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Editorial: Biogeochemical behavior and biological response of environmental contaminants

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Editorial on the Research Topic
Biogeochemical behavior and biological response of environmental contaminants

The current pace of industrialization has escalated the discharge of contaminants into the environment, transforming environmental contamination into a pressing global issue. This contamination poses significant risks to both flora and fauna. For instance, plant growth and reproduction can be hindered (Li et al., 2023), while humans face heightened risks of chronic diseases (Shetaia et al., 2023). The magnitude of environmental contamination correlates with human activity, underscoring the importance of studying the biogeochemical behaviors and biological responses to these contaminants. This provides the essential theoretical groundwork for addressing and mitigating environmental contamination. By understanding the migration and transformation of contaminants across various environmental media, we can better manage and potentially alleviate these issues.

Studies in this realm aim to discern the distribution, behavior, and toxic effects of environmental contaminants. It is imperative to comprehend the biogeochemical behavior and biological repercussions of these contaminants to effectively control and manage them. Doing so aids researchers in better gauging potential risks and crafting interventions. For instance, delving into the mechanisms by which contaminants affect organisms can inform the creation of preventive measures to shield organisms from harm.

Many contaminants pose toxicity risks to various organisms, highlighting the pressing need for research aimed at ensuring ecological safety and protecting human health. A seminal study by Guo et al. employed a comprehensive quantitative analysis of numerous peer-reviewed articles, revealing the deleterious effects of microplastics on earthworms. Their research underscored histopathological damage and oxidative stress as primary toxic mechanisms. Moreover, they identified critical concentrations of microplastics that trigger neural and DNA damage in earthworms due to oxidative stress. Their findings contribute significantly to the theoretical foundation necessary for fostering an ecologically sustainable soil environment. Furthermore, environmental contamination can spur the adaptive evolution of microorganisms. Notably, certain microorganisms, with the potential to effectively break down pesticides, can be isolated from pesticide-contaminated soils (Sun et al., 2022). In a pivotal study, Zhang et al. cultivated strains specifically adept at degrading diesel oil, offering a promising solution to mitigate the

environmental harm posed by diesel contamination and underscoring its utility in bioremediation efforts for diesel-polluted soils. The pervasive nature of organic contamination is alarming, particularly in the absence of robust monitoring tools. Emphasizing the urgency of this issue, Ma et al.highlighted the unique propensity of cats to accumulate organic contaminants, particularly those associated with indoor environments. Intriguingly, a majority of these organic compounds remain undegraded within their systems, positioning cats as potential bio-indicators or "sentries" for monitoring indoor contaminants. In another insightful study, Li et al. leveraged advanced techniques involving double isotopes and Bayesian models. This approach facilitated the identification and quantification of multiple contamination sources, paving the way for a more nuanced understanding of the source, movement, and alteration of nitrogen within the Cao'e River basin.

However, understanding contaminants in the environment is not straightforward. Often, it is not a singular contaminant but a combination, necessitating bespoke experimental approaches. Given the vast array of contaminants, comprehensive sample analysis can be costly and time-intensive. Consequently, establishing contamination models using extensive data for simulation becomes a viable strategy (Zhang et al., 2023). Yet, the absence of authoritative databases limits the potential of such modeling. Additionally, the use of experimental animal models is indispensable for understanding the behavioral responses to contaminants. The integrity of these models is paramount, as it directly impacts the accuracy and reliability of research findings (Zhang et al., 2022).

In light of the above, the editors anticipate this Research Topic will captivate the readership of Frontiers in Environmental Science, sparking further advancements in understanding the biogeochemical behaviors and biological impacts of environmental contaminants.

Author contributions

CZ: Conceptualization, Writing-original draft. AL: Supervision, Writing-review and editing. PG: Supervision, Writing-review and editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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