

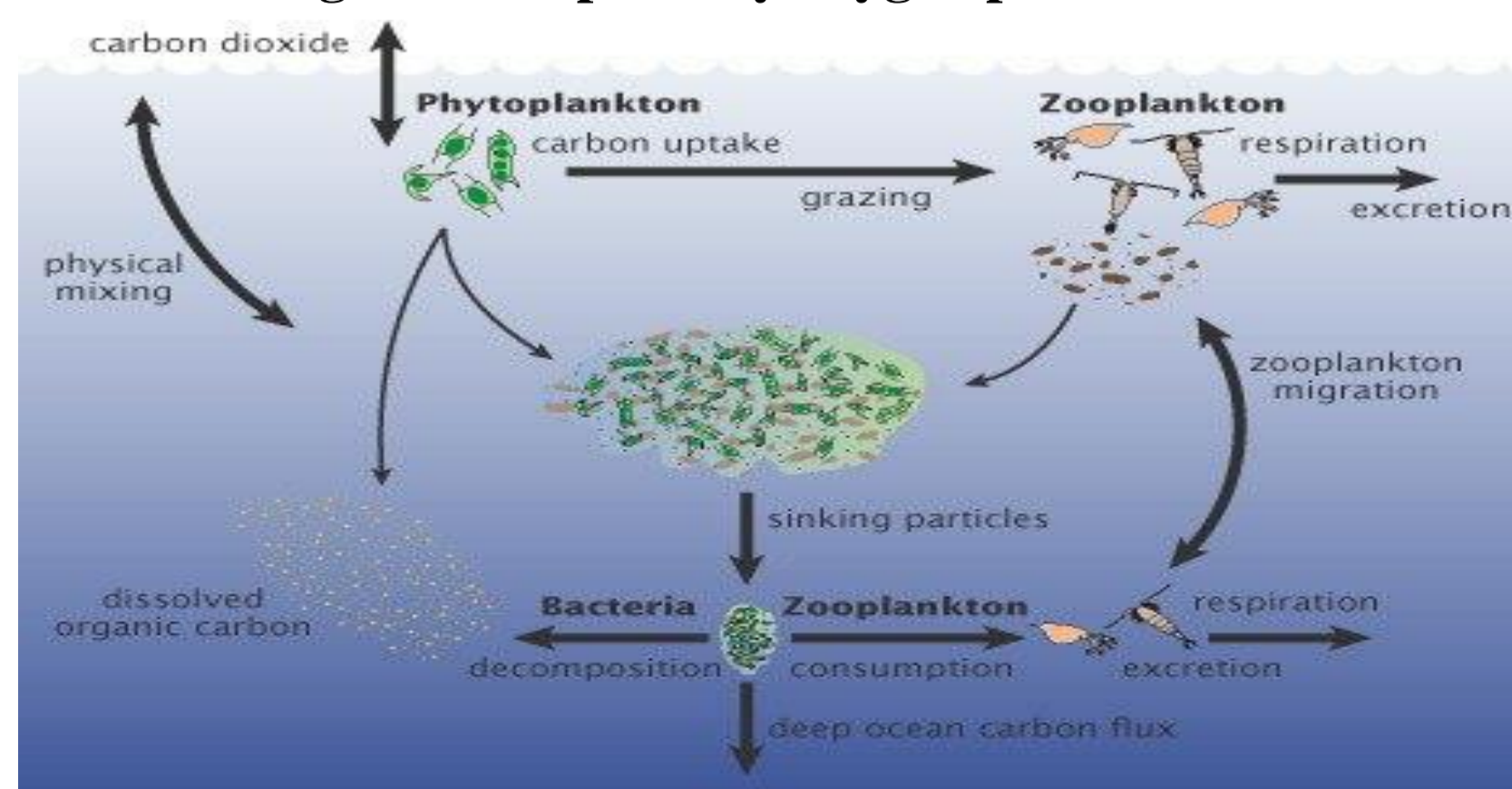
The Impact of Pharmaceuticals on Phytoplankton: Save Phytoplankton, Breathe Freely Contaminants of Emerging Concern

Introduction

The production, prescription and use of pharmaceuticals (PC) has steeply increased during the last decades. PCs are ubiquitous in aquatic ecosystems. They are found at concentrations ranging from several picograms per liter to several milligrams per liter. These compounds have ecotoxic effects on aquatic organisms, even at very low concentrations. They can significantly affect aquatic organisms when chronically exposed and can cross trophic levels and travel up the food chain.

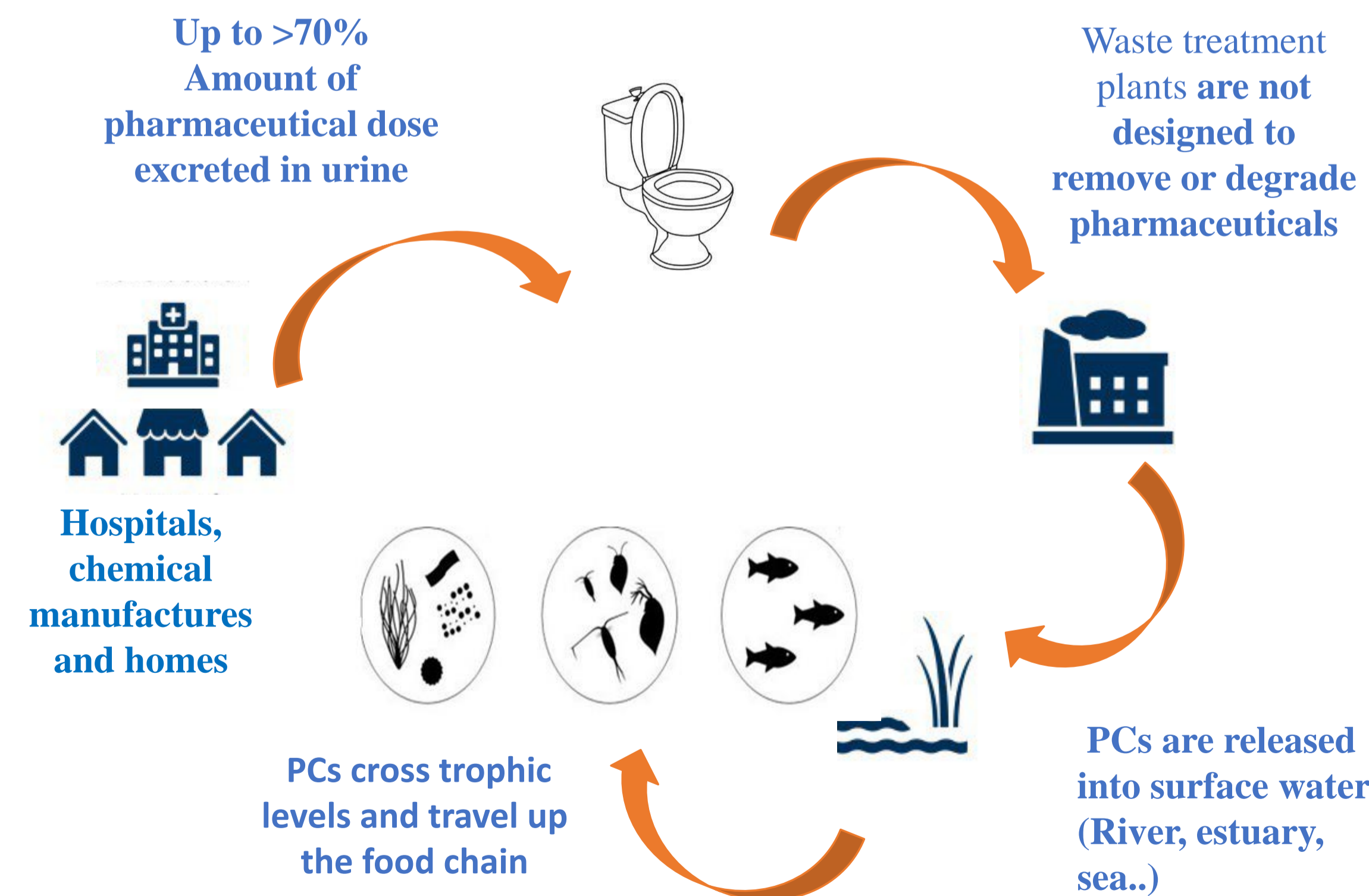
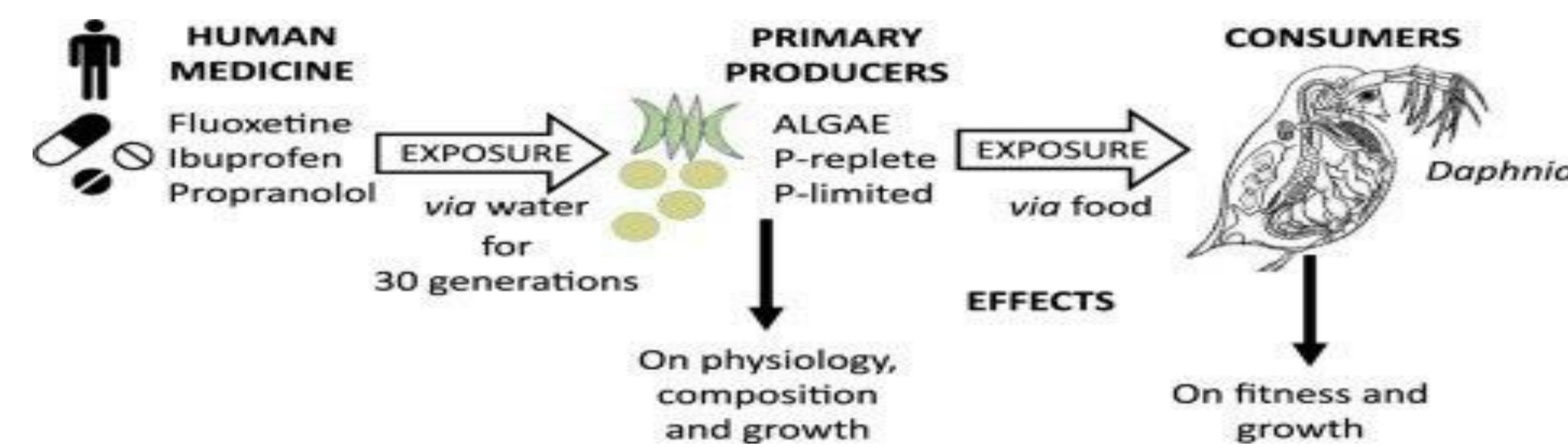
Challenge

- Being biologically active by design, antibiotics and non-steroidal anti-inflammatory drugs (NSAIDs) are of concern for their potential interactions with non-targeted organisms in the environment, such as plankton. The two main types of plankton are the photosynthesizing phytoplankton, and zooplankton which are animals.
- Phytoplankton are aquatic primary producers, a basic food source and a carbon recycler. Even a slight change in their productivity could affect the world's climate. It is estimated that the ocean-dwelling phytoplankton is **responsible for 50-70% of the global net primary oxygen production.**



Results

Experimental results have shown, **PCs are bio-accumulated and consequently consumed by the zooplankton *Daphnia magna*.** The anti-diabetic drug, metformin, **affects phytoplankton photosynthetic processes by increasing non-photochemical quenching (NPQ) and reducing electron transport.** Hence, different aspects of phytoplankton life, ranging from growth, reproduction, morphology, physiology, biochemical composition, oxidative response, proteomics, and transcriptomics, are altered by PCs.



Studies have shown our drinking water contains traces of PCs, including antibiotics and medicines used to treat anxiety, heart problems, infection etc.

Conclusion

The contamination of water bodies with pharmaceutical products is unfavorably affecting phytoplankton's ability to perform their vital role in oxygen production. So, one can expect that a decrease in the rate of oxygen production by phytoplankton may have catastrophic consequences for life on earth, possibly resulting in a mass extinction of organisms.

References

- Orias, F., Simon, L., & Perrodin, Y. (2015). Respective contributions of diet and medium to the bioaccumulation of pharmaceutical compounds in the first levels of an aquatic trophic web. *Environmental Science and Pollution Research*, 22(24), 20207–20214. <https://doi.org/10.1007/s11356-015-5243-7>
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