

Airborne Particulate Matters Impact on Health and Environment

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Abstract:

Airborne particulate matter (APM) embodies the most critical environmental and public health challenges worldwide. This study reviews the characteristics, sources, chemical composition, and impacts of particulate matters (PM) like PM₁₀, PM_{2.5}, and PM_{0.1} with a explicit focus on associated heavy metals (HMs). PM are generated from both natural sources like volcanic activity, dust, vehicular emissions, fossil fuel combustion, industrial processes, and agricultural practices. Heavy metals like lead, cadmium, mercury, arsenic, chromium and nickel are frequently adsorbed fine particles, enhancing their atmospheric transport and bioavailability. Due to very small size and high reactive surface area, the ultrafine particles can penetrate deep into respiratory system, enter systemic circulation, and induce oxidative stress. Prolonged acquaintance is strongly linked with respiratory diseases, cardiovascular disorders, neurological impairments etc. The populations with pre-existing health conditions, including children, elderly, and individuals face elevated risks. Beyond human health, this study significantly highlights the atmospheric deposition of PM-bound heavy metals affects on the terrestrial and aquatic ecosystems through bioaccumulation, soil acidification, eutrophication, and disruption of nutrient cycles. A multidisciplinary research approach is essential to better understand long-term exposure risks, bioaccumulation pathways, and integrated environmental-health impacts.

Keywords:

Airborne Particulate Matter, Environmental Toxicology, Health Hazards, Heavy Metals.