

Wastewater Treatment Sludge as a Potential Source of Heavy Metal Contamination in Livestock

Authors : Glynn K. Pindihama, Rabelani Mudzielwana, Ndamulelo Lilimu

Abstract : Wastewater treatment effluents, particularly sludges, are known to be potential sources of heavy metal contamination in the environment, depending on how the sludge is managed. Maintenance of wastewater treatment infrastructure in developing countries such as South Africa has become an issue of grave concern, with many wastewater treatment facilities in dilapidating states. Among the problems is the vandalism of the periphery fence to many wastewater treatment facilities, resulting in livestock, such as cows from neighboring villages, grazing within the facilities. This raises human health risks since dried sludge from the treatment plants is usually spread on the grass around the plant, resulting in heavy metal contamination. Animal products such as meat and milk from these cows thus become an indirect route to heavy metals to humans. This study assessed heavy metals in sludges from 3 wastewater treatment plants in Limpopo Province of South Africa. In addition, cow dung and sludge liquors were collected from these plants and evaluated for their heavy metal content. The sludge and cow dung were microwave-digested using the aqua-regia method, and all samples were analyzed for heavy metals using ICP-OES. The loadings of heavy metals in the sludge were in the order Cu>Zn>Ni>Cr>Cd>As>Hg. In cow dung, the heavy metals were in the order Fe>Cu>Mn>Zn>Cr>Pb>Co>Cd. The levels of Zn and Cu in the sludge liquors where the animals were observed drinking were, in some cases, above the permissible limit for livestock consumption. Principal component and correlation analysis are yet to be done to determine if there is a correlation between the heavy metals in the cow dung and sludge and sludge liquors.

Keywords : cow dung, heavy metals, sludge, wastewater treatment plants, sludge.

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