The Potential of Waters Analysis in Toxicology: A Review of Publications Between 2019-2023

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ORIGINAL ARTICLE

ASTRACT

Introduction: Water quality-threats have been emerging over the years, presenting a devastating public health issue[1]. The analysis of water from the standpoint of toxicology is essential for assessing the risks posed by contaminants, safeguarding human health and ecosystems, complying with regulations, and making informed decisions to manage and protect water resources. It enables a comprehensive understanding of the complex interactions between pollutants, organisms, and the environment. Thus, the present study aimed to explore descriptively which are the current most common extraction and detection techniques, as well as the tested analytes and types of waters.

Methodology: To achieve this purpose, the Web of Science database was used to retrieve papers published from 2019 to 2023 (10th august 2023), with the search string "determination in water" for terms included in the title, abstract or keywords. Given the generality of the search's thematic, only articles written in English and performing analyte extraction and detection in water samples were included.

Results: Taking these criteria into consideration, 2962 articles were found from which 333 were considered. Articles were classified according to the type of paper, analysed water(s), detected analyte(s), and extraction and detection approaches. From the 306 original articles and the 27 reviews analysed, the majority assessed surface waters (195), followed by wastewaters (152), tap (60), drinking (29), rain (7) and hospital waters (5). Regarding analytes, pharmaceuticals (39%) and pollutants (34%) emerged as the main concerns, whereas heavy metals (14%), biomarkers (5%), substances from cosmetics (5%), illicit drugs (2%) and caffeine (2%) were less studied. Correlation between contaminants and type of water was also described (e.g., surface water and pharmaceuticals were detected 45%). The great majority of studies used solid-phase extraction (71%), while others chose miniaturized techniques (21%), liquid-liquid extraction (5%) or protein precipitation and direct injection (3%). Liquid chromatography (63%) was the most used instrumentation method, followed by gas chromatography and biosensors (both 12%), spectrophotometric methods and atomic absorption spectrometry (both 5%) and fluorometric methods (2%).

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Discussion and conclusions: In conclusion, considering the crucial role of water quality assessment in public health and safety, further investigation is needed in order to improve and optimize the existing approaches, taking into account the type of analyte and sample.

Keywords: toxicology, water analysis, public health.

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