

Determination of Heavy Metals in Whitening Creams Using ICP-AES

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Structured Abstract

Background: Skin whitening creams often contain toxic heavy metals like mercury, lead, and cadmium, posing severe health risks such as neurotoxicity and kidney damage. In Malaysia, many unregulated creams exceed permissible limits set by the National Pharmaceutical Regulatory Agency (NPRA) and the U.S. Food and Drug Administration (FDA). These metals enter the body through dermal absorption, leading to long-term toxicity. Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) is a reliable method for detecting heavy metals. Stricter regulations and monitoring are essential to ensure consumer safety and prevent hazardous exposure.

Methods: The study used Inductively Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES) to determine heavy metal concentrations in whitening creams. Samples from five different brands, labeled as Brands A, B, C, D, and E, were collected from various stores in Malaysia. Sample preparation involved weighing 1.5g of the product, performing acid digestion, heating for three hours, cooling to room temperature, filtering, and transferring to labeled sample bottles. ICP-AES was calibrated and optimized to ensure accuracy. The method successfully quantified Hg, Zn, Fe, and Cd, providing essential data for assessing the safety of whitening creams.

Results: The ICP-AES analysis showed strong correlations for Hg, Zn, Fe, and Cd, allowing accurate quantification using calibration curves with good R^2 values. Hg was found at high concentrations in several whitening creams, exceeding permissible limits, posing potential health risks. Cd levels were also concerning in some brands. Zn and Fe were detected in varying amounts, with Fe concentrations sometimes exceeding safe limits. These findings highlight the need for stricter regulation and consumer awareness regarding harmful metal exposure from cosmetic products.

Conclusion: In conclusion, Hg, Zn, Fe, and Cd were successfully quantified in whitening creams using ICP-AES, with strong calibration curve correlations. Hg and Cd exceeded permissible limits, posing health risks, while Zn and Fe varied across brands, with some Fe levels being high. These findings highlight the need for stricter regulations and greater consumer awareness to ensure the safety of cosmetic products.

Keywords: Heavy metals, whitening creams, ICP-AES analysis, regulatory limits, consumer safety