



Health risks posed by microplastics in tea bags: microplastic pollution – a truly global problem

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According to a recent study, depending on sex and age, people consume between 39 000 and 52 000 particles of microplastic (MP) annually^[1]. Thousands of plastic compounds are used across the world today, and of those, more than 20% have been classified by the European Union as being of concern due to their persistence, accumulation in human fatty tissues, and/or toxicity, while 39% have not been linked to any negative health effects^[2]. MP pollution poses a health concern. The more plastic created, the more the subsequent generation will have to endure it is unknowable impacts, which might pose an irreparable health danger. Despite the fact that research has mostly concentrated on a small number of plastic compounds, a wide variety of health conditions, including endocrine disruption, reproductive toxicity, cancer risk, problems with metabolism and nutrition, and interference with neurodevelopment, are also a concern^[2].

Due to the potential health risks and negative impacts on the environment, the use of MPs in tea bags and other products is a major issue. In spite of the material's nonbiodegradability, polypropylene is frequently used in manufacturing tea bags. Given that tea bags are subjected to high temperatures during the brewing process, it is concerning that certain branded teas are offered in tea bags made from allegedly 'food grade' polymers, such as nylon^[3]. In tea bags additionally available are fluorine compounds, arsenic, radium salt, aluminum, copper, lead, mercury, cadmium, barium, nitrates, and many more^[4]. So you are sipping tea and consuming these dangerous substances in the same bag^[4]. Tea bag plastics, which can take hundreds of years to decompose in nature, may fragment into particles that range in size from 1 µm to 5 mm, or MPs^[4]. Instead of utilizing the conventional paper tea bags, tea makers now use plastic ones^[5]. This is concerning since water is regularly heated to 95°C or more while making tea, and even 'food grade' plastics can break down or release harmful materials when heated over 40°C^[5]. People who drink tea frequently are continually dosing themselves with

billions of plastic particles, some of which may be tiny enough to enter human cells. Most paper tea bags also have plastic fibers used in the sealant in addition to these nylon and PET plastic tea bags. Even paper tea bags have an unsettling substance called epichlorohydrin added to them in order to keep them from bursting. According to a recent study, each cup of tea produced by one plastic tea bag steeped at brewing temperature included roughly 11.6 billion MPs and 3.1 billion nanoplastics (NPs)^[6]. Around 96% of the tea sold in the UK market is packaged in tea bags, according to Jha *et al.*^[7]. According to Xu *et al.*^[8] study six tea brands were tested, and it was found that four of them included polypropylene in varying amounts, one was nearly entirely composed of nylon, and the sixth was thought to be biodegradable and free of any plastic residue. It was also discovered that contact to hot water caused chemical alterations, which raises the issue of what standards may be used to categorize MPs as they degrade^[8]. The main goal was to precisely estimate the abundance of MPs for human consumption in order to educate policy and play a significant role in affecting industry and public opinion^[8]. There are rising worries over the human exposure to MPs^[8]. The significance of determining the plastic to nonplastic ratio was severely examined in this work, and it was highlighted that a thorough spectrum analysis was required^[8].

Prior studies on animals have demonstrated that intestinal oxidative and inflammatory imbalance was brought on by exposure to NPs and MPs.^[9] Additionally, malabsorption brought on by weakness and/or undernutrition can result from the erosion of the gut's mucosa that results in epithelial impermeability^[9]. In addition, the effects of chemicals on the human gut flora are poorly known. MPs include additives, adsorb pollutants, irritants, and the development of bacterial pathogens may occur on their surface, making them extremely dangerous to consume, whether purposely or accidentally^[9]. This impairs the body's defensive system and makes it susceptible to diseases. Additionally, they carry intestinal toxins that disrupt intestinal processes and upset the balance of the organisms in the gut, perhaps setting the stage for the emergence of long-term immune system problems^[9]. A multiendpoint toxicological investigation on colorectal cancer cell lines revealed higher absorption and intracellular accumulation of MP and NP particles with regard to gastrointestinal cancer^[10]. Due to the numerous negative consequences of tea bags, tea aficionados should refrain from using single-use tea bags in favor of loose leaf teas poured in a glass, metal, or ceramic strainer in addition to demanding that tea firms switch to plastic-free packaging. Making the move from tea bags to loose leaf tea is among the simplest strategies to prevent consuming MPs in tea. Using loose leaf tea instead of tea bags, which may contain MPs, is a wonderful way to experience traditional tea brewing techniques. Utilizing instant tea is the final option. As an alternative to conventional tea brewing, instant tea is a terrific option. To avoid all of these issues, one can also utilize a cloth-based tea bag.

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To present, the health consequences of ingesting MPs and NPs on people are unclear, but the absence of evidence of toxicity does not imply safety, but sublethal effects found in other species (eg, algae, zooplankton, fish, mice) provide an early warning of both environmental danger and potential human health risk. Future studies should investigate how MPs are released from plastic items, particularly those that are heated during processing, like tea bags. Therefore, research that seek to identify the MP's origins are subsidies to better understand the different exposure paths to these pollutants, even though we have not obtained conclusive evidence on their effects.

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