[ID-P#158] Heavy Metal Emissions from Electronic Cigarettes: A Comprehensive Analysis and Health Risk Assessment

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Background: Aerosols emitted from electronic cigarettes (e-cigs) have been found to contain detectable levels of various heavy metals, raising concerns about potential health risks associated with their use. This study aims to analyse the heavy metals in e-cig emissions and evaluate the associated health risks.

Method: A comprehensive literature review of articles published from 2014 to September 2024 was conducted. The search was performed on Google Scholar and Scopus databases using specific keywords “Heavy Metals”, “Electronic Cigarettes”, “Vape Emission” and “Health”. The articles included journals, reports and reviews, and only English articles. From the 64 potentially relevant articles searched, 10 articles were thoroughly assessed and analysed in this study.

Results: Heavy metals present in e-cig emissions are mainly nickel (Ni), chromium (Cr), lead (Pb) and cadmium (Cd). The reported units for concentrations (ng/10 puffs; 1 puff/55 mL, ng/m3, µg/kg, µg/L) were converted to mg/m3 for comparison. Concentration for some commonly detected metals in emissions ranged from 4.35×10−6 to 1.12×10−1 mg/m3 for Ni, 7.97×10−7 to 2.95×10−2 mg/m3 for Cr, and 1.49×10−6 to 2.75×10−2 mg/m3 for Pb. Other elements such as aluminium (Al), Cd and copper (Cu) ranged from 3.51×10-7 to 7.09×10-7 mg/m3, 1.00×10-10 to 1.20× 10-9 mg/m3 and 1.31×10-8 to 1.27×10-7 mg/m3 respectively. Most reports are from the United States (6 articles), and the highest concentrations documented were primarily nickel (373 ng/10 puffs), zinc (4,580 ng/10 puffs) and lead (463 ng/10 puffs). Higher cancer risks were estimated at 5.9×10−7 mg/m3 for Ni, 5.2×10−8 mg/m3 for Cd, and 3.1×10−5 mg/m3 for Cr. Cr and Ni were found to be the leading contributors to respiratory cancer risk.

Conclusion: This study highlights the presence of harmful heavy metals in e-cig emissions. Further research is needed to identify additional heavy metals and assess their long-term health impacts on e-cig users.