



Emerging Pollutants: Protecting Water Quality for the Health of People and the Environment

An overview of endocrine-disrupting compounds in drinking water and human health

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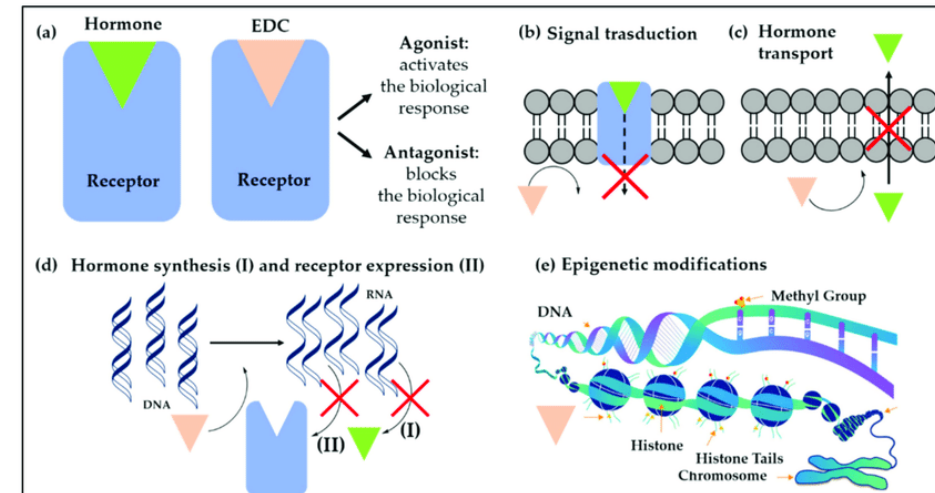
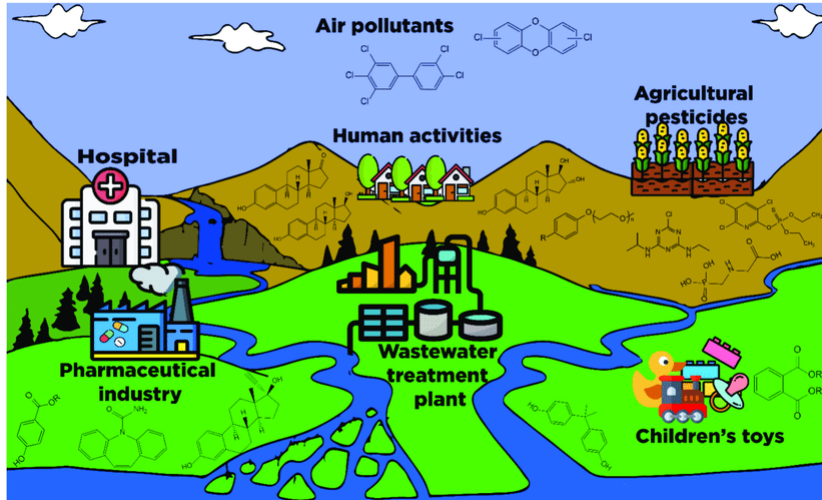


Background

- Access to safe water is paramount in determining environmental sustainability, public health, and economic prosperity.
- Endocrine disrupting compounds (EDCs) are an environmental contaminant of emerging concern, which threatens the safety of drinking water.
- EDCs are emerging contaminants that have accumulated in the water at concentration levels that have been determined to be significant to humans and animals.
- Several compounds belong to this family, from natural substances (hormones such as estrone, 17 β -estradiol, and estriol) to synthetic chemicals, especially pesticides, pharmaceuticals, and plastic-derived compounds (phthalates, bisphenol A).
- The purpose of this article is to compile important aspects of EDCs, especially human health effects.

Literature review

- A review of recent publications revealed that the potential health issues of EDCs are not fully understood yet due to scarce research on their exposure and associated risks via drinking water consumption.
- Literature search included EDCs' contamination and accumulation in water, their toxicity and exposure risks to human.



What we know

- Many EDCs have been identified in significant amounts in different water matrices including drinking water, thus increasing the possibility of entering the food chain.
- In general, EDCs interfere with the endocrine system, particularly hormone signals, by antagonizing the modes of action and mechanisms of endogenous hormones, especially through nuclear receptors.
- The disrupted endocrine system thus causes effects in exposed individuals and populations ranging from acute to chronic diseases, namely, metabolic syndromes, reproductive abnormalities, behavioral changes, disrupted fetal development and growth.
- EDCs are not easily removed from water through conventional treatment processes offered by water or sewage treatment plants. Thus, advanced removal technologies could represent more appropriate removal pathways.

What we know

- Owing to the diverse physicochemical properties of the endocrine disruptors, several processes can be applied as treatment technologies and obtain different removal efficiencies.
- Different methods, like biosorption, adsorption, advanced oxidation, membrane filtration, and biodegradation, have been investigated as suitable treatment pathways for the removal of EDC.
- Several EDCs have been identified in the treated drinking water supply worldwide, particularly in tap water in the concentration range of 0.2–5510 ng/L, with a maximum concentration (28,000 ng/L) detected in drinking water from the wells in India.
- The World Health Organization has revealed that the WHO guidelines for drinking-water quality are inadequate based on the current exposure levels to EDCs in drinking water.

Conclusion

- Integrating preventive measures with a multibarrier approach to safe drinking water is highly challenging because of the relatively low public awareness and political responsibility, as well as the nature and characteristics of EDCs themselves.
- Further progress on the detection, complete health hazards and removal of EDCs from drinking water are need of the hour.
- WHO guidelines for drinking-water quality is now receiving rolling updates as and when new data emerge. The latest guideline is 4th edition with addenda, published in 2022.
- EDCs are also present in air and food; total intake from all sources is the deciding factor for human health effects. A holistic approach to this emerging issue is needed.