CHAPTER 1

The Fate of Pesticides in Wastewater: A Review

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ABSTRACT

Pesticides are substances applied primarily in agricultural practices to improve the quality and yield of crops by protecting them against pests and diseases. The growing global demand for adequate and high-quality food necessitates an increased rate of pesticide application for food production. As a result, active pesticide ingredients, referred to as pesticide residues (PRs), accumulate in domestic and industrial wastewater through effluent discharge and runoff from agricultural or industrial settings. Consequently, these residues induce physicochemical (abiotic) processes and biochemical (biotic) transformations, degrading water quality and leading to acute or chronic toxicity in aquatic animals and humans, depending on their nature and concentration.

Long-term exposure to PRs can pose significant risks to public health through pesticide poisoning. The associated risks include ataxia, carcinogenicity, heart, liver, and kidney diseases, lung injury, skin irritation, paralysis, and death, depending on the pathways of cellular and molecular interactions within biological systems. Thus, the presence and fate of PRs in wastewater remain a global concern, requiring adequate scientific attention to mitigate their effects on humans and the environment.

This chapter provides an overview of some prominent PRs in wastewater from both agricultural and non-agricultural fields. These include organochlorines, organophosphorus compounds, S-metolachlor, polychlorinated biphenyls (PCBs), polychlorinated dibenzo-dioxins (PCDDs), atrazine, chlorfenapyr, chlorpyrifos, diazinon, difenoconazole, ethion, fipronil and its metabolites, malathion, dichlorvos, methyl parathion, profenofos, and thiacloprid. The review enumerates the processes leading to the deposition of pesticides in wastewater, the consequences of their accumulation, and approaches for their effective

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