
ID der Kurzfassung : **204**

# Assessment of Toxic Heavy Metals in Soil, Vegetables and Grasses Irrigated with Healthcare Wastewater and Associated Health Risks in the Akaki River Catchment, Central Ethiopia

## Inhalt

Healthcare facilities generate wastewater that contain a variety of potentially toxic heavy metals, including lead (Pb), cadmium (Cd), chromium (Cr), and zinc (Zn), which are often discharged into nearby rivers. This study investigates the concentration of heavy metals in healthcare wastewater (HCWW) released into the Akaki River Catchment (ARC) and assesses its potential health and environmental impacts in central Ethiopia. Samples of HCWW, soil, selected vegetables, and grasses were collected from discharge points and adjacent irrigation areas. Tap and wastewater samples were analyzed for physicochemical properties and heavy metal content, while soil, vegetables, and grass samples were analyzed specifically for heavy metals using photometry and the Agilent 5800 ICP-OES instrument. The estimated daily intake (EDI) of heavy metals was calculated based on their concentrations in vegetables and the typical consumption rates of those vegetables and grasses. Except temperature, all the measured physicochemical parameters were surpassed recommended maximum limits (RML). In vegetable samples, the mean concentrations of Cd, Cr, and Pb (ranging from 1.82-4.23, 0.03-7.22, and 1.78-26 ppm, respectively) exceeded the RML established by the joint WHO/FAO guidelines. Lettuce and tomato exhibited the highest levels of Pb and Cd, while salad, carrot and beetroots were notably contaminated with Zn and Cr. In soil samples, the mean concentrations of Pb (34.13-35.36 ppm), Zn (7.66-8.6 ppm), and Cd (3.25-4.23 ppm) also exceeded FAO's RML. Likewise, in irrigated wastewater samples, the mean concentrations of Cr (3.71ppm), Cd (2.68ppm), and Pb (0.04ppm) surpassed the limits set by the US EPA guidelines. Grasses from irrigated areas also contained Pb, Cd, Cr, and Zn of 13.53, 2.16, 0.03 and 5.47 ppm concentrations respectively with Pb, Cd and Zn being above the recommended limits. The EDI, transfer health index (THI), and hazard index (HI) calculated for vegetables and grasses consumed by humans and livestock indicated elevated exposure, particularly for Pb, Cd, and Zn. In conclusion, the discharge of healthcare wastewater has compromised the suitability of river water for urban agriculture, livestock drinking, and the safe consumption of vegetables and animal products grown in wastewater-irrigated areas. Improving river water quality is crucial to mitigate potential health risks and to ensure the sustainable use of water resources.

## Keywords

Akaki River Catchment; Animal and human health risks; Environmental health risk; Grasses; Healthcare wastewater; Heavy metals; One-Health; Soil; Vegetable contamination

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## Professional Status of the Speaker

PhD Student

## Junior Scientist Status

No, I am not a Junior Scientist.

**Track Klassifizierung:** One Health in Public Health

**Typ des Beitrags:** Both options possible