

SUBMISSION

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Inquiry into the impacts of microplastics and other toxics on human health

Community Affairs Reference Committee

Online submission

1. Introduction

The Australian Medical Association (AMA) thanks the Community Affairs References Committee for its timely inquiry, recognising growing concern about microplastics, per- and polyfluoroalkyl substances (PFAS) and other toxics on human health. Microplastics and PFAS specifically represent a growing public health concern due to their persistence in the environment, widespread population exposure, and evolving but incomplete evidence base regarding long-term health impacts³. While the causal pathways and clinical thresholds for harm, particularly for microplastics, are not yet fully established, the ubiquity of exposure, potential for biological interaction, and long latency of many chronic diseases warrant a proportionate precautionary public health response³. While definitive causal relationships between these exposures and specific health outcomes are not yet established, emerging evidence has reported associations with adverse outcomes including certain cancers, reproductive and fertility effects, endocrine disruption and immune dysregulation³. Given the persistence, bioaccumulation and widespread nature of these exposures, the AMA considers a precautionary, equity-focused, harm-reduction approach essential to protect public health while the evidence base continues to develop, rather than waiting for definitive causal proof where population-level risk may already be accruing³.

2. Submission Principles in response to ToR of Inquiry

From a consolidated perspective, exposure to microplastics, PFAS and related environmental contaminants occur through multiple pathways including drinking water, food systems, indoor and outdoor air (particularly dust and microfibrils), consumer products, and occupational settings³. This multi-pathway exposure profile reinforces the need for upstream prevention strategies addressing production, waste management, and environmental contamination, alongside downstream health surveillance. The AMA supports a systems-based approach recognising that environmental degradation, pollution, and human health outcomes are intrinsically linked, and that reducing

environmental contamination is a legitimate and evidence-consistent public health intervention even where epidemiological certainty is still emerging.

The AMA's submission to this Inquiry is guided by precaution, proportionality, and evidence-informed policy. PFAS are well established as persistent and bioaccumulative chemicals with documented human exposure and emerging health associations. Microplastics are best characterised as persistent environmental particles with ubiquitous exposure and plausible biological effects, but with ongoing scientific uncertainty regarding dose-response relationships and long-term clinical outcomes³. Accordingly, policy responses should differentiate between these exposure classes while maintaining a consistent precautionary framework and transparent risk communication.

The AMA has applied the following principles in responding to the Terms of Reference:

2.1. Minimise Exposure

The AMA supports minimising exposure to microplastics, PFAS and other persistent chemicals even in the absence of definitive exposure thresholds. Where evidence indicates plausible risk or emerging harm signals, precautionary exposure-reduction measures should be prioritised in policy and practice.

2.2. Microplastics as a Preventable Health Risk

Microplastic exposure should be treated as a preventable health risk rather than an inevitable environmental burden. The AMA supports proactive measures to reduce exposure through regulation, procurement policies, product standards and public education, recognising that early intervention can reduce future health burden while evidence matures.

2.3. Cross-Sector Collaboration

The AMA advocates for coordinated action across health, environmental, regulatory and industry sectors to accelerate evidence generation, support the development of safer alternatives, and implement sustainable practices that reduce population-level exposure.

2.4. Precautionary Principle in Policy-Making

The AMA calls for the precautionary principle to underpin policy decisions related to PFAS, microplastics and other persistent chemicals. This includes conservative guideline values, routine environmental and human monitoring, and transparent, proportionate communication with communities about potential risks and uncertainties.

2.5. Alignment with International Research and Standards

The AMA supports benchmarking Australian policy and research against international best practice, including World Health Organisation (WHO) guidance¹⁰, United States Environmental Protection Agency (EPA) drinking-water standards¹, and European Union Registration, Evaluation, Authorisation

¹ United States Environmental Protection Agency (2025). Per and Polyfluoroalkyl Substances (PFAS). Available at: <https://www.epa.gov/sdwa/and-polyfluoroalkyl-substances-pfas>

and Restriction of Chemicals (REACH) restrictions². Alignment with global frameworks promotes consistency, accelerates evidence translation, and enables Australia to adopt proven harm-reduction strategies while contributing to international knowledge.

3. Response to Terms of References

3.1. Reproductive Health

Current evidence on the reproductive impacts of microplastics and PFAS remains limited and inconclusive³. However, emerging international studies have reported associations of microplastics with impaired fertility, menstrual disturbances, altered hormone signalling, and adverse pregnancy outcomes⁴. While these findings are preliminary and often based on small sample sizes or non-human data, they raise credible concerns given the persistence and bioaccumulation of these substances⁸.

The AMA acknowledges that biologically plausible pathways for reproductive harm exist³. At present, however, there is insufficient high-quality human evidence to define exposure thresholds, quantify individual risk, or support the development of specific clinical guidance³. This uncertainty underscores the need for a precautionary, harm-reduction approach rather than inaction.

A coordinated national research effort is required, including longitudinal reproductive health cohorts and human biomonitoring that directly measure chemicals, pollutants or their metabolites in human biological samples. Such an approach is essential to characterise exposure across sources, pathways and life stages, clarify potential reproductive effects, and inform future public-health policy.

3.2. Early Development and the First 1,000 Days

Evidence linking microplastics and PFAS to adverse outcomes in early development remains inconclusive⁵. However, emerging international research has identified potential associations with developmental and pregnancy-related outcomes, warranting careful attention given the persistence and bioaccumulation of these substances⁶. In this context, the AMA supports applying a

² European Commission (2025). REACH Regulation. Available at: https://environment.ec.europa.eu/topics/chemicals/reach-regulation_en

³ Qu, R, Wang, J, et al (2024). Per- and Polyfluoroalkyl Substances (PFAS) Affect Female Reproductive Health: Epidemiological Evidence and Underlying Mechanisms. Available at: <https://www.mdpi.com/2305-6304/12/9/678>

⁴ Haimbaugh, A, Meyer, D et al (2024). Environmental Exposure to Per- and Polyfluoroalkyl Substances (PFASs) and Reproductive Outcomes in the General Population: A Systematic Review of Epidemiological Studies. *International Journal of Environmental Research and Public Health*. Available at: <https://pubmed.ncbi.nlm.nih.gov/39767456/>

⁵ Ames, J, Sharma, V & Lyall, K (2025). Effects of Early-life PFAS Exposure on Child Neurodevelopment: A Review of the Evidence and Research gaps. Available at: <https://pmc.ncbi.nlm.nih.gov/articles/PMC11785707/>

⁶ Hunt, K, Davies, A et al (2023). Exposure to microplastics and human reproductive outcomes: A systematic review. Available at: <https://doi.org/10.1111/1471-0528.17756>

precautionary, harm-reduction lens that acknowledges plausible risk while recognising significant evidence gaps.

Australia currently lacks the coordinated surveillance systems and well-designed early-life exposure cohorts needed to determine if these contaminants pose measurable developmental risks across pregnancy, infancy and childhood⁷. Investment in prospective pregnancy cohort studies, paired maternal–infant biomonitoring, and the adoption of harmonised analytical methods will be essential to strengthen the evidence base and inform proportionate public health policy.

Emerging evidence suggests that microplastics may act as a novel environmental stressor to the developing nervous system⁸. Experimental but limited human studies indicate that certain microplastic particles are capable of crossing the blood–brain barrier and accumulating in brain tissue, where they may contribute to oxidative stress, neuroinflammation and other pathological processes⁸.

Preliminary observational evidence has raised concerns about potential downstream neurocognitive and neuropsychiatric effects later in life; however, the current human evidence base remains limited and insufficient to establish causality or quantify risk⁸. Given the vulnerability of the developing brain, particularly during the first 1,000 days of life, these findings support a precautionary approach and highlight the need for targeted longitudinal research into neurodevelopmental and cognitive outcomes.

3.3. Cardiovascular Health

Several recent observational studies have reported associations between microplastic or PFAS exposure and indicators of cardiovascular risk, including hypertension, atherosclerotic plaque burden, and inflammatory biomarkers⁹. These findings remain preliminary and are not sufficient to establish causation, quantify individual clinical risk, or define clinical thresholds⁹. The AMA therefore recognises cardiovascular effects as a potential area of concern but notes that the current evidence base is inadequate to support specific clinical recommendations. Further research, particularly in Australian populations is required to determine whether these observed associations reflect meaningful biological pathways or population-level health risks.

3.4. Endocrine, Immune and Cancer Outcomes

⁷ Australian Academy of Health and Medical Sciences (2024). Academy calls for a national human biomonitoring program to track the health impacts of forever chemicals Available at: <https://archive.aahms.org/news/academy-calls-for-a-national-human-biomonitoring-program-to-track-the-health-impacts-of-forever-chemicals/>

⁸ Qianwen, M, Lei, J, et al (2025). Neurotoxicity of Micro- and Nanoplastics: A Comprehensive Review of Central Nervous System Impacts. Available at: <https://pubs.acs.org/doi/10.1021/envhealth.5c00087>

⁹ Marfella, R, Prattichizzo, F, et al (2024). Microplastics and Nanoplastics in Atheromas and Cardiovascular Events. Available at: <https://www.nejm.org/doi/full/10.1056/NEJMoa2309822>

Microplastics and PFAS have been implicated in endocrine disruption, immune dysregulation, and possible carcinogenic pathways in experimental studies¹⁰. However, human health evidence remains inconsistent and insufficient to support definitive conclusions, reflecting the predominance of observational study designs, variability in exposure assessment, and limited longitudinal follow-up¹⁰. Reported associations between PFAS exposure and outcomes such as early menopause⁴, immune deficiencies¹¹, and certain cancers¹² reiterate the need for more coordinated national research, including prospective cohort studies and improved exposure characterisation, to strengthen the evidence base.

3.5. Education and Public Awareness

Public understanding of microplastics and PFAS remains limited, and health professionals currently lack clear, evidence-based guidance¹⁰. It is therefore important to equip clinicians and the public with reliable, authoritative information while avoiding unwarranted alarm or misinterpretation of emerging evidence.

The AMA supports the development of targeted public-awareness initiatives that focus on practical, proportionate exposure-reduction strategies. Education efforts should be accompanied by the availability of viable, affordable alternatives to PFAS-containing and plastic-intensive products, recognising that behaviour change is more likely when individuals are supported with realistic options rather than information alone.

Clinicians should be supported with guidance and communication tools that enable them to discuss emerging risks in a balanced manner, acknowledging uncertainty while responding to patient concerns. Clear and consistent labelling of PFAS-containing products, alongside accessible and coordinated government messaging, would further support informed consumer choice and improve community awareness.

3.6. National Standards

The AMA supports strengthened and nationally consistent implementation of health-protective drinking water standards, including the updated NHMRC Australian Drinking Water Guidelines and

¹⁰ World Health Organisation (2022). Dietary and inhalation exposure to nano- and microplastic particles and potential implications for human health. Available at: <https://www.who.int/publications/i/item/9789240054608>

¹¹ Tursi, A, Lindeman, B, et al (2024). Immune cell profiles associated with human exposure to perfluorinated compounds (PFAS) suggest changes in natural killer, T helper, and T cytotoxic cell subpopulations. Available at: <https://www.sciencedirect.com/science/article/pii/S0013935124011265>

¹² Li, S, Oliva, P, et al (2025). Associations between per-and polyfluoroalkyl substances (PFAS) and county-level cancer incidence between 2016 and 2021 and incident cancer burden attributable to PFAS in drinking water in the United States. Available at: <https://pmc.ncbi.nlm.nih.gov/articles/PMC12069088/#Sec16>

associated PFAS guidance¹³. Rather than simple adoption in principle, jurisdictions should ensure enforceable regulatory integration, transparent monitoring, and public reporting of contaminants of emerging concern. Benchmarking against leading international standards, including those adopted in the United States¹ and European Union², should be used to ensure Australian thresholds remain conservative yet health protective as the evidence base evolves. This approach aligns with precautionary public health practice and recognises the long-term and potentially irreversible nature of exposure to persistent contaminants.

4. Conclusion

While microplastics and PFAS are now widely recognised as persistent and pervasive environmental contaminants, significant uncertainty remains regarding their long-term health impacts¹⁰.

Current evidence, largely observational suggests emerging associations with adverse reproductive, developmental and chronic health outcomes, but falls short of establishing causality or quantifying population-level risk¹⁰. At present, there are no universally accepted clinical thresholds for microplastic exposure, and routine clinical testing is not standard practice nor clearly actionable at a population level¹⁰. While PFAS biomonitoring is more established in specific exposure contexts, the clinical interpretation of results remains complex and evolving⁷.

The AMA emphasises a public health prevention approach focused on exposure reduction and environmental controls rather than reliance on individual clinical detection, which may lag behind environmental and epidemiological realities. A precautionary and evidence-building approach is warranted: strengthening research and monitoring, aligning standards and regulation with international best practice, and supporting clinicians and the public to reduce avoidable exposure. Together, these measures will enable Australia to respond proportionately to emerging risks while building the robust evidence base required for future regulatory decision-making.

¹³ NHMRC (2025). Australian Drinking Water Guidelines. Available at: <https://www.nhmrc.gov.au/about-us/publications/australian-drinking-water-guidelines>