Presence of Pharmaceuticals in Irish Surface Waters

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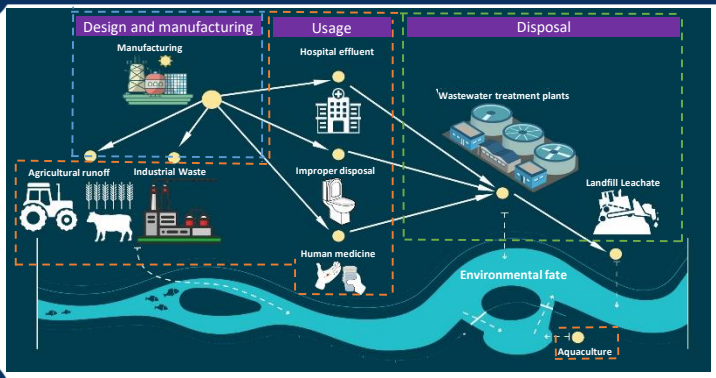
1 Introduction:

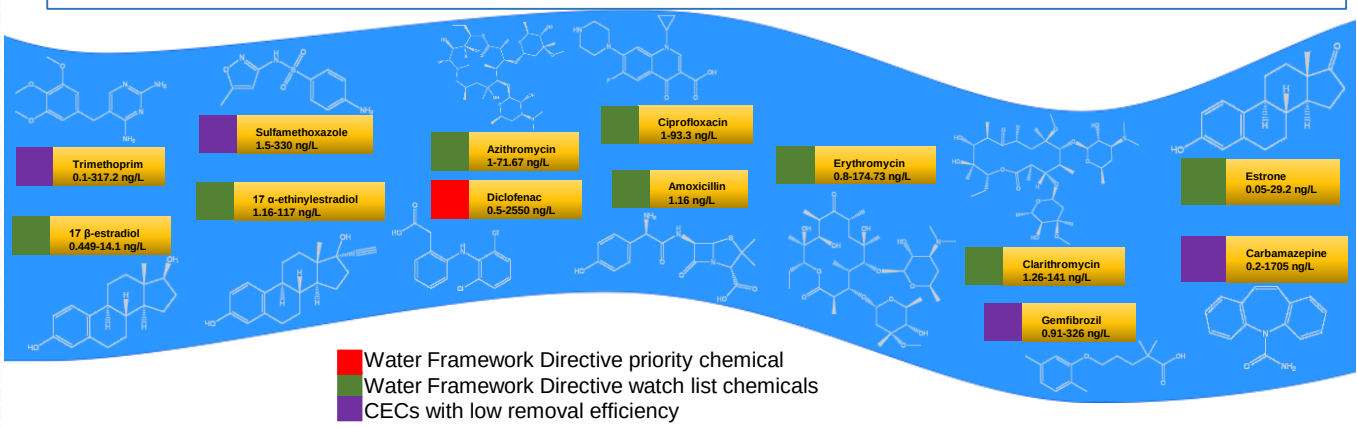
At each stage of a pharmaceutical lifecycle, there is a significant risk of environmental exposure. For this reason, it is imperative to implement both source directed and end of pipe control measures. This will mitigate any potential hazards to the environment or to humans. The ever-increasing use and availability of pharmaceuticals in the last decade have led to the contamination of surface water ecosystems with ng/L to µg/L concentrations. The environmental fate and toxicological implications of many pharmaceuticals and their residues are not fully understood. Additionally, the stability and biological activity of these "micro-pollutants" can lead to chronic environmental exposure causing behavioural and health-related effects. This research investigates pharmaceuticals chosen from the updated surface water "Watch List" (Decision (EU) 2018/840), followed by pharmaceuticals which are commonly found in European surface water and pharmaceuticals which have a low removal efficiency in wastewater treatment plants.[1] This project aims to create a comprehensive prioritisation framework and a risk-based assessment by calculating their risk quotient for each of the chosen pharmaceuticals.

2 Life cycle of pharmaceuticals



3 Pharmaceuticals commonly found in European surface waters

Each of these chosen pharmaceuticals have been identified as Contaminants of Emerging Concern (CECs).[2] However, the chemical cocktail of pharmaceuticals and their associated metabolites can lead to an unknown toxicity to humans and biota.



4 Factors influencing environmental concentrations and risk assessment

Increased usage

Pharmaceutical usage is projected to increase by 43-67 percent by the year 2045. [4]

Improper disposal

of 398 people questioned in Cork and Galway had said they have improperly disposed of medicine in the past.[5]

72%

Environmental risk assessments are only conducted on pharmaceuticals licenced after 2006.[6]

Climate change!

Droughts and floods can drastically alter the dilution of pharmaceuticals in surface water. This can lead to pollution events where the toxic effects of pharmaceuticals are heightened.[5]

Acknowledgements

Water Institute DCU epaResearch Climate · Water · Sustainability

References:

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