

Microplastics even in our arteries

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A study recently showed that the presence of microplastics in the walls of the carotid arteries increased the risk of cardiovascular accidents. This unexpected observation highlights the urgency of better understanding the health impacts of this increasingly widespread form of pollution.

Plastics are complex polymers composed of a molecular skeleton of carbon from fossil fuels (oil, gas, coal) into which tens of thousands of chemical compounds are incorporated which give them specific properties, whether in terms of color, stability, or resistance to water or fire.

Plastics have become omnipresent in our lives and have radically transformed several aspects of our society, in fields as diverse as medicine, aerospace, construction, sports and food packaging. This large-scale use of plastic is reflected by the exponential rise in its production over the last decades, which increased from 2 to 460 million tonnes produced annually from 1950 to 2019.

In addition, it's not over: it is predicted that by 2050, the production of plastic and its derivatives could reach one billion tonnes (1).

Plastic has undoubtedly become essential, but that does not prevent this material from having two serious flaws:

1. several chemical compounds which are part of its composition are very toxic due to their carcinogenic, neurotoxic or endocrine system disrupting effects;
2. we do not have effective ways to dispose of plastic after use (less than 10% is recycled).

With around 22 million tonnes of plastic waste seeping into the environment each year, it's no wonder that scientists have found traces of it everywhere on the planet, from the depths of the oceans to the peaks of the highest mountains.

Plastics can also be found in the human body in the form of tiny particles called microplastics (less than 5 mm in diameter) and nanoplastics (less than 1 µm in diameter). These particles come from the breakdown of larger products or, in some cases, cosmetic and personal care products that contain microbeads.

In both cases, microplastics enter the body through ingestion or inhalation, such as eating food that is contaminated or has been stored or heated in plastic containers (infants may be exposed to high levels of microplastics by ingesting formula milk prepared in propylene bottles) (2).

BAD FOR THE HEART

An Italian study indicates that contamination by microplastics could have very negative repercussions on health (3). In samples of atherosclerotic plaques surgically excised from the carotid arteries of 304 individuals, plastic was detected in the plaques in approximately half of this cohort, with polyethylene in 150 of the samples and polyvinyl chloride in 31



among them. These molecules come from plastic particles, as visualized by examining samples by electron microscopy.

The main result of the study is that the presence of plastic in the plaques is strongly associated with the subsequent development of cardiovascular disease: within the 34 months after surgery, the researchers observed that people with microplastics in their plaques were at risk 4.5 times higher to develop cardiovascular accidents (infarction, stroke or cardiac death) compared to patients whose plaques did not contain microplastics.

INFLAMMATORY BOWEL DISEASES

It also appears that this harmful effect of plastic particles is not restricted to the heart, as another study showed that patients suffering from inflammatory bowel disease had elevated concentrations of at least 15 different types of plastic particles, and that these levels were correlated with more severe forms of these diseases (4).

As mentioned in editorials recently published in two of the most prestigious medical research journals, the *New England Journal of Medicine* and *Nature Medicine*, even if these studies have not demonstrated a causal link between the presence of plastic particles and these diseases, the results nevertheless highlight the need to accelerate research on this subject.

A particularly pressing question to elucidate is determining the amounts of particles absorbed through ingestion, inhalation, or skin exposure, the amounts that accumulate in different organs over a person's lifetime, and how these particles may affect the function of these organs.

- (1) Landrigan PJ et al. The Minderoo-Monaco commission on plastics and human health. *Ann. Glob. Health* 2023; 89: 23.
- (2) Li D et al. Microplastic release from the degradation of polypropylene feeding bottles during infant formula preparation. *Nature Food* 2020; 1: 746-754.
- (3) Marfella R et al. Microplastics and nanoplastics in atheromas and cardiovascular events. *N. Engl. J. Med.* 2024; 390: 900-910.
- (4) Yan Z et al. Analysis of microplastics in human feces reveals a correlation between fecal microplastics and inflammatory bowel disease status. *Environ. Sci. Technol.* 2022; 56: 414-421.