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**Emerging PFAS Contamination: Understanding the Ecological and Human Health Impacts on Water Quality**

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**Abstract**

The emergence of per- and polyfluoroalkyl (PFAS) contamination has raised critical concerns regarding its profound impact on the environment and human health. PFAS, widely known as "forever chemicals" due to their exceptional persistence, have infiltrated aquatic ecosystems globally, posing a dual threat to water quality and public well-being. Hence, we conducted a thorough systematic review of primary research to provide insights into the geographical distribution, detection patterns, and the serious environmental and health concerns associated with PFAS contamination. The process of article screening was executed by adopting search keywords such as "PFAS contamination", "sustainable water resources", "aquatic ecosystems", "health risks", and "innovative remediation approaches" using the Web of Science database. We exclusively considered 25 peer-reviewed articles published in English from 2018 to 2023 for our analysis. We employed content analysis and thematic analysis to analyse data. The study's findings reveal that PFAS contamination has become pervasive in aquatic environments, stemming from industrial discharges and atmospheric deposition. Recent research highlights the presence of PFAS in Finnish rivers and fish, with profound ecological consequences as these chemicals persist in ecosystems, entering the food chain and potentially disrupting aquatic life. On the human health front, consuming PFAS-contaminated fish, particularly those with high PFAS levels like PFOS, poses inherent risks, potentially exceeding safe intake levels. The evolving landscape of PFAS compounds, shifting from long-chained to short-chained variants, adds complexity to the issue. Therefore, addressing these multifaceted challenges requires robust monitoring, stringent regulations, and source-focused remediation efforts at wastewater treatment plants and contaminated land areas. In conclusion, the emerging PFAS contamination crisis demands comprehensive strategies for safeguarding ecosystems and public health. Continued research, strict regulations, and innovative remediation methods are essential to mitigate these ecological and health risks effectively.

**Keywords:** Aquatic ecosystems, Innovative remediation approaches, Ecological and human health risks, PFAS contamination, PFOS contamination