Perspective

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Drinking-Water Contaminated with Micro-Plastics

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Abstract

Micro Plastics (MPs) have been found in tap and bottled water in a variety of locales, according to scientists. On a worldwide basis, information on MP contamination in drinking water is currently scarce. Although there are significant disparities in reported MP concentrations, it is impossible to say whether MP content is higher in tap or bottled water. It is still unknown if these inconsistencies are due to variances in the analyzed systems or differences in quantification limits the accuracy of the used analytical methods, or contamination during collection, processing, and analysis. Furthermore, animal and cell toxicity investigations have yielded relatively little information on MP absorption and destiny. Comparable data from quality guaranteed and regulated methodologies, as well as further knowledge on the possible absorption and destiny of MPs in the human body, are still needed to set a limit of tolerance for plastic pollution in drinking water.

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Introduction

Because plastics are ubiquitous in all parts of human existence, people are inextricably exposed to Micro Plastics (MPs) daily. MPs have been found in tap water from various sources (ground, surface, or desalinated water and bottled water in various packaging (single-use plastic, reusable plastic, beverage carton, and glass) at various locations around the world in recent years. Concerns about the potential health effects linked with MP exposure through drinking water have grown. Because one of the United Nations' Sustainable Development Goals is to ensure that everyone has access to clean drinking water, it's critical to accurately measure MPs and related dangers to human health from drinking water usage. As a result, the European Drinking Water Directive (DWD) wants to put MPs on a "watch list" of developing chemicals by 2024, in response to rising public concern over MPs and their consequences for human health.

The World Health Organization divides the possible human health concerns associated with MPs into two categories: particles and chemicals, and biofilms adhering to MPs. We will concentrate on MP contamination in drinking water in this review. We analyzed peer-reviewed papers on MPs in tap and bottled drinking water published between 2018 and 2021 to assess the current level of knowledge. Scopus was used to find the literature using the search term 'TITLE-ABS-KEY (microplastic AND drinking AND water AND bottle OR tap).'In addition, we searched Google Scholar for related publications using relevant keywords. We found 26 studies on MPs in drinking water as a result of our search. The purpose of this study was to highlight critical information gaps, difficulties, and key problems in MP drinking water research that must be addressed to better understand and assess future threats to human health.

The possible health concerns associated with MP consumption are poorly known, and data on MP absorption and destiny obtained from animal and cell toxicity studies is scarce. MPs' destiny and rate of absorption into different organs, on the other hand, are said to be depending on their size and polymer type. The absorption of MPs bigger than 150 m into organs is considered implausible, whereas the absorption and uptake of MPs smaller than 20 m into organs are considered restricted. The European DWD, on the other hand, wants to put MPs on a "watch list" by 2024-26, enabling member states to take preventative actions to decrease MPs if too many are notified. Putting the consumption of MPs in drinking water into context, based on existing evidence, drinking water may not be the primary source of MP absorption for a human being. Even though ingestion is the most common way for humans to be exposed to MPs, other routes like inhalation and skin contact are also important sources of exposure. An absorption of 12,000-204,000 particles per person and year is estimated based on the intake of plastic-contaminated seafood (fish and shellfish), beer, table salt, sugar, and honey. Inflammation, increased permeability, cell function disruption, increased oxidative stress, and changes in gut microbial composition and metabolism may all result from MPs

entering the gastrointestinal tract via contaminated foodstuff. MPs may be adsorbed in the gut wall by specialized M-cells after digestion, whilst the 'corona' effect may enable MP particles to permeate the intestinal mucus by increasing their solubility or simply because of their tiny size. As their translocation to the circulatory system following oral treatment has been proven in vivo, MPs might be vulnerable to these similar processes.

Concerns about the impact of plastic and microplastic contamination have boosted public awareness and participation. Parallel to this, political commitment is developing, with government officials from around the world, including the European Commission, pledging to dramatically reduce single-use plastic goods over the next ten years and stressing the significance of long-term MPs removal from the seas. The European Union emphasizes the urgent need for standard MP sampling techniques for monitoring and studying water quality in all water bodies, from lakes, rivers, and streams to pressurized water systems, drinking water, and wastewater, in the framework of the DWD. Although the robust and consistent technique is beginning to emerge, there is presently no universal strategy for sampling these contaminants in water. Furthermore, the destiny, absorption rate, and consequences of MPs on human health must be addressed to identify the limit of tolerance for MPs in drinking water.

Conclusion

The combination and stepwise approach of 1. Quality assurance/control of harmonized methods, 2. Collection of resulting comparable quality data, 3. Further development of analytical techniques to increase sensitivity and, for example, reliably assess ever smaller plastic particles, and 4. Data collection on the uptake and fathoming of plastic pollution in drinking water, in our opinion, offers the best chance to evaluate potential risks and define the limit of tolerance for plastic pollution in drinking water. As a result, determining the acceptable level of plastic contamination in drinking water will take time. Meanwhile, additional research should be focused on the development of new technological breakthroughs for MPs/NPs (Nano Plastic) removal procedures in drinking water treatment facilities that may be used as a preventive strategy.