revealed that there is higher tendency of accumulation of heavy metals in bovine milk which might contribute to human CKDu through food chain. Further studies are in progress on other CKDu prevalent areas of Sri Lanka.

Key word: Heavy metals, Bovine blood and milk, CKDu, Sri Lanka