Petroleum Pollution and Soil-Borne Antibiotic Resistance: Insights and Implications for Ecosystem Health

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Abstract

Antibiotic resistance is an emerging global health crisis with the potential to impact both ecosystems and human health. One of the most overlooked contributors to the spread of antibiotic-resistant bacteria is oil pollution, which creates an environment conducive to the proliferation of resistant microbes. Understanding how oil contamination in soil contributes to the spread of antibiotic resistance is crucial, as it may exacerbate the risk of resistant bacteria affecting not only soil ecosystems but also water bodies and the atmosphere. Despite its importance, information on the specific mechanisms driving the spread of antibiotic resistance in oil-polluted soils remains limited. Moreover, available data on the resistance profiles of bacteria in these environments is often fragmented, hindering our ability to fully understand the scale of the problem. This article highlights the role of oil-contaminated soils as key hotspots for the development and dissemination of antibiotic-resistant bacteria. The bacterial species implicated, and techniques for identifying resistant genes in polluted environments have also been expatiated on. To address the threat of antibiotic resistance spread, we recommend developing innovative bioremediation technologies, like enzyme- or gene-based methods, to efficiently decontaminate petroleum pollutants. These strategies can help reduce antibiotic resistance and support the One Health approach, emphasizing the link between human, animal, and environmental health

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