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Impacts of Linear Alkylbenzene (LABs) on ecosystems: Detection, fate and remediation

Sadeq Abdullah Abdo Alkhadher [a,*], Lariyah Mohd Sidek [a,b], Mohamad Pauzi Zakaria [c], Maged Al-gradi [d], Suhaimi Suratman [e], Mohammad Sherjeel Javed Khan [a], Hidayah Basri [a,b], Mohd Hafiz Zawawi [a,b], Najat Masood [f], Tonni Agustiono Kurniawan [g], Sami Magam [h]

[a] *Institute of Energy Infrastructure (IEI), Universiti Tenaga Nasional (UNITEN), 43000, Selangor, Malaysia*
[b] *Department of Civil Engineering, College of Engineering, Universiti Tenaga Nasional (UNITEN), 43000, Selangor, Malaysia*
[c] *Institute of Ocean and Earth Sciences (IOES), University of Malaya, 50603 Kuala Lumpur, Malaysia*
[d] *Department of Animal Production, College of Food and Agriculture Sciences, King Saud University, Riyadh, Saudi Arabia*
[e] *Institute of Oceanography and Environment, Universiti Malaysia Terengganu, Kuala Nerus 21030, Terengganu, Malaysia*
[f] *Department of Chemistry, College of Science, University of Ha'il, Ha'il City, Saudi Arabia*
[g] *College of the Environment and Ecology, Xiamen University, Xiamen 361102, Fujian, China*
[h] *Basic Science Department, Preparatory Year, University of Ha'il, Ha'il City, 1560, Saudi Arabia*

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ABSTRACT

This review article provides a thorough examination of an interaction between linear alkylbenzenes (LABs) and ecosystems. The review covers various aspects of LABs' impact on ecosystems, focusing on detection and treatment strategies to mitigate ecological consequences. It delves into LABs' role as molecular markers for sewage pollution, their physicochemical properties contributing to persistence, and their effects on aquatic and terrestrial organisms, including disruptions to endocrine systems. The diverse sources of LABs, including domestic wastewater and industrial effluents, are explored, along with their ratios in different matrices for assessing contamination origins. Biodegradation pathways of LABs, both aerobic and anaerobic, are scrutinized, considering their interaction with microbes. Distribution patterns in aquatic environments are discussed, encompassing sediment, water, sewage, and soils. An investigation is conducted on the relationship between LABs and total organic carbon (TOC) as a means of evaluating sewage pollution. It is assessed how sewage treatment facilities (STPs) contribute to biodegradation.

1. Introduction

Up to 1940, soaps were made from plant or animal triglycerides reacting with alkaline saponification to produce sodium salts of fatty acids (Al-Ghanayem and Joseph, 2020). During the 1960s, the use of linear alkylbenzenes expanded quickly owing to the remarkable quality of the items and their economic advantages (Thomes et al., 2019; Maulana et al., 2023; Alkhadher et al., 2023b). The widespread use of linear alkylbenzenes (LABs) in household detergents and industrial products raises environmental concerns (Achman et al., 1996; Alkhadher et al., 2021). LABs play a crucial role in industrial and domestic products as precursors for LASs, essential detergent components. Their widespread presence in ecosystems demands in depth examination, as they extend beyond industrial boundaries (Conchubhair et al., 2019; Liang et al., 2019).

Understanding the physicochemical attributes of LABs is crucial for understanding their interactions within ecosystems. Their hydrophobic nature and stability enable their persistence across diverse environmental matrices, making them valuable molecular markers for sewage contamination and influencing their distribution dynamics in aquatic and terrestrial domains (Alkhadher et al., 2015a, 2020a). LABs are molecular markers for sewage pollution, guiding the identification of sewage effluents and understanding potential ecological consequences. Their widespread presence in various environmental compartments highlights their crucial role in providing environmental disturbances and guiding mitigation strategies. Understanding their role in guiding mitigation strategies is essential.

Exploring the effects and toxicity of LABs on aquatic and terrestrial

* Corresponding author.
E-mail address: sadeq.abdo@uniten.edu.my (S.A.A. Alkhadher).

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