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## Adverse Cardiovascular Effects of Micro and Nanoplastics

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Plastics in daily use can be degraded into microplastics which are smaller than 5 mm and nanoplastics which are smaller than 1000 nanometre [1]. These can trigger toxicologic effects in the human body [2]. Routes of entry of micro and nano particles (MNPs) into the human body could be by ingestion, topical exposure and even by inhalation. Microbeads which are a type of microplastic are often added as exfoliants to health and beauty products as well as some cleansers and even tooth-pastes [3], increasing the chance of human exposure.

Adverse cardiovascular effects of MNPs have come into limelight with the publication of a paper in NEJM which has correlated the presence of MNPs in carotid artery atheromas removed during carotid endarterectomy to increased cardiovascular events during follow up [4]. Earlier experimental studies had suggested that MNPs promote oxidative stress, inflammation and apoptosis in endothelial and other vascular cells which could eventually lead to impairment in cardiac function, myocardial fibrosis and endothelial dysfunction [5].

The study by Marfella R et al [4] was a prospective, multicenter observational study of patients undergoing carotid endarterectomy for asymptomatic carotid artery disease. The plaques excised from carotid arteries were analyzed using pyrolysis-gas chromatography-mass spectrometry, stable isotope analysis, and electron microscopy. Estimation of inflammatory biomarkers were also carried out. A composite of myocardial infarction, stroke or death from any cause was the primary endpoint of the study. Comparison was between those who had MNPs in carotid artery plaques with those who did not have them in their carotid plaques.

One hundred and fifty patients had polyethylene in their carotid artery plaques and 31 patients had polyvinyl chloride in their carotid plaques. Presence of foreign particles were noted in plaque macrophages and extracellular debris by electron microscopy. The initial number of patients enrolled in the study was 304, of which 257 completed the study. Mean follow up period was 34 months in this study. A hazard ratio of 4.53 was noted for those who had MNPs in carotid plaques for the primary endpoint.

An important limitation mentioned in the study was that even though good care was taken, they could not completely rule out laboratory contamination as plastics were present in the laboratory as well! Authors suggested future studies with the use of clean rooms where there is no plastic in any form except for the material under study to avoid this confounding factor [4]. Another group authors who reviewed the cardiovascular effects of MNPs has even asked whether they are to be considered as a new cardiovascular risk factor [5]. They have noted direct cardiac

toxicity of MNPs including abnormal heart rate, cardiac function impairment, pericardial edema and myocardial fibrosis. Microvascular effects noted were MNP induced hemolysis, thrombosis, coagulation and endothelial damage. Certainly, more research is needed on these aspects before we can make definite conclusions about the cardiovascular adverse effects of MNPs, which would have long lasting implications on the human community.

## References

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