Identification and Quantification of Micro- and Nano-plastics in Common Soft Drinks in the US

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Microplastics (≤5 mm) have been detected in various environments and are impacting over 1,300 aquatic and terrestrial species. Alarmingly, they have also been found in human tissues, organs and bodily fluids, including blood cells, sputum, lung, liver, breastmilk. These particles are common in everyday products such as food, beverages, and cosmetics, and they can easily enter the human body through ingestion, inhalation, and skin absorption. Nanoplastics (<1 μm) can fragment from microplastics and have the potential to cross biological barriers. However, research on nanoplastics is still limited due to a lack of reliable analytical techniques for their detection and quantification. Thus, this study aims to fill that research gap by examining the presence and concentration of micro- and nanoplastics (MNPs) in popular soft drinks in the U.S., as this represents a significant pathway for human exposure. To conduct this research, soft drinks were processed using oxidation techniques to eliminate sugars and colorants, making them suitable for analysis through scanning electron microscopy (SEM) and stimulated Raman spectroscopy (SRS). Preliminary SEM results show that the detected materials vary in size and shape and exhibit moderate carbon concentrations, which align with the carbon-based structure of plastic polymers. SRS analysis indicates that a 12-ounce can of Coca-Cola contains approximately 3.74×10^6 MNPs, of which 78% are nanoplastics. Notably, nearly 50% of the identified MNPs were found to be polyethylene. Ongoing research will further investigate the concentration of MNPs in different soft drinks and container types, including glass and plastic bottles, as well as cans.