World Journal of Pharmacology and Toxicology

Open Access

Comparative Toxicity o Common Environmental Pollutants in Aquatic Ecosystems: Implications for Human Health

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Aquatic ecosystems are increasingly exposed to a variety of environmental pollutants, including heavy metals,

problems in children, including reduced IQ and behavioral disorders [3].

Pha ace ca

Pharmaceuticals, including antibiotics, analgesics, and hormones, enter aquatic environments through wastewater discharge. ese compounds can have sublethal e ects on aquatic life, even at low concentrations.

Ma e a a d Me h d

S d de g

is comparative study on the toxicity of common environmental pollutants in aquatic ecosystems was conducted through a systematic review of existing literature. e study focuses on four major categories of pollutants: heavy metals, pesticides, pharmaceuticals, and industrial chemicals. A comprehensive analysis was performed to assess the impact of these pollutants on aquatic life and the potential implications for human health [4].

L e a e ea ch

A thorough literature search was conducted using several scienti c databases, including PubMed, ScienceDirect, and Google Scholar. Keywords used in the search included “environmental pollutants,” “aquatic ecosystems,” “heavy metals,” “pesticides,” “pharmaceuticals,” “industrial chemicals,” “toxicity,” “bioaccumulation,” “endocrine disruption,” and “human health implications.” e search was limited to articles published in English within the last 20 years to ensure the relevance and timeliness of the data.

I c a d E c C e a

I c C e a

- Peer-reviewed articles, reviews, and meta-analyses.
- Studies focusing on the toxic e ects of heavy metals, pesticides, pharmaceuticals, and industrial chemicals on aquatic organisms.
- Research examining the implications of these pollutants on human health.

E c C e a

- Studies not related to aquatic ecosystems.
- Articles not providing speci c data on toxicity levels or mechanisms of action.
- Non-peer-reviewed sources and grey literature [5].

Da a E ac a d A a

Data were extracted from selected studies, focusing on:

- Pollutant Characteristics: Chemical properties, sources, and environmental concentrations.
- Toxicity E ects: Speci c e ects on various aquatic species, including sh, invertebrates, and microorganisms.
- Bioaccumulation and Biomagni cation Levels of accumulation in aquatic organisms and the potential for biomagni cation through the food web.
- Mechanisms of Toxicity: Biological pathways and mechanisms underlying the toxic e ects of each pollutant.
- Human Health Implications: Potential health risks to humans from exposure to contaminated water and aquatic organisms [6].

C a a e a a

e comparative analysis involved

- Examining the toxic e ects of mercury, lead, cadmium, and arsenic on aquatic organisms and their bioaccumulation potential.
- Analyzing the impact of atrazine, glyphosate, and chlorpyrifos on endocrine disruption and reproductive anomalies in aquatic life.
- Investigating the sublethal e ects of antibiotics, analgesics, and hormones on aquatic species and microbial communities.
- Assessing the carcinogenic and mutagenic e ects of PCBs and PAHs on aquatic organisms [7].

R a e e

A qualitative risk assessment was conducted to evaluate the potential human health risks associated with exposure to these pollutants. is involved reviewing epidemiological studies and risk assessments from health agencies such as the World Health Organization (WHO) and the Environmental Protection Agency (EPA).

- Antibiotics can disrupt microbial communities in aquatic ecosystems, leading to antibiotic resistance and altered nutrient cycles.
- Common painkillers like ibuprofen can a ect sh behavior, reproduction, and development.
- Hormonal pollutants, such as those from birth control pills, can cause endocrine disruption in sh, leading to issues like intersex conditions and reproductive failure [8].

I ca f h a hea h

environmental pollutants in aquatic ecosystems underscore the critical threats these substances pose to aquatic life and human