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Carcinogenic and Non - Carcinogenic Health Risk Assessment of Formaldehyde Exposure Among Workers in a Cosmetic Manufacturing Facility

Tengku Aiman Naim Bustaman, Siti Raihan Zakaria*

Structured Abstract

Background: Formaldehyde is commonly used in cosmetic manufacturing, particularly through formaldehyde-releasing preservatives, and is known to cause both carcinogenic and non-carcinogenic health effects. Workers involved in cosmetic production may be exposed to airborne formaldehyde through inhalation during routine operations, especially in poorly ventilated environments. This study aims to determine formaldehyde exposure levels and evaluate the associated health risks among workers in a cosmetic manufacturing facility.

Methods: Formaldehyde exposure was assessed in selected production areas of a cosmetic factory in accordance with the Industry Code of Practice on Indoor Air Quality. Airborne formaldehyde concentrations were measured using a formaldehyde meter during working hours at randomly selected locations. The measured concentrations were compared with recommended occupational exposure limits. Non-carcinogenic and carcinogenic health risks were evaluated using the hazard quotient (HQ) and excess lifetime cancer risk (ELCR), respectively.

Results: Formaldehyde concentrations varied across work areas, with the highest concentrations recorded in the granule mixing, liquid filling, and cream filling rooms (0.018–0.734 ppm). 75% of the sampling locations exceeded the recommended exposure limits. Non-carcinogenic risk assessment showed hazard quotient (HQ) values greater than 1 in 75% of the production areas. Carcinogenic risk assessment revealed excess lifetime cancer risk (ELCR) values ranging from 10^{-7} to above 10^{-5}, with the highest risks observed in the granule mixing and liquid filling rooms.

Conclusion: Formaldehyde exposure in the cosmetic manufacturing facility presents potential health risks, particularly in the granule mixing, liquid filling, and cream filling rooms where the highest exposure and risk values were observed. Although measured concentrations were below the OSHA permissible exposure limit, the elevated HQ and ELCR values highlight the need for improved ventilation, stricter implementation of occupational safety practices, and consistent use of personal protective equipment to protect workers' health.

Keywords: Formaldehyde, Indoor Air Quality, Cosmetic Manufacturing

*Correspondence: sitiraihan@uitm.edu.my
School of Chemistry & Environment, Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam, Malaysia