An Examination of the Presence of Potentially Toxic Elements and its Related Health Risks within Food Webs, Highlighting Food Safety and Sustainability Concerns in Indonesia

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Abstract

Potentially toxic elements (PTEs), including Pb, As, Cd, and Cr are non-biodegradable toxic chemical substances originating from natural mineral sources and industrial effluents. Those elements are not allowed presence in human body in high concentration because they can cause health problems in human such as carcinogenesis, immune systems imbalance, kidney and liver dysfunction, and death. PTEs are frequently present in food products in Indonesia, attributable to inadequate industrial wastewater control and insufficient safety regulations. This is systematic review research utilizing papers from various journals published between 2004 and 2024 (20 years). Numerous studies indicate that the sources and transport pathways of potentially toxic elements (PTEs) in the environment may compromise the sustainability of food systems in Indonesia, as they pose hazards to human health. This problem is related to food safety program. Several studies found that the concentration of heavy metals in food products in Indonesia is higher than the acceptable concentration set by Indonesian regulation, FAO, and WHO. Numerous studies have documented PTE contamination in Indonesian food products and ecological components; nevertheless, a thorough toxicity assessment and critical evaluation of multitrophic transmission and the health risks associated with PTEs in the food chains in Indonesia remain insufficient. This literature review critically discussed PTEs contamination, research gaps, exposure toxicity, legislation, and future direction of remediation strategies to eliminate PTEs in food webs. This is the first research investigating the possible multi-trophic transmission of PTEs across food chains in Indonesia.