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MICRO AND NANO-PLASTICS HARM HEALTH

By Ann Gerhardt MD July 2026

MAGNITUDE OF PLASTICS USE: Annual worldwide plastics production has ballooned since the 1950s, when plastics were introduced, to about 450 million metric tons per year (making the 1967 The Graduate movie's "Just one word. Plastics." quote prescient), in part due to the fossil fuel industry viewing plastics as an alternative to maintain profits as global demand for traditional fossil fuels use declines. Of those tons of plastics, an estimated 50% is discarded after a single use. Much of that single use occurs in healthcare settings, but our population purchases about fifty billion single use water bottles per year, about fourteen bottles per person every month.

THE PROBLEM with this volume is the fact that plastics do not decompose, but instead become ubiquitous in our environment, a problem not limited to plastic straws choking turtles. Rather than decompose, plastics fragment. Attempting plastics disposal by pyrolysis (heating to very high temperatures without oxygen) releases toxic chemicals into the environment, making that ostensible solution worse than the problem.

MICRO- AND NANO-PLASTICS: Whole plastic containers' unsightly accumulation on beaches, sidewalks and forest paths is unfortunate but not as dangerous as are their fragments. Tiny MNPs (Micro-{1 micron to 5 millimeters[the diameter of a pencil eraser]}and Nano- {less than 1 micron} Plastic) fragments, such as polyvinyl chloride (PVC), acrylates, acrylamides, polysorbates and polyethylene glycols, are ubiquitous in air, water, soil and food, adversely affecting our health. We ingest these tiny plastics via inhaled, oral and skin-contact routes. In the body they have no more chance of being degraded and eliminated than do whole plastics in nature.

Some Plastics also contain the endocrine (hormone) disruptors bisphenol A, phthalates, parabens and perfluoroalkyls capable of causing reproductive, metabolic and neuropsychiatric disorders, as well as lymphoma and cancers of the biliary and immune systems, kidney, lung, stomach, and brain and reproductive organs. They are found in disposable medical equipment and flexible plastics such as tubes, catheters, bags and syringes. California and the EU currently ban medical supplies containing the carcinogen DEHP [di(2-ethylhexyl)phthalate], which is added to plastics to make them flexible. Since DEHP was banned, manufacturers have used less dangerous non-phthalate plasticizers, which increase the distance between PVC chains to allow for greater movement and flexibility.

DISEASE: MNPs have been found in every bodily tissue and fluid, causing inflammation, cancerous mutation and oxidant stress. Two scientific studies published in November 2024 linked MNPs to major diseases. MNPs were known to accumulate in the brain. In the first study, University of Mexico neuropathologist Elaine Bearer identified more hook-shaped nano plastic clusters in the brains of dementia patients than in brains of non-dementia corpses. She and subsequent scientists posit that inflammation caused by MNPs might induce amyloid accumulation and tau protein hyperphosphorylation, hallmarks of Alzheimer's disease.

In the second 2024 study, an Italian vascular research group published their MNP work, concluding that "patients with carotid artery plaque in which MNPs were detected had a higher composite risk of heart attack, stroke, or death from any cause during 34 months of follow-up than those in whom MNPs were not detected." MNPs also lodge in arterial plaque, increasing risk of adverse vascular events, like heart attack and stroke, by a factor of 4.5. This begets the questions of which is

more important in vascular disease, LDL-cholesterol or MNPs, or is this a chicken and egg problem: Do MNPs damage arteries or are damaged arteries more likely to accumulate MNPs that may or may not accelerate damage?

MNPs contribute to liver damage via oxidative stress, inflammation and metabolic dysfunction, including altered lipid-cholesterol metabolism. The liver is our primary detoxification organ but does not have a mechanism to eliminate MNPs. Studies have also linked MNPs to kidney (the other organ that clears toxins) damage.

CAN WE RID OURSELVES OF THIS SCOURGE? Scientists are working to find a way to clear MNPs from our brains and other tissues. Former neurosurgeon and cabinet member Ben Carson MD has circulated a video claiming that he developed a mixture of sidr honey (produced from the nectar of sidr trees) and Bacopa monnieri flowers that degrades MNPs and alleviates dementia, with many user testimonials attached to ads for the proprietary product. A similar video, attributed to Dr. Sanjay Gupta, who claims he's not responsible, promotes a cider-honey dementia cure. Perhaps these are the same "cures", if one misspells sidr as cider.

The majority of positive reports of honey's health benefits have been anecdotal, but research has suggested that more common types of honey might help to prevent or reduce dementia, without proof that honey eliminates MNPs. Early data suggest that honey's multiple healthy bioflavonoids, neuroprotective components and phenolic acids might mitigate MNPs' adverse effects on the brain, with early data suggesting honey might reverse some of the damaging effects.

BIOLOGIC DISPOSAL? Notwithstanding all the negativity above, there may be some hope: Two bacterial, Pseudomonas species, aeruginosa and citronella, can digest the sub-micron (< 400 nm) sized nano plastics polystyrene and polyethylene, suggesting that biosorption might be a reasonable plastic waste treatment possibility. A do-it-yourself option of ingesting Pseudomonas species is inadvisable, as they might cause fatal infection.

WHAT TO DO: By minimizing plastics exposure, we might limit future health effects of MNPs. We likely cannot prevent people from choosing single-use plastics in their daily lives though education that a **single liter bottle of water contains upwards of 240,000 MNPs** might discourage their use. Unless we live in a community like Flint, Michigan, where politicians decided to save money on inadequately purified water, we should drink, wash and cook with tap water, plain or through an MNP purifier at the faucet. I have had many patients who quantify their water consumption in numbers of water bottles drunk, which, to me, is sad. Physicians can certainly change how much they use single-use plastics in our healthcare facilities. Both the European Union and the World Health Organization (WHO), to promote safe and sustainable practices in healthcare, have established guidelines regarding plastics use in medical settings, particularly discouraging the use of single-use plastic devices and procedure trays, and I have introduced a resolution to the California Medical Association suggesting that we do the same.

Both latex and nitrile gloves contain and release MNPs. Washing our hands and bodies with water and detergent removes micro but not most nano plastics. Chinese scientists have removed 98 percent of nano plastics from water by distillation followed by microfiltration. Compulsive handwashing is a better infection preventive than gloves are in a healthcare setting: It might also save us from MNP-related disease. Some laundry detergent companies now make "detoxifying" detergents that bind and remove MNPs. I recommend not using detergent pods, which are made from PVC, or dryer sheets made from nonwoven polyester fabric, often with petroleum-based polymer coatings. And, for our own bodies' sake, give up plastic coffee pods and water bottles!