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Connecting wastewater quality and human exposure pathways

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Many different chemicals can enter the water and wastewater network as a result of anthropogenic activities. Wastewater entering the sewage treatment (influent) can provide information on the chemicals that the connected human population is exposed to. Treated wastewater flowing out of the sewage treatment plant (effluent) can also be a source of chemicals to which people can get exposed indirectly via the environment, especially when these chemicals are persistent. The linkage between human exposure and occurrence in wastewater influent and effluent defined by the sources of the chemicals and the processes in the environment are studied in environmental forensics.

This study aimed to establish a connection between wastewater quality, exposure pathways, and potential health risks from chemicals found in (treated) wastewater. Reuse of wastewater and increasing water scarcity due to climate change may result in an increase in human exposure to chemicals in wastewater. A systematic literature review identified pathways through which humans can be exposed to wastewater and wastewater contaminants. Human exposure to wastewater can occur through accidental ingestion during recreational or occupational water activities, dermal contact with irrigated areas, inhalation of wastewater aerosols, and the consumption of food or drinking water that came in contact with wastewater. A prioritization framework was developed to evaluate the chemical composition of wastewater. This was based on criteria related to exposure and risk, such as tolerable daily intake, water quality threshold values, persistency, and bioaccumulation. The framework prioritized PFAS, pesticides, fungicides, heavy metals, PCBs, surfactants, and antimicrobial agents as substances that are associated with health risks.

The main outcome is a novel approach to evaluate effluent concentrations and their potential implications for human health, while existing research primarily focuses on ecotoxicological and environmental aspects. Persistent chemicals with bioaccumulating properties have significant potential to harm human health. This underlines that efforts should be made to prevent or mitigate the discharge of these potentially harmful chemicals into the wastewater and receiving surface water. It is recommended to monitor areas and products that come into contact with wastewater effluent and be vigilant for a potential increase in chemical concentrations.

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