Implications of Microplastics on Human Health

FEDERAL TEAM POLICY BRIEF

Microplastics have grown from a local concern to a major problem. With increasing microplastic levels, human health is severely affected. This policy brief offers solutions to address this growing problem, including reclassifying microplastics as a separate category, closing the BPA-free loophole, and more.

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I. Executive Summary

The growing problem of microplastics has transitioned from being a local concern to a global health crisis. Scientists have confirmed that microplastics, derived from packaging and plastic beverage containers, are present in the human body across various organ systems and functions. Single-use plastics pose significant risks to human health, as evidence links exposure to microplastics, nanoplastics, and endocrine-disrupting chemicals to cardiovascular disease, metabolic dysfunction, reproductive harm, neurological effects, and chronic inflammation.

This policy brief proposes a set of targeted measures to mitigate microplastic pollution by mandating that microplastics be labeled as an individual category, closing the loophole of endocrine-damaging substitutes, and taking national action in a growing health crisis. The current regulations of the Environmental Protection Agency (EPA) and Food and Drug Administration (FDA) are outdated and fail to establish standards for the safety of US citizens.

The recommendations of this brief focus on establishing national standards for microplastic exposure across waterways and food consumption, as microplastics are typically inhaled or ingested. Furthermore, microplastics should be regulated as a separate class rather than grouped together with chemicals that are already being addressed. The government should call upon strengthening food package requirements and enforcing the law with producer accountability. By implementing such measures, the government can enhance public health while protecting the environment.

II. Background

Plastics continue to impact individuals across the world, with the breakdown of these plastics producing microplastics, which harm the human body and degrade the environment. Microplastics are minuscule pieces of plastic debris resulting from the breakdown of plastic products that are typically improperly disposed of. Microplastics are typically

less than five millimeters in diameter and are categorized as primary and secondary. Primary microplastics are plastics designed to be of such a small size. Secondary microplastics are plastics that have degraded from a larger piece due to weathering and sunlight exposure. Nanoplastics are even more dangerous as they are less than one micrometer, allowing them to cross human membranes and permanently damage the body. Nanoplastics are extremely small plastic particles, generally less than 1,000 nanometers. They are formed from the degradation of larger plastic items or industrial processes and can infiltrate biological tissues due to their microscopic size. Secondary plastics and nanoplastics are the primary concern regarding this policy brief.

Studies have shown that ingestion, inhalation, and dermal contact are the primary pathways by which microplastics enter the human body. In the United States, over 90 percent of the population has detectable levels of microplastics, according to the Centers for Disease Control and Prevention. The growing body of research shows that microplastics are not only an external threat but are now damaging the human body. Exposure to microplastics affects various bodily functions, including cardiovascular, endocrine, reproductive, and immune functions. Microplastics disrupt the endocrine system by releasing endocrine-disrupting chemicals that mimic or block hormonal processes. Although products can be labeled "BPA-free" (meaning they do not contain Bisphenol A), their substitutes can have even greater adverse effects on the body, such as infertility and hormone-dependent cancers. Further, microplastics affect reproductive functions, as scientists have found that microplastics cross the placental barrier and damage the fetus. These disruptions can cause permanent, intergenerational health defects. Microplastics also damage the metabolic and immune systems. The chemicals found in such plastics are similar to obesogens, which disrupt metabolic regulation and increase insulin resistance. The scale of damage microplastics pose makes this a major health challenge for the United States.

The current US regulations regarding microplastics are very fragmented and outdated. Although the EPA and FDA do have statutes, these policies undermine the consequences of microplastics by focusing on individual chemicals, lacking national standards for appropriate levels of microplastics, and categorizing products as generally labeled as safe.

The current federal regulatory framework, built on statutes written decades ago, does not reflect the latest

research and understanding of microplastic exposure pathways and health effects. With historical action taken against lead and ozone-depleting chemicals, the US government must act, as the current policies fail to protect not only the environment but also human health.

III. Problem Statement

A federal response must call upon transparent labeling, accelerate the phase-out of hazardous plastic classes, and implement policies on producer responsibility. The current federal laws remain outdated, and the safety standards established by the EPA and the FDA fail to apply nationwide. Without a centralized mandate to standardize monitoring and develop statutes regarding microplastics, the United States continues to rely on decades-old science that does not reflect modern exposure. The US government should focus on limiting microplastic exposure by closing loopholes, reclassifying microplastics, and enforcing producer responsibility. This response will lead to a positive shift across public health, the environment, and current scientific understanding of the problem.

IV. Policy Analysis

The US government has made critical responses to handling microplastics and their effects on the human body. However, these responses do not cover the full scope of health implications, and microplastics continue to damage the human body to this day. Previously, the Obama administration signed the Microbead-Free Waters Act of 2015, which prohibited adding plastic microbeads to cosmetics and other products such as toothpaste. Furthermore, former President Joe Biden's recent administration focused on phasing out microplastics from the food industry by 2027, signing numerous laws and executive orders. Different US state legislators are also taking action. California passed laws mandating testing for microplastics in drinking water, while New York expanded bans on plastic materials such as Styrofoam to prevent them from breaking down into microplastics. While the United States is considered a leader in research and addressing microplastics, the government should shift to a federal response to address microplastics head-on.

V. Policy Recomendations

To address the growing public health and environmental risks of plastic pollution, federal policy should integrate regulatory reform, market-based measures, research investment, and environmental justice protections. Implementing these recommendations would empower communities to address pollution at its source, protect vulnerable

populations, and shift responsibility toward producers as we move toward safer, sustainable material systems.

Establishing National Microplastic Exposure Standards. The EPA should set binding, health-focused national standards for microplastic concentrations in drinking water, food, and ambient air. These could include health-based reference levels for drinking water (particles per liter by size class) or nationwide monitoring of airborne microplastics, measuring fibers and fragments through existing air-quality networks. Standards should reflect the best available science on cardiovascular, reproductive, and developmental impacts, accounting for cumulative exposure across pathways. Federal law should require monitoring at public water systems, food manufacturing facilities, and air quality stations, with publicly accessible reporting to ensure transparency and accountability.

Regulate Hazardous Chemicals by Class. Congress should amend the Toxic Substances Control Act (TSCA) to authorize regulating classes of structurally related chemicals with shared mechanisms of toxicity. Regulating chemicals individually has allowed harmful substances to be replaced with close analogs that pose comparable risks. For example, between 2009 and 2012, state-level bans of Bisphenol A (BPA) in food and infant products in California, New York, and Connecticut led manufacturers to market "BPA-free" products. Instead, BPA was often substituted with bisphenol F (BPF), a similar compound with comparable endocrine-disrupting effects, especially in young children. Because these substitutes were not covered by BPA restrictions, exposure persisted. All bisphenols and phthalates should be regulated as endocrine disruptors, with the EPA encouraged to require alternatives analysis before continued use is permitted.

Strengthen Food Packaging Safety Requirements. The FDA should reevaluate all plastic food-contact substances, with a focus on endocrine-disrupting chemicals and microplastic migration. The current "generally recognized as safe" (GRAS) system should require an independent safety review. The FDA should ban bisphenols, phthalates, and other endocrine disruptors in food contact applications and mandate clear labeling when packaging contains chemicals of concern or generates detectable microplastic contamination.

Implement Federal Extended Producer Responsibility. Congress should enact a national extended producer responsibility (EPR) framework modeled on California's SB 54 and European Union directives. California's SB 54

shifts the cost of plastic waste management from cities to producers by requiring manufacturers to fund collection, recycling, and environmental remediation, while also maintaining recycled-content goals. Similarly, the European Union requires producers to finance the full lifecycle of packaging waste and meet recyclability standards, resulting in high recycling rates.

A federal EPR system should require producers to fund waste collection, recycling, and disposal. This program should include minimum recycled content requirements, design-for-recycling standards, and phase-out timelines for nonrecyclable packaging. EPR revenue should fund municipal waste infrastructure, alternative materials research, and remediation in communities that have been disproportionately harmed. These measures shift the cost of plastic pollution from taxpayers to producers while reducing microplastic pollution. This policy will substantially reduce single-use plastic entering the environment by mandating the redesign of packaging.

Accelerate Federal Procurement Reform. Federal agencies should accelerate the phase-out of single-use plastics in federal operations by adopting interim targets ahead of existing deadlines. The General Services Administration should revise Federal Supply Schedules to prioritize plastic-free packaging, phase out harmful plastics such as polystyrene and PVC, and prioritize reusable alternatives. Federal purchasing power should drive broader market transformation.

Protect State and Local Authority. Federal law should block state preemption of local plastic reduction policies. States and cities must retain authority to enact plastic bag bans, fees on single-use items, and other locally tailored needs. Federal standards should set a regulatory floor, allowing jurisdictions to adopt more protective measures to address ecological vulnerability.

Invest in Research, Alternatives, and Environmental Justice. Federal funding for research on microplastic health effects, exposure pathways, and remediation should expand with coordination among agencies NIH, EPA, and NSF. Innovation funding should prioritize safe, affordable plastic alternatives and reusable systems accessible to low-income communities. All plastic reduction policies should explicitly address environmental justice by prioritizing, monitoring, cleanups, and community-led interventions in fenceline and overburdened communities that bear disproportionate health and environmental harms.

VI. Implementation Plan

The successful implementation of federal microplastic regulation will require a multi-phase, agency-partnered approach that integrates regulatory reform, monitoring national infrastructure, and industry accountability. This plan reflects a realistic timeline and assigns certain responsibilities across federal agencies while allowing greater flexibility for state and local governments.

Phase I: Foundation and Rulemaking (Years 1-3). Within the first two years, Congress should pass legislation authorizing national microplastic exposure standards, expanded chemical class regulation under the TSCA, and extended producer responsibility (EPR) structures. During this period, the EPA will lead the development of standardized definitions, testing methodologies, and exposure thresholds for microplastics in drinking water, food, and air. Simultaneously, the FDA should conduct an extensive review of food materials, prioritizing plastics containing bisphenols, phthalates, and other endocrine-disrupting chemicals. Public comment periods and stakeholder inclusion with public health experts and environmental justice communities will ensure transparency and feasibility.

Phase II: Monitoring, Compliance, and Infrastructure Development (Years 3-5). Once national standards are finalized, federal agencies will transition to enforcement and monitoring. Public water systems, food manufacturers, and regulated facilities will be required to conduct regular microplastic testing and report all collected data to the EPA public databases. The EPA will provide technical and compliance assistance, with targeted support for smaller cities and manufacturers. During this phase, the federal extended producer responsibility (EPR) program will be implemented, requiring producers to finance the collection, recycling, and safe disposal of plastic products. The EPA will establish a national producer registry, creating fee structures based on packaging material type and recyclability, approving producer responsibility organizations (PROs) to administer compliance. Producers will be required to register, report packaging logistics, and cover fees, while the EPA and state agencies will oversee enforcement.

Phase III: Evaluation, Adjustment, and Expansion (Years 5-10). After five years, agencies should conduct a thorough evaluation of health outcomes, environmental impacts, and industry compliance. The EPA and FDA will revise exposure standards as new scientific evidence emerges, ensuring

regulations remain prevalent and protective. Congress may expand restrictions to additional high-risk plastic products based on evaluation findings. Long-term investment in research and innovation will continue through EPA grant programs, supporting the development of safer materials and alternatives. This research will prioritize educating the general public on microplastic health effects, improving detection and monitoring technologies, and encouraging the development of safer materials and reusable systems that do not produce microplastic pollution. Throughout this phase, states and local governments will have authority to enact stronger protections, with federal standards serving as a regulatory floor.

Long-Term Oversight and Accountability. Congressional oversight checks, public reporting dashboards, and independent third-party scientific review panels will ensure accountability across all phases of policy implementation. Environmental justice measures will be taken to protect exposed communities.

VII. Conclusion

By adopting multi-phased, comprehensive federal policies to address microplastic pollution, the United States can take a proactive step toward reducing widespread environmental contamination and associated public health risks. These actions would protect vulnerable populations, align federal regulation with emerging scientific evidence, and support safer material systems across the plastic lifecycle. Implementing the recommendation outlined in this brief would position the federal government as a leader in evidence-based environmental health protection while laying the groundwork for more sustainable and protective plastic governance.

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