

Occurrence of antibiotics in aqueous matrices: an outlook about the situation in Brazil

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Keywords: Pharmaceuticals, Surface water, Wastewater, Hospital effluent.

Highlights

The occurrence of antibiotics in Brazilian waters was carefully revised. 20 antibiotics were detected in 4 matrices ranging from ng L^{-1} to $\mu\text{g L}^{-1}$. Antibiotic concentrations reached up to 37300 ng L^{-1} .

Abstract

Antibiotics are among the most important tools in medicine, but their misuse and overuse can stimulate bacterial evolution and the spread of resistance, one of the principal threats to public health in the 21st century¹. This study presents data regarding the occurrence of antibiotics in several aqueous matrices in Brazil in the last twelve years (from 2010 to 2022). The search was thoroughly carried out using Science Direct, Web of Science, and Scielo databases. A total of 20 scientific papers were found to develop this work (Fig. 1A). Despite the low number of studies regarding this subject, Brazil is the Latin American country with the highest number of published data on the occurrence of antibiotics in surface water. These studies are still limited to the south and southeast regions. Only two studies were carried out in the Northeast region and there is an absence of data in other regions (North and Central West), leaving Brazil without a general scenario about the occurrence of antibiotics. Data from these papers show the detection of 20 antibiotics in 4 aqueous environments, occurring at concentrations in the range from ng L^{-1} to $\mu\text{g L}^{-1}$. Sulfamethoxazole was the most frequently found and the one with the highest concentration, 37300 ng L^{-1} in a hospital effluent (Fig. 1B and C). As expected, in studies about seasonal variation, the highest levels of the antibiotics commonly prescribed to treat respiratory infections were found in winter, while antibiotics used for other types of infections are generally climate independent.

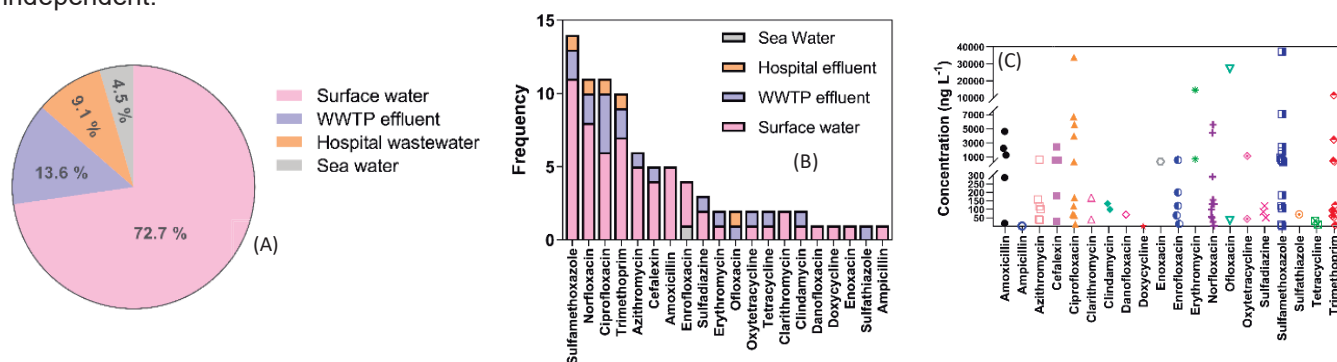


Figure 1: (A) Distribution of studies by matrix (B) Frequency of antibiotic by matrix and (C) Maximum antibiotic concentrations found.

The large variations in climate and social conditions play an important role in the consumption of antibiotics in different regions. For example, according to the Brazilian Diagnostic of Water and Sewage Services², only 54.1% of the population has a sewage treatment service, predominantly the urban population and centered in the most populous region, causing a direct impact on the occurrence of antibiotics in surface water. Since most of the occurrence studies were conducted in south and southern regions, the data available are only representative of these regions and is not an appropriate standard for the rest of the country. Furthermore, considering the environmental and health urgency associated with this topic, and consequently, for future inclusion of antibiotics to the standards related to water quality, it is necessary: (i) further studies to evaluate the capacity of the wastewater treatment plants (WWTPs) for removing antibiotics; (ii) the studies of occurrence in the other regions of the country.

References

¹ WHO, 2018. WHO Report on Surveillance of Antibiotic Consumption 2016 – 2018.

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Acknowledgments

FAPESP (grants 2018/12780-4 and 2019/22218-4), CNPq, CAPES (Finance Code 001) and PROPe-PROPG/UNESP. 46^o Reunião Anual da Sociedade Brasileira de Química: "Química: Ligando ciências e neutralizando desigualdades"