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Benzene; Indoor Air Pollutant, Implications on Health and Its Control

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ABSTRACT: Indoor air environment possesses organic and inorganic elements, particulate matter, and bacteria. All enclosed human spaces, such as the home, office, shopping, education, entertainment, and transportation, are considered part of the indoor world. Although humans may be exposed to pollutants in indoor spaces through inhalation, absorption, and skin contact, investigations into indoor air quality usually focus on the inhalation pathway and thus on health risks associated with inhalation. Many indoor air pollutants may be classified based on their impact on human health, the frequency in which they occur, their typical concentration levels, and their origins, among other factors. This study focused on benzene species that are present in both indoor and outdoor air environments and are examined more commonly in indoor environments.

KEYWORDS: Indoor air pollution, Pollutants, Types, Benzene, IAQ, Solution

I. INTRODUCTION

An air quality index is a system that combines the weighed values of various air pollution-related parameters (such as pollutant concentrations) into a single number or set of numbers [1]. Majority of urban residents spend most of their time indoors, urban indoor air quality (IAQ) is a growing health concern, where emission levels are usually higher than they are outside. Both outdoor and indoor air comprises benzene. Indoor concentrations, on the other hand, are generally higher than those found in outdoor air due to benzene accumulation and the presence of several other indoor sources. Because of inadequate ventilation and widespread use of low-efficiency stoves and biofuels, the issue of indoor emissions from domestic cooking stoves takes on greater significance in developing countries. The use of kerosene stoves has been related to benzene concentrations ranging from 44 to 167 $\mu\text{g}/\text{m}^3$ [2]. Indoor benzene concentrations are mostly influenced by materials used in building, remodelling, and decorating [3]. Benzene and other aromatic hydrocarbons were present in substantially higher concentrations in enclosed vehicles in city traffic than in indoor air. One of the primary indoor sources of benzene is environmental cigarette smoke (ETS). Cigarette smoke emits between 430 and 590 μg per of benzene per cigarette [4]. One of the most common carcinogens in humans is benzene. The concentration of benzene in the air was higher than normal. The breath of a smoker is ten times more concentrated than non-smokers [5]. The amount of benzene in traditional smoke appears to be proportional to the amount of tar and nicotine found in the cigarette.

Benzene is a solvent that can be used in several things, including gasoline, inks, oils, and paints, plastics, rubber, detergents, pharmaceuticals, and dyes. Deodorizers are unquestionably among the most popular consumer goods in the modern world. Antiperspirants are personal care items that use preservatives and bactericidal activity to help prevent sweat from decomposing due to bacteria. Odorous VOCs, on the other hand, are contained in room air fresheners and are released to mask unpleasant odours. Strong room deodorizers and toilet bowl cakes, which are commonly used in bathrooms, can contain m- and p-dichlorobenzene. Shields et al [6] (1996) reported p-dichlorobenzene concentrations of up to 20 $\mu\text{g}/\text{m}^3$ in commercial buildings.

The toxicity of benzene is subject to its metabolism, as shown by its lower toxicity firstly in the presence of toluene, a benzene metabolism inhibitor; secondly in animals with partial hepatectomy, or mice lacking the CYP2E1 enzyme [7]. Chronic benzene exposure increases the occurrence of tumours in both rats and mice, though mice are more susceptible [8]. The acute non-oncogenic effects of high benzene applications and the carcinogenic effects of long-term exposure to lower applications are well-studied topics.

Since the majority of city residents spend 90% of their time indoors, urban indoor air quality (IAQ) is a growing health concern (either in office or home). Where emission levels are usually higher than they are outside

II. BIOLOGICAL APPROACH TO REMOVE INDOOR AIR POLLUTION:

Guieysse *et al.* examined the advantages and disadvantages of biological treatment methods for removing indoor VOC contaminants [9]. Biological approaches for indoor VOC elimination have shown some promise, but the unique characteristics of indoor air and the indoor air climate face various challenges. Seventy-three ornamental plant species were screened for their ability to extract 150 ppb benzene from indoor air by Liu *et al.* [10]. Over ten species, including *Crassula portulaca* and *Hydrangea macrophylla*, were found to have the greatest capacity to extract benzene from indoor air. Wang and Zhang implemented and tested a dynamic botanic air filtration device (DBAF), a fan-assisted activated carbon/hydroculture-based potted plant unit with optimised airflow [11]. NASA examined how well houseplants absorbed contaminants like benzene, formaldehyde, and trichloroethylene.

III. CONCLUSION

Indoor plants are beneficial to people's well-being in several ways. Plants are important in creating a fun and relaxing atmosphere in which to walk, function, and relax. Indoor plants can also improve occupational fitness, happiness, and productivity.

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