

Advancing Multidisciplinary Approaches for a Sustainable and Resilient Future

Heavy Metals and Some Selected Elemental Spotlights in Serum of Milking Cows Reared in High CKDu Prevalence Areas in Sri Lanka

Ileperuma I.A.M.P.^{1,2,6}, Wasana H.M.S.^{3,4,7}, Perera G.D.R.K.^{1,7}, Abeysundara H.T.K.⁵, Jayarathne L.⁶, and Wei Y.⁷

¹Department of Farm Animal Production and Health, Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Sri Lanka.

²Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka.

³Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing, China.

⁴Postgraduate Institute of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka.

⁵Department of Statistics and Computer Science, Faculty of Science, University of Peradeniya, Sri Lanka.

⁶National Institute of Fundamental Studies, Hanthana Road, Kandy, Sri Lanka. ⁷Joint Research and Demonstration Center, Sri Lanka.

* damperera@pdn.ac.lk

Chronic Kidney Disease of Uncertain aetiology (CKDu) is a growing public health concern worldwide. Environmental exposure to heavy metals and other elements is a risk factor to CKDu, which can have adverse effects on human and animal health including disrupting body function and metabolism. However, there is limited information about the levels of heavy metals and other elements in the blood serum of milking cows reared in high CKDu prevalence areas. To address this gap this study aimed to evaluate the concentration levels of heavy metals and selected elements in blood serum samples of milking cows reared in high CKDu prevalence areas compared to control areas. 83 blood samples from milking cows, with 50 from a high CKDu prevalence area (Kebithigollewa) and 33 from the control area (Kandy) was collected. Microwave digestion-assisted high throughput Inductively Coupled Plasma Optical Emission Spectrophotometry (ICP-OES) was employed for elemental analysis. Sixteen elements were selected for the analysis. Statistical analysis using the 'Two-sample t-test' was performed on the data using the Minitab 18 version. It was found that the average Mn (Test [T]: 0.47-47.77 and Control [C]: 0.65-8.42 ppb), Mg (T: 547.61-1009.82 and C: 321.21-1037.61 ppb), Mo (T: 3.85-7.44 and C:2.45-7.09ppb), and V (T: 26.11-61.19 and C: 15.42-56.65 ppb) concentrations in serum levels were significantly higher (p < 0.001) for the test group than the control group. However, serum K (T: 1.72-4.75 and C: 1.07-7.82 ppm) and Zn (T: 4.82-499.15 and C: 5.51-72.63 ppb) concentrations were significantly lower (p < 0.001) for the test group than the control group, showcasing similar indications to CKD/CKDu patients in end-stage kidney failure. The study suggests that milking cows in high CKDu prevalence areas may have severe chronic renal malfunctions with reference to the control group. Thus, suggesting prolonged exposure to environmental toxicants may pose a health hazard to animals and may lead to kidney damage as reflected by serum clinical chemistry. Further studies are warranted to determine their effects on physiological functions.

Keywords: CKDu, Heavy metals, ICP-OES, Milking cows, Serum





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