

The Senate

Community Affairs References
Committee

Impact of microplastics and other toxics on
human health

May 2026

© Commonwealth of Australia

ISBN 978-1-76093-939-7 (Printed version)

ISBN 978-1-76093-939-7 (HTML version)

This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 International License.



The details of this licence are available on the Creative Commons website:

<https://creativecommons.org/licenses/by-nc-nd/4.0/>.

Printed by the Senate Printing Unit, Parliament House, Canberra

Members

Chair

Senator Penny Allman-Payne AG, QLD

Deputy Chair

Senator Dorinda Cox ALP, WA

Members

Senator Michelle Ananda-Rajah ALP, VIC

Senator Alex Antic LP, SA

Senator Wendy Askew (*from 05 February 2026*) LP, TAS

Senator Leah Blyth (*until 05 February 2026*) LP, SA

Senator Jessica Collins (*until 03 March 2026*) LP, NSW

Senator the Hon Anne Ruston (*from 03 March 2026*) LP, SA

Substitute Member

Senator the Hon Carol Brown ALP, TAS

(*Replaced Senator Cox for a public hearing on 19.03.2026*)

Participating Member

Senator the Hon Anne Ruston LP, SA

(*from 06 November 2025 until 03 March 2026*)

Secretariat

Apolline Kohen, Committee Secretary

Grace Holt, Senior Research Officer

Ayrton Kiraly, Research Officer

Justin Bowen, Administrative Officer

PO Box 6100

Parliament House Canberra ACT 2600

Phone: 02 6277 3515

Email: community.affairs.sen@aph.gov.au

Internet:

www.aph.gov.au/Parliamentary_Business/Committees/Senate/Community_Affairs

Contents

Members	iii
Abbreviations	ix
List of recommendations	xi
Chapter 1—Introduction	1
Referral	1
Conduct of the inquiry	2
Structure of the report	2
Acknowledgements	3
What are microplastics?	3
Nanoplastics	4
Exposure pathways	5
What are toxics?	5
Endocrine-disrupting chemicals.....	6
What are forever chemicals?.....	7
Exposure pathways	7
The Australian Government’s role in the management of microplastics, toxics and forever chemicals	8
Department of Climate Change, Energy, the Environment and Water	8
Australian Centre for Disease Control.....	10
Australian Industrial Chemicals Introduction Scheme	11
Food Standards Australia New Zealand	12
National Health and Medical Research Council	12
Australian Pesticides and Veterinary Medicines Authority	13
Previous inquiries	14
Senate Select Committee on PFAS.....	14
Senate Environment and Communications References Committee – Inquiry into Waste Reduction and Recycling Policies.....	15
House of Representatives – Inquiry into Plastic Pollution in Australia’s Oceans and Waterways	16
Chapter 2—Reported health impacts	17
Possible mechanisms of harm on human health	18

Microplastics.....	18
Endocrine-disrupting chemicals.....	18
PFAS	18
Reproductive health: the canary in the coalmine	19
Fertility	19
Gynaecological conditions.....	22
In utero transmission, placental function and foetal development.....	22
Maternal health and pregnancy outcomes.....	23
First 1000 days of life.....	24
Cardiovascular impacts.....	26
Endocrine-disrupting chemicals.....	27
Chapter 3— Evidence and research	29
Data collection and methods	29
Inconsistent measurement and detection methods	30
Contamination and quality control.....	32
The challenge of establishing causality.....	33
Ethical considerations impeding research.....	34
Gaps in knowledge on exposure pathways	35
Policy implications.....	36
Improving the evidence base.....	37
Utilising existing studies and biobanks.....	37
Collaboration needs.....	38
Accelerating research	39
Reproductive health and fertility: a case study	43
Precautionary approach.....	44
Chapter 4— Adopting a precautionary approach	47
Education and information.....	47
Public awareness.....	47
The need for evidence-based messaging.....	48
Current government information.....	50
Community-based initiatives.....	51
Limiting MNPs and PFAS in consumer products.....	53

Fostering industry innovation	53
Strengthening extended producer responsibility.....	54
Limited regulations in Australia.....	55
National standard	56
International regulation	57
Regional and rural considerations.....	59
Chapter 5 – Committee view.....	61
The need for a whole of government approach	61
Past parliamentary inquiries	62
Potential health impacts.....	63
Data collection and methods.....	64
Exposure pathways	65
Biomonitoring and longitudinal research	65
The role of National Health and Medical Research Council	66
Education and information.....	67
Limiting MNPs and PFAS in consumer products.....	68
Regulation.....	69
Additional Comments from Labor Senators.....	71
Appendix 1 – Site visit to Adelaide University laboratories	75
Appendix 2 – Submissions and additional information	79
Appendix 3 – Public hearings and witnesses	83

Abbreviations

AAHMS	Australian Academy of Health and Medical Sciences
AFGC	Australian Food and Grocery Council
AICIS	Australian Industrial Chemicals Introduction Scheme
AMAN	Australian Multicultural Action Network
ANMF	Australian Nursing and Midwifery Federation
APVMA	Australian Pesticides and Veterinary Medicines Authority
AUSMAP	Australian Microplastic Assessment Program
Australian CDC	Australian Centre for Disease Control
BPA	Bisphenol-A
The committee	Senate Community Affairs References Committee
DCCEEW	Department of Climate Change, Energy, the Environment and Water
EDCs	Endocrine-disrupting chemicals
EPR	Extended producer responsibility
EU	European Union
FSANZ	Food Standards Australia New Zealand
Heart Foundation	National Heart Foundation of Australia
ISO	International Organization for Standardization
MNPs	Micro- and nanoplastics
NESP 2	National Environment Science Program Phase 2
NHMRC	National Health and Medical Research Council

nm	Nanometre
PACs	Plastic-associated chemicals
PCOS	Polycystic ovary syndrome
PERTH Trial	Plastic Exposure Reduction Transforms Health Trial
PFAS	Per- and polyfluoroalkyl substances
PFAS Committee	Senate Select Committee on PFAS
RACGP	Royal Australian College of General Practitioners
RANZCOG	Royal Australian and New Zealand College of Obstetricians and Gynaecologists
REACH	Registration, Evaluation, Authorisation, and Restriction of Chemicals
TCRs	Targeted Calls for Research
UNSW SMaRT Centre	Sustainable Materials Research and Technology Centre at the University of New South Wales Sydney
WA	Western Australia
µm	Micrometre

List of recommendations

Recommendation 1

5.12 The committee recommends that the Australian Government mandate the Australian Centre for Disease Control to coordinate a whole of government approach to the monitoring of the potential impacts of micro- and nanoplastics and per- and polyfluoroalkyl substances on human health, with a view of developing a national strategy by 2028.

Recommendation 2

5.17 The committee recommends that the Australian Government work with relevant stakeholders to assess per- and polyfluoroalkyl substances (PFAS) contamination in clothing, textiles, floor coverings and furniture, identify key resources and import pathways, reduce contaminated imports and improve the safe disposal of legacy PFAS-contaminated textile waste.

Recommendation 3

5.18 The committee recommends that, as a priority, the Australian Government works to enforce the PFAS ban in relation to cosmetics and personal care products, including period products.

Recommendation 4

5.27 The committee recommends that the Australian Centre for Disease Control, in consultation with relevant stakeholders, develop nationally standardised methods for measurement, exposure assessment and contamination control of micro- and nanoplastics and per- and polyfluoroalkyl substances in human samples.

Recommendation 5

5.38 The committee recommends that Australian Centre for Disease Control commissions research to better understand exposure pathways to micro- and nanoplastics, including a national, micro- and nanoplastics and per- and polyfluoroalkyl substances biomonitoring research program.

Recommendation 6

5.39 The committee recommends that the Medical Research Future Fund consider funding longitudinal human studies of Australian cohorts to further understand the potential links between micro- and nanoplastics and per- and polyfluoroalkyl substances' exposure with adverse health outcomes.

Recommendation 7

5.47 The committee recommends that the National Health and Medical Research Council open a Targeted Call for Research into the impact of micro- and nanoplastics, per- and polyfluoroalkyl substances and endocrine-disrupting chemicals on human health.

Recommendation 8

5.51 The committee recommends that the Australian Centre for Disease Control develop a range of communication products on micro- and nanoplastics and per- and polyfluoroalkyl substances to provide evidence-based guidance to the public. This should include health considerations and ways to reduce exposure.

Recommendation 9

5.55 The committee recommends that the Australian Government consider allocating funding to support industry innovation to reduce micro- and nanoplastics and per- and polyfluoroalkyl substances in products at the source.

Recommendation 10

5.59 The committee recommends that the Australian Government work with state and territory governments to consider how to expand extended producer responsibility schemes to expand and harmonise product stewardship legislations and accelerate the transition to the manufacturing of products that are more durable, easier to recycle and made from safer, less harmful materials.

Recommendation 11

5.64 The committee recommends that the Australian Government consider extending investment for the National Environment Science Program beyond 2027.

Recommendation 12

5.68 The committee recommends that the Department of Climate Change, Energy, the Environment and Water undertake a review of regulatory approaches in leading international jurisdictions for the management of micro- and nanoplastics, per- and polyfluoroalkyl substances and endocrine-disrupting chemicals, with the view of developing a coordinated, whole-of-government regulatory response.

Chapter 1

Introduction

- 1.1 Recent trends in Australia's health statistics have been cause for concern. Fertility rates are at an all-time low and cancers in young people have spiked.¹ While researchers grapple with the causes behind these alarming trends, increasing attention has been paid to the potential influence of environmental factors, including substances such as microplastics, forever chemicals and toxics.
- 1.2 Microplastics are a widespread and persistent form of pollution that are now ubiquitous in the environment.² They are in the air we breathe, the food we eat, the water we drink and the clothes we wear. While there are steps individuals can take to reduce exposure to these substances, human contact with them is unavoidable. Alongside microplastics, Australians are also exposed to toxics and forever chemicals through their diet and the environment.
- 1.3 It is recognised that there are knowledge gaps and limitations in research about the impacts that these substances have on human health. The inquiry was referred to explore the potential actions, policies, and investments needed to ensure that Australians are protected, in line with evidence standards, from the potential harms that microplastics, toxics and forever chemicals may pose to our health.

Referral

- 1.4 On 6 November 2025, the following matter was referred to the Senate Community Affairs References Committee (the committee) for inquiry and report by 26 May 2026.

The impact of microplastics, toxics and forever chemicals on human health, with particular reference to:

the impact of microplastics, toxics and forever chemicals on reproductive health, including:

- (a) women's fertility, hormonal disorders, endometriosis, polycystic ovary syndrome and premature menopause,

¹ ABC News, *Australia's baby recession deepens, new ABS data says*, 15 October 2025, www.abc.net.au/news/2025-10-15/australia-s-baby-recession-deepens-new-abs-data-says/105541086 (accessed 30 March 2026); Royal Australian College of General Practitioners - News GP, *'Disturbing' spike in youth cancer*, 12 March 2024, www1.racgp.org.au/newsgp/clinical/disturbing-spike-in-youth-cancer (accessed 30 March 2026).

² Dr Nina Wootton, Researcher, Adelaide University, *Committee Hansard*, 19 March 2026, p. 10; The Australian Centre for Disease Control, *Submission 27*, p. 2.

- (i) in utero transmission of microplastics and the impact on placental function and foetal development,
 - (ii) maternal health, including impacts on pregnancy outcomes like miscarriage, preterm birth and still birth, and
 - (iii) fertility impacts across all populations, including men's fertility;
- (b) disruption of key developmental pathways in the first 1,000 days of life that significantly impact later-life health outcomes like obesity, heart disease, diabetes and cognitive function;
 - (c) cardiovascular impacts, including links between microplastic accumulation in arterial plaque and increased risks of heart attack, stroke and cardiovascular mortality;
 - (d) links between endocrine disruptors and increased rates of cancer in young people, fertility issues, hormone dysregulation, respiratory diseases, inflammatory conditions and immune system dysfunction;
 - (e) the effectiveness of any education or informative efforts to notify the public of potential harms and prevention opportunities;
 - (f) the potential benefits of a national standard for consumer products;
 - (g) protocols and policies of other countries which have proven to be effective;
 - (h) the adequacy of current research, monitoring and measurement standards for microplastic contamination in Australia; and
 - (i) any other related matter.³

Conduct of the inquiry

- 1.5 Details of the inquiry were published on the committee's website, and the committee invited a number of organisations and individuals to lodge submissions. The committee received 73 submissions, which are listed at Appendix 2.
- 1.6 The committee held four public hearings and one site visit:
 - 19 March 2026 – Adelaide, South Australia (including a site visit to the Robinson Research Institute. Please see Appendix 1 for more information.);
 - 20 March 2026 – Melbourne, Victoria;
 - 27 March 2026 – Canberra, Australian Capital Territory; and
 - 8 April 2026 – Canberra, Australian Capital Territory.
- 1.7 A list of witnesses who gave evidence at the public hearings is available at Appendix 3.
- 1.8 In this report, references to *Committee Hansard* are to proof transcripts. Page numbers may vary between proof and official transcripts.

Structure of the report

- 1.9 This report is comprised of five chapters, as outlined below:

³ *Journals of the Senate*, No. 23, 6 November 2025, pp. 747–748.

- Chapter 1 introduces the report by setting out general information that outlines the conduct of the inquiry and provides background information relating to micro- and nanoplastics (MNPs), forever chemicals and toxics.
- Chapter 2 explores the reported impacts of MNPs, per- and polyfluoroalkyl substances (PFAS) and associated toxics on various aspects of human health.
- Chapter 3 canvasses the gaps in the evidence base and the consequences for policy formulation. It also considers ways to improve the evidence base, which are reflected in a case study on fertility and reproductive health. This chapter concludes by considering calls for a precautionary approach.
- Chapter 4 discusses public awareness and education and explores how we can reduce our exposure to plastics and other substances through product innovation and regulations. It also considers what a precautionary approach may entail.
- Chapter 5 concludes with the committee's view and recommendations.

Acknowledgements

- 1.10 The committee thanks all those who contributed to the inquiry by making submissions, providing additional information, appearing at public hearings and facilitating the committee's site visit.
- 1.11 The committee also wishes to thank the Parliamentary Library for the background materials on microplastics, forever chemicals and toxics that they developed for the committee.

What are microplastics?

- 1.12 The Australian Industrial Chemicals Introduction Scheme (AICIS), the Commonwealth regulator responsible for administering the introduction of industrial chemicals, defined microplastics as 'solid plastic particles with a particle size 5 mm or smaller and are composed of mixtures of polymers and functional additives'.⁴
- 1.13 Chemistry Australia, the peak national body representing the Australian chemical industry, including the Australian plastics industry, identified that there are two types of microplastics:
- primary microplastics: manufactured for use in this size range to produce things like cosmetics, toothpaste and pharmaceutical drugs; and
 - secondary microplastics: generated by the degradation of larger plastic items.⁵

⁴ Australian Industrial Chemicals Introduction Scheme (AICIS), *Submission 28*, pp. 4–5.

⁵ Chemistry Australia, *Submission 65*, p. 3.

1.14 Inquiry participants noted that secondary microplastics are the major source of microplastics in the environment.⁶ Microplastics can enter the environment in a range of ways, including:

- Synthetic textile fibres released during washing
- Tyre wear particles generated through road transport
- Fragmentation of plastic packaging and litter
- Industrial plastic resin pellet losses
- Intentionally added microplastics in some consumer products.⁷

Nanoplastics

1.15 The Nano and Microplastics Research Consortium at Flinders University explained that nanoplastics are plastics that are 'so small they are measured in nanometres (1nm = one billionth of a metre)'.⁸

1.16 In a joint submission, the Centre for Safe Air, the Lung Foundation, THRIVE and University of Queensland's Child Health Research Centre defined nanoplastics as a 'smaller subgroup of plastic particles ranging from 1 nanometre (nm) to less than 1 micrometre (μm) in size'.⁹

1.17 Inquiry participants sometimes considered nanoplastics collectively with microplastics, which were generally together referred to as 'MNPs'.¹⁰ The figure below illustrates the different sizes of these types of plastic particles:

⁶ See, for example, Professor Oliver Jones, *Submission 24*, p. 2; Product Safety Solutions, *Submission 57*, p. 5; Chemistry Australia, *Submission 65*, p. 3.

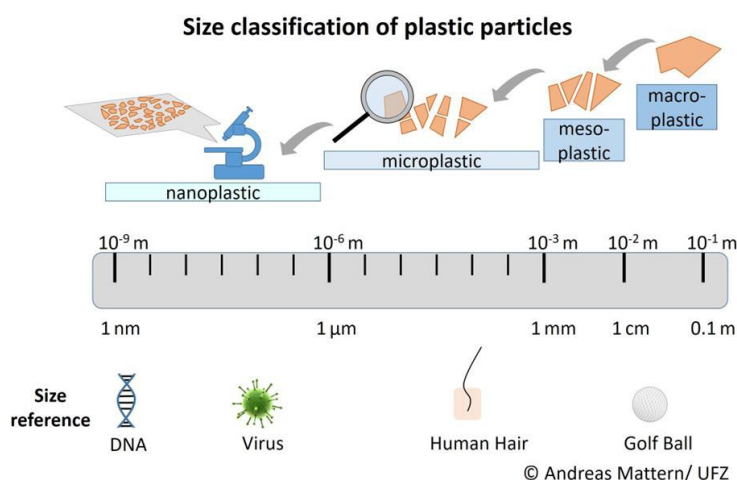
⁷ Solving Plastic Waste Cooperative Research Centre, *Submission 64*, [pp. 2–3].

⁸ Flinders University – Nano and Microplastics Research Consortium, *Submission 21*, p. 1.

⁹ Centre for Safe Air, the Lung Foundation, THRIVE and University of Queensland's Child Health Research Centre, *Submission 61*, p. 3.

¹⁰ See, for example, I'm Plastic Free, *Submission 22*, p. 3; Vinyl Council of Australia, *Submission 39*, [p. 1]; Minderoo Foundation, *Submission 41*, p. 5; Food Packaging Forum, *Submission 48*, p. 1; Product Safety Solutions, *Submission 57*, p. 3.

Figure 1.1



Source: Chemistry Australia, Submission 65, p. 3.

Exposure pathways

- 1.18 As discussed earlier, microplastics are ubiquitous.¹¹ Therefore, there are a range of exposure pathways in which individuals are exposed to them.
- 1.19 The Australian Centre for Disease Control (Australian CDC), which provides public health advice to the government, outlined major exposure pathways and exposure settings in its submission:

Inhalation: Inhalation is a primary exposure pathway noting indoor air typically contains higher concentrations of microplastics than outdoor air. Australian studies have found 0.20 to 2.25 particles/m³ in indoor air, with highest concentrations in childcare centres.

Ingestion: Microplastics have been detected in bottled water, tap water and a range of foods (such as seafood, honey, sugar, rice and processed items) at widely variable concentrations.

Dermal and Medical Exposure: Microplastics are present in medical devices and personal care products. In many of these contexts, plastic components are considered essential with procedural routes that may introduce particles directly (for example, intravenous tubing, syringes, dialysis circuits), noting that quantified human exposure estimates in these settings remain limited.¹²

What are toxics?

- 1.20 For the purposes of this inquiry, 'toxics' refer to 'harmful materials that can cause adverse effects in humans, animals and plants'.¹³ Inquiry participants

¹¹ See, for example, Australian Nursing and Midwifery Federation, *Submission 26*, p. 4; Australian Centre for Disease Control, *Submission 27*, p. 2; UNSW SMaRT Centre, *Submission 29*, p. 6.

¹² Australian Centre for Disease Control, *Submission 27*, p. 3. Emphasis in original.

¹³ AICIS, *Submission 28*, p. 5.

used a variety of terms to refer to such materials, including ‘toxins’ and ‘contaminants’.¹⁴

- 1.21 While some inquiry participants mentioned the health impacts of heavy metals, such as lead, mercury, cadmium and arsenic,¹⁵ endocrine-disrupting chemicals (EDCs) were the main type of toxics that inquiry participants considered.

Endocrine-disrupting chemicals

- 1.22 Cancer Council Australia defined EDCs as ‘chemically diverse substances identified for their evident or potential adverse impact on reproductive or hormonal processes’.¹⁶ The Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) also noted that many EDCs are associated with microplastics or plastic production.¹⁷
- 1.23 Bisphenols and phthalates, types of EDCs which are also plastic-associated chemicals (PACs),¹⁸ are briefly outlined in the following sections. The reported health impacts of EDCs are considered in Chapter 2.

Bisphenols

- 1.24 Bisphenols received particular attention from submitters like the Plastics and Female Infertility Research Team, led by Dr Jessie Sutherland and Dr Alex Peters at the University of Newcastle. They explained that bisphenols are ‘a group of industrial chemicals that are widely used for food and beverage packaging, found in plastic containers and can linings’.¹⁹

Phthalates

- 1.25 Phthalates are a group of synthetic chemicals that are used to make plastic flexible and durable. They are found in products like PVC packaging, medical devices, and personal care products.²⁰

¹⁴ See, for example, Royal Australian and New Zealand College of Obstetricians and Gynaecologists, *Submission 6*, p. 2; Robinson Research Institute, *Submission 25*, p. 2; Doctors for the Environment Australia, *Submission 30*, p. 3; Responsible Future (Illawarra Chapter), *Submission 47*, [p. 14]; Australian Academy of Health and Medical Sciences, *Submission 67*, p. 5.

¹⁵ See, for example, Doctors for the Environment Australia, *Submission 30*, p. 3; No More Butts, *Submission 38*, p. 2; Natural Turf Alliance, *Submission 46*, p. 6.

¹⁶ Cancer Council, *Submission 13*, p. 5.

¹⁷ Royal Australian and New Zealand College of Obstetricians and Gynaecologists, *Submission 6*, p. 1.

¹⁸ PERTH Trial, *Submission 20*, [p. 2].

¹⁹ Plastics and Female Infertility Research Team, *Submission 32*, p. 1.

²⁰ Australian Academy of Health and Medical Sciences, *Submission 67*, p. 21.

Exposure pathways

- 1.26 The Plastic Exposure Reduction Transforms Health (PERTH) Trial, based at the University of Western Australia and funded by the Minderoo Foundation, explained that phthalates and bisphenols are ingested, inhaled as particulates in household dust, or absorbed cutaneously.²¹
- 1.27 The Plastics and Female Infertility Research Team also identified that the vast majority (90 per cent) of BPA exposure is through diet, as it leaches into food products, particularly after heating.²²
- 1.28 The PERTH Trial also noted that human exposure to these EDCs is ‘direct, continuous, begins at gestation and persists across the lifespan’.²³

What are forever chemicals?

- 1.29 Doctors for the Environment Australia, an organisation of Australian medical doctors, explained that PFAS are synthetic compounds that contain strong carbon-fluoride bonds which resist breaking down in the environment or the human body.²⁴
- 1.30 As noted by some inquiry participants, PFAS are often referred to as ‘forever chemicals’ due to their persistence, meaning they are not easily eliminated from the body or easily broken down in the environment.²⁵

Exposure pathways

- 1.31 Doctors for the Environment Australia explained that the presence of PFAS are widespread:
- Present in soil, water, and air due to widespread industrial use since the 1940s, PFAS are found in everyday products including non-stick cookware, water-resistant fabrics, food packaging, and firefighting foam. Contamination has spread through manufacturing facilities, military bases, airports, landfills, and wastewater treatment plants.²⁶
- 1.32 The Australian Nursing and Midwifery Federation (ANMF) also stated that exposure to PFAS can be geographically variable. Water supplies and land that have been contaminated with PFAS have been documented in Katherine (Northern Territory), Oakey (Queensland), and Williamtown (New South

²¹ The PERTH Trial, *Submission 20*, [p. 2].

²² Plastics and Female Infertility Research Team, *Submission 32*, p. 1.

²³ The PERTH Trial, *Submission 20*, [p. 2].

²⁴ Doctors for the Environment Australia, *Submission 30*, p. 3.

²⁵ Cancer Council Australia, *Submission 13*, p. 3; Plastic Pollution Coalition/The Last Plastic Straw, *Submission 14*, [p. 2]; Australian Nursing and Midwifery Federation (ANMF), *Submission 26*, p. 4.

²⁶ Doctors for the Environment Australia, *Submission 30*, p. 3.

Wales). The ANMF noted that these communities have been associated with the historical use of aqueous film-foam at Defence bases.²⁷

- 1.33 Similarly, the Australian Academy of Health and Medical Sciences noted that the Wreck Bay Aboriginal community in New South Wales has been impacted by PFAS contamination from Defence activities.²⁸

The Australian Government's role in the management of microplastics, toxics and forever chemicals

- 1.34 This section canvasses the Australian Government's role in the management of microplastics, toxics and forever chemicals. According to the Australian CDC, there are multiple portfolios that are responsible for these substances.²⁹
- 1.35 However, it noted that while Australia has existing regulatory arrangements for chemicals, water quality, food standards and environmental protection, microplastics are not specifically regulated as a defined contaminant category.³⁰
- 1.36 The Australian CDC also submitted that 'no jurisdiction globally has yet established health-based regulatory thresholds for microplastics in air, water or food' due to uncertainties associated with exposure, analysis and evidence,³¹ which is further discussed in Chapter 3.

Department of Climate Change, Energy, the Environment and Water

- 1.37 At a public hearing, Ms Rachel Burgess, Head of the Chemicals, Atmosphere and International Branch within the Department of Climate Change, Energy, the Environment and Water (DCCEEW), clarified that DCCEEW's role focusses on the 'risk management of industrial chemicals' and 'areas of waste policy', which means that:

... whilst we don't have a direct role in assessing or managing human health risks when it comes to industrial chemicals, our policies and programs do contribute indirectly to the protection of human health by reducing the exposure of humans to harmful chemicals through the environment.³²

Chemicals management

- 1.38 DCCEEW outlined that it administers the *Industrial Chemical Environmental Management (Register) Act 2021*, which establishes nationally consistent

²⁷ ANMF, *Submission 26*, p. 7.

²⁸ Australian Academy of Health and Medical Sciences, *Submission 67*, p. 16.

²⁹ Australian Centre for Disease Control, *Submission 27*, p. 1.

³⁰ Australian Centre for Disease Control, *Submission 27*, p. 3.

³¹ Australian Centre for Disease Control, *Submission 27*, p. 3.

³² Ms Rachel Burgess, Head, Chemicals, Atmosphere and International Branch, Circular Economy Division, Department of Climate Change, Energy, the Environment and Water, *Committee Hansard*, 27 March 2026, p. 2.

standards to protect the environment by managing the import, manufacture, export, use and disposal of industrial chemicals. This could be chemicals on their own, in mixtures, or in finished goods, including those that may contain microplastics.³³

- 1.39 DCCEEW also assists the Department of Health, Disability and Ageing and AICIS. It assesses the risks that industrial chemicals pose to ecosystems and provides advice to the Executive Director of AICIS.³⁴

Plastic pollution

- 1.40 DCCEEW is responsible for Australia's engagement in negotiations to develop a new international legally binding instrument on plastic pollution under the mandate of the United Nations Environment Assembly Resolution 5/14.³⁵

- 1.41 As part of these negotiations, Australia is supporting measures relevant to microplastics, including:

- recognising intentionally added microplastics as a factor in identifying problematic plastic products;
- promoting product design that reduces leakage into the environment; and
- minimising microplastic releases throughout product lifecycles.³⁶

- 1.42 DCCEEW also manages the National Plastics Plan 2021, which outlines Australia's approach to increase plastic recycling, find alternatives to unnecessary plastics and reduce the impacts of plastics on the environment.³⁷

Research on microplastics

- 1.43 DCCEEW supports research on microplastics through the National Environment Science Program Phase 2 (NESP 2), a government-funded research program that supports all levels of government to deliver on their environmental commitments. Applied research for NESP 2 is delivered through four research hubs.³⁸

³³ Department of Climate Change, Energy, the Environment and Water (DCCEEW), *Submission 3*, p. 1.

³⁴ DCCEEW, *Submission 3*, p. 1.

³⁵ DCCEEW, *Submission 3*, p. 2.

³⁶ DCCEEW, *Submission 3*, p. 2.

³⁷ DCCEEW, *National Plastics Plan*, 10 October 2021, www.dceew.gov.au/environment/protection/waste/plastics-and-packaging/national-plastics-plan (accessed 5 May 2026).

³⁸ DCCEEW, *Submission 3*, p. 2.

- 1.44 The Sustainable Communities and Waste Hub, which is delivering applied research under NESP 2, has conducted research on microplastics released from synthetic turf and tyre particles released from tyre road wear.³⁹
- 1.45 Additionally, research conducted under this hub has contributed to new Australian ISO (International Organization for Standardization) standards for measuring microplastics in the environment.⁴⁰

Australian Centre for Disease Control

- 1.46 According to the Australian CDC, it conducts activities related to public health and environmental health risk factors:

The Australian CDC provides public health advice, conducts horizon scanning for emerging risks and leads evidence synthesis activities to inform national regulatory, policy and community guidance. The Australian CDC has a role in coordinating surveillance and health protection efforts relating to environmental health risk factors - including microplastics.⁴¹

- 1.47 It also stated that through the Environmental Health Standing Committee, it works with jurisdictional health departments to support 'nationally consistent interpretation, risk assessment and communication of emerging environmental health hazards, including issues such as microplastics where the evidence base is still evolving'.⁴²
- 1.48 In 2026, the Australian CDC also published an open tender to support a biomonitoring pilot study to better understand feasibility and assess approaches for potential future biomonitoring arrangements.⁴³

Microplastics and health report

- 1.49 Further, in 2025, the interim Australian CDC commissioned Allen + Clarke to undertake a review on the potential health effects of microplastic particles.⁴⁴ The report was released during the course of the inquiry. It provides an evidence review on the potential associations between exposure to microplastic particles and health outcomes, and a comparative analysis of health advice and jurisdictional approaches to managing health-related risks from microplastics, as well as advice provided by international organisations. The final part of the

³⁹ DCCEEW, *Submission 3*, p. 2.

⁴⁰ DCCEEW, *Submission 3*, p. 2.

⁴¹ Australian Centre for Disease Control, *Submission 27*, p. 2.

⁴² Australian Centre for Disease Control, *Submission 27*, p. 2.

⁴³ Professor Zoe Wainer, Director-General, Australian Centre for Disease Control, *Committee Hansard*, 27 March 2026, p. 55.

⁴⁴ Professor Zoe Wainer, Director-General, Australian Centre for Disease Control, *Committee Hansard*, 27 March 2026, p. 55.

report analyses policy options that the Australian CDC could consider to address emerging concerns about microplastics.⁴⁵

1.50 Key policy options that the Australian CDC could consider in response to concerns about the health impacts of exposure to microplastics outlined in the report include:

- evaluate the effectiveness of the current regulatory approaches;
- ongoing periodic review as new evidence emerges;
- development of evidence-based advice and education; and
- inter-agency coordination and collaboration.⁴⁶

Australian Industrial Chemicals Introduction Scheme

1.51 AICIS is the Commonwealth regulator responsible for administering the introduction of industrial chemicals. It helps protect public health and the environment by assessing the risks of industrial chemicals and recommending ways to manage those risks.⁴⁷ It noted that industrial chemicals include those that are used to manufacture plastics, such as polymers and plastic additives.⁴⁸

1.52 AICIS also submitted that it does not have the power to impose enduring bans or phase outs of industrial chemicals. Further, its regulatory decisions do not prevent an introducer from reapplying to introduce the same industrial chemical again for the same or new uses.⁴⁹

Role in regulation of microplastics

1.53 While AICIS does not regulate plastic articles, like plastics bags or toys, it can assess the potential human health and environmental risks arising from chemicals that are unintentionally released from plastic articles.⁵⁰

1.54 It noted that in these cases, it can make recommendations to risk managers but has no other regulatory powers over such products.⁵¹

Role in regulation of PFAS

1.55 AICIS noted that it provided evidence regarding its regulatory role on PFAS in its submission to the Senate Select Committee on PFAS. In this submission, AICIS explained that:

⁴⁵ Australian Centre for Disease Control, [Microplastics and health report](#), April 2026, pp. 4–6.

⁴⁶ Australian Centre for Disease Control, [Microplastics and health report](#), April 2026, pp. 168–177.

⁴⁷ AICIS, *Submission 28*, p. 4.

⁴⁸ AICIS, *Submission 28*, p. 4.

⁴⁹ AICIS, *Submission 28*, p. 9.

⁵⁰ AICIS, *Submission 28*, p. 9.

⁵¹ AICIS, *Submission 28*, p. 9.

- it regulates the introduction of PFAS chemicals, except when regulated by other Commonwealth regulatory agencies; and
 - it does not regulate PFAS that are introduced in articles unless they are intended to be released from the article during use.⁵²
- 1.56 In its submission to this inquiry, AICIS also noted that it initiated an evaluation of 522 PFAS listed on the Australian Inventory of Industrial Chemicals in 2025. AICIS has required introducers of industrial chemicals to provide information on whether the listed PFAS have been introduced in Australia, and if introduced, information on the volume of introduction and use was required.⁵³
- 1.57 AICIS submitted that this evaluation will inform consideration of which chemicals should be prioritised for further evaluation and that an evaluation statement will be published by 31 December 2026.⁵⁴

Food Standards Australia New Zealand

- 1.58 Food Standards Australia New Zealand (FSANZ) is the independent statutory authority that is responsible for developing and maintaining food standards in Australia and New Zealand.⁵⁵
- 1.59 FSANZ noted that it is actively monitoring the work of international bodies and engaging counterpart agencies to track emerging approaches to risk assessment and risk management for microplastics in food.⁵⁶

National Health and Medical Research Council

- 1.60 The National Health and Medical Research Council (NHMRC)'s role is to inquire into, issue guidelines on, and advise and make recommendations to the Commonwealth, states and territories on matters relating to the improvement of individual and population health.⁵⁷
- 1.61 It has responsibility for a range of environmental health guidelines, which provide nationally consistent standards and advice on environmental contaminants to maintain public health.⁵⁸ This includes the Australian Drinking Water Guidelines.

⁵² Senate Select Committee on PFAS, *Submission 65 - Australian Industrial Chemicals Introduction Scheme*, p. 11.

⁵³ AICIS, *Submission 28*, p. 10.

⁵⁴ AICIS, *Submission 28*, p. 10.

⁵⁵ Food Standards Australia New Zealand, *Submission 10*, [p. 1].

⁵⁶ Dr Sandra Cuthbert, Chief Executive Officer, Food Standards Australia New Zealand, *Committee Hansard*, 27 March 2026, p. 46.

⁵⁷ National Health and Medical Research Council, *Submission 5*, [p. 1].

⁵⁸ National Health and Medical Research Council, *Submission 5*, [p. 2].

Research on chemicals

- 1.62 The NHMRC submitted that it has funded over \$56 million for research on the health impacts from exposure to endocrine disruptors, PFAS and other chemicals over the last 10 years.⁵⁹
- 1.63 It specifically highlighted funding under one mechanism, Targeted Calls for Research (TCRs), which enable the NHMRC to address specific health issues through one-off, priority-focussed funding opportunities.⁶⁰
- 1.64 Under a TCR, the NHMRC provided \$14.4 million to research projects relating to the health effects of PFAS and other grant schemes.⁶¹

Australian Drinking Water Guidelines

- 1.65 The Australian Drinking Water Guidelines ‘provide an authoritative reference for determining the quality of water to be supplied to consumers in all parts of Australia’.⁶² Further, these guidelines include ‘health-based guidance values which represent the concentration of a water quality characteristic that, based on present knowledge, do not pose a significant risk to health over a lifetime of consumption’.⁶³
- 1.66 In June 2025, the NHMRC updated advice for PFAS in these guidelines.⁶⁴ Changes to the guidelines reduced the level required in drinking water.⁶⁵
- 1.67 Additionally, while the NHMRC acknowledged that these guidelines do not currently specify guidance or guideline values for microplastics, it did note that it is considering the issue of microplastics in drinking water as part of its Water Quality Advisory Committee’s 2026–28 work plan.⁶⁶

Australian Pesticides and Veterinary Medicines Authority

- 1.68 The Australian Pesticides and Veterinary Medicines Authority (APVMA) is Australia’s independent regulator of agricultural and veterinary products,

⁵⁹ National Health and Medical Research Council, *Submission 5*, [p. 3].

⁶⁰ Professor Steve Wesselingh, Chief Executive Officer, National Health and Medical Research Council, *Committee Hansard*, 27 March 2026, p. 39.

⁶¹ National Health and Medical Research Council, *Submission 5*, [p. 3].

⁶² National Health and Medical Research Council, *Submission 5*, [p. 2].

⁶³ National Health and Medical Research Council, *Submission 5*, [p. 2].

⁶⁴ National Health and Medical Research Council, *Submission 5*, [p. 2].

⁶⁵ Professor Steve Wesselingh, Chief Executive Officer, National Health and Medical Research Council, *Committee Hansard*, 27 March 2026, p. 39.

⁶⁶ National Health and Medical Research Council, *Submission 5*, [p. 3].

including products that are used to control pests and diseases, and to treat animal diseases.⁶⁷

- 1.69 APVMA is a product-based regulator. Before a product is registered or approved, APVMA must be satisfied across a range of factors, including that it does not pose a risk to the health and safety of people or the environment. When risks are identified, APVMA has a broad range of regulatory options available to manage the risks of the product.⁶⁸
- 1.70 APVMA also has powers to review any active constituents or registered products when new information emerges. These powers include varying conditions of use, suspending or cancelling approvals and registrations, and undertaking compliance and enforcement actions, including recalls.⁶⁹

Previous inquiries

- 1.71 There are a number of previous parliamentary inquiries that have been undertaken which relate to this inquiry. A brief overview of each of these pieces of work is provided below.

Senate Select Committee on PFAS

- 1.72 In August 2024, the Senate appointed the Select Committee on PFAS (PFAS Committee) to inquire into the extent, regulation and management of PFAS.⁷⁰ In March 2025, the PFAS Committee tabled an interim report which provided a brief overview of PFAS in Australia and had a focus on the community of Wreck Bay.⁷¹
- 1.73 Recommendations related to improving the government's remediation response at Wreck Bay and the committee being reappointed to continue its work in the 48th Parliament.⁷²

⁶⁷ Dr Ed Cram, Executive Director, Agricultural Chemicals, Australian Pesticides and Veterinary Medicines Authority, *Committee Hansard*, 27 March 2026, p. 45.

⁶⁸ Dr Ed Cram, Executive Director, Agricultural Chemicals, Australian Pesticides and Veterinary Medicines Authority, *Committee Hansard*, 27 March 2026, p. 45.

⁶⁹ Dr Ed Cram, Executive Director, Agricultural Chemicals, Australian Pesticides and Veterinary Medicines Authority, *Committee Hansard*, 27 March 2026, p. 45.

⁷⁰ Senate Select Committee on PFAS (per and polyfluoroalkyl substances), *Interim report*, March 2025, p. 1.

⁷¹ Senate Select Committee on PFAS (per and polyfluoroalkyl substances), *Interim report*, March 2025, p. 7.

⁷² Senate Select Committee on PFAS (per and polyfluoroalkyl substances), *Final report*, November 2025, pp. 1–2.

1.74 The PFAS Committee was reappointed on 28 July 2025.⁷³ It made 47 recommendations in its final report, which captured a range of matters, including:

- tasking FSANZ with reconsidering the need to establish regulatory limits of PFAS in food;
- consulting with relevant stakeholders on the designs for a national, longitudinal chemicals biomonitoring program and associated longitudinal PFAS health research projects;
- commissioning longitudinal research into the health impacts of PFAS contamination on the Wreck Bay community;
- funding and coordinating a strategic national PFAS environmental monitoring program;
- establishing a fund and taskforce to support the remediation of severely PFAS-contaminated sites; and
- working with First Nations community and language groups, and Aboriginal Community Controlled Organisations, to review PFAS management plans and update them to incorporate actions to safeguard the cultural, social, nutritional and economic wellbeing of First Nations people and communities impacted by PFAS contamination.⁷⁴

Senate Environment and Communications References Committee – Inquiry into Waste Reduction and Recycling Policies

1.75 In April 2025, the Senate Environment and Communications References Committee tabled its report for the inquiry into waste reduction and recycling policies.⁷⁵

1.76 The committee made 19 recommendations in its final report. Recommendations included matters such as:

- legislating a Circular Economy Act to implement a full circular economy framework;
- establishing a cross-jurisdictional circular economy action taskforce to oversight harmonised waste prevention and recycling practices, and the shift towards a circular economy;

⁷³ Senate Select Committee on PFAS (per and polyfluoroalkyl substances), *Final report*, November 2025, p. 2.

⁷⁴ Senate Select Committee on PFAS (per and polyfluoroalkyl substances), *Final report*, November 2025, pp. xix–xxiii.

⁷⁵ Senate Standing Committees on Environment and Communications, *No time to waste – Report*, April 2025, www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/Wastereduction/Report (accessed 26 March 2026).

- amending the *Recycling and Waste Reduction Act 2020* to implement ambitious producer-funded mandatory national product stewardship schemes, packaging design and rules, with mechanisms to drive demand for recycled materials; and
- amending the *Recycling and Waste Reduction Act 2020* to provide a national legislative framework for extended producer responsibility schemes, to be funded by industry.⁷⁶

House of Representatives – Inquiry into Plastic Pollution in Australia’s Oceans and Waterways

1.77 The House of Representatives Standing Committee on Climate Change, Energy, Environment and Water conducted an inquiry into plastic pollution in Australia’s oceans and waterways from 2022 to 2024. The committee’s final report made 22 recommendations, including:

- that DCCEEW develop an updated National Plastics Plan;
- that the government develop and fund a public awareness and education campaign, that should focus on proper recycling practices, and the impacts of plastic pollution, particularly the risks associated with microplastics;
- that DCCEEW commission comprehensive research to determine the impacts of microplastic ingestion, inhalation and skin contact on human health, including any absorbed toxins, and that this research should be made publicly available by July 2026 through the National Plastic Pollution Portal; and
- that the government set as a priority a national microplastic reduction strategy, that should be in place by December 2025.⁷⁷

⁷⁶ Senate Environment and Communications References Committee, *No time to waste – Waste reduction and recycling policies*, April 2025, pp. xi–xv.

⁷⁷ House of Representatives Standing Committee on Climate Change, Energy, Environment and Water, *Drowning in waste – Plastic pollution in Australia’s oceans and waterways*, May 2024, pp. xv–xix.

Chapter 2

Reported health impacts

- 2.1 As Professor Oliver Jones submitted, ‘one does not need to go very far to read all sorts of scary things about microplastics’.¹ For instance, the claim that humans eat one credit card worth of microplastics per week is a commonly circulated statement, but it is not supported by robust evidence.²
- 2.2 Though the findings of many studies on microplastics have been challenged,³ Mrs Lucinda (Lucy) Lines, founder of Two Lines Fertility, emphasised to the committee that ‘while the long-term impacts are still being investigated, what is clear from a clinical and patient perspective is that people are already concerned’.⁴
- 2.3 This chapter explores the reported impacts of micro- and nanoplastics (MNPs), per- and polyfluoroalkyl substances (PFAS) and associated toxics on various aspects of human health. It does not express a view on whether the reported impacts of microplastics on health are correct. Concerns regarding evidentiary standards are considered in Chapter 3.
- 2.4 Throughout the inquiry, the committee heard that the health impacts of chemical exposures include outcomes like impaired fertility, neurological effects and cancer.⁵
- 2.5 This chapter begins by examining possible mechanisms through which MNPs, PFAS, and toxics like endocrine-disrupting chemicals (EDCs) could impact human health.
- 2.6 The following sections consider the reported impacts of MNPs, PFAS and EDCs on a range of health matters, including the reproductive health of men and women, developmental outcomes in children and cardiovascular health. Finally, it canvasses the impacts that EDCs specifically may have on health outcomes, like cancer and respiratory diseases.

¹ Professor Oliver Jones, *Submission 24*, p. 4.

² Australian Centre for Disease Control, *Submission 27*, p. 4.

³ See, for example, Damian Carrington, ‘A bombshell’: doubt cast on discovery of microplastics throughout human body’, *The Guardian*, 14 January 2026, www.theguardian.com/environment/2026/jan/13/microplastics-human-body-doubt (accessed 1 April 2026).

⁴ Mrs Lucinda (Lucy) Lines, Founder, Two Lines Fertility, *Committee Hansard*, 19 March 2026, p. 1.

⁵ See, for example, Dr Bradley Clarke, Private capacity, *Committee Hansard*, 20 March 2026, p. 39; Dr Jane Muncke, Managing Director and Chief Scientific Officer, Food Packaging Forum, *Committee Hansard*, 27 March 2026, p. 9.

Possible mechanisms of harm on human health

2.7 Chapter 1 explored the pathways in which individuals are exposed to microplastics, EDCs and PFAS. This section provides an overview on how these substances interfere with the human body once individuals are exposed to them.

Microplastics

2.8 The Australian Centre for Disease Control (Australian CDC) explained that there are three possible mechanisms by which microplastics could affect human health:

- Direct physical effects from the particles themselves.
- Leaching of chemical additives from plastics.
- By acting as carriers for other pollutants, like chemicals, heavy metals and biological agents.⁶

Endocrine-disrupting chemicals

2.9 As discussed in Chapter 1, bisphenol-A (BPA) and phthalates are types of EDCs that are also plastic-associated chemicals (PACs).⁷ The PERTH Trial, based at the University of Western Australia, explained that these EDCs interfere with naturally occurring hormones, the activity of nuclear and steroid hormone receptors, and disrupt normal metabolism.⁸

2.10 Similarly, studies have shown that MNPs and phthalates may lead to inflammation and oxidative cellular damage.⁹ Phthalates can be ingested, inhaled or absorbed,¹⁰ and are associated with reproductive harm for both men and women.¹¹

PFAS

2.11 As noted in Chapter 1, PFAS are synthetic compounds that contain strong carbon-fluoride bonds which resist breaking down in the environment or the human body.¹² As such, these chemicals accumulate in human tissues and have been linked to adverse health effects such as immune dysfunction, metabolic disruption, and increased cancer risk.¹³

⁶ Australian Centre for Disease Control, *Submission 27*, p. 2.

⁷ PERTH Trial, *Submission 20*, [p. 2].

⁸ PERTH Trial, *Submission 20*, [p. 2].

⁹ See, for example, Australian Academy of Health and Medical Sciences, *Submission 67*, p. 12.

¹⁰ PERTH Trial, *Submission 20*, [p. 2].

¹¹ I'm Plastic Free, *Submission 22*, p. 4.

¹² Doctors for the Environment Australia, *Submission 30*, p. 3.

¹³ Doctors for the Environment Australia, *Submission 30*, p. 3.

Reproductive health: the canary in the coalmine

2.12 Dr Jacinta Martin and her colleagues, whose expertise spans reproductive biology, reproductive toxicology, environmental impacts on health, and the molecular mechanisms of environmental stress, explained that reproductive health is widely recognised as an early warning indicator of environmental harm, and that:

Changes such as declines in sperm quality, altered ovarian function, longer time to conceive, increased miscarriage risk, and adverse pregnancy outcomes often occur before broader health effects become apparent.¹⁴

2.13 Dr Martin and her colleagues elaborated that this is because reproductive systems are particularly vulnerable to small disruptions to its processes:

Reproductive systems are highly dependent on carefully balanced hormones and are therefore particularly vulnerable to endocrine disrupting chemicals, such as PFAS, which interfere with normal hormonal function. Key reproductive processes, including the production of sperm and eggs, fertilisation, implantation, and placental development, rely on closely coordinated hormonal, immune, and gene-regulatory signals. Even small disruptions to these processes can reduce fertility, affect embryo survival, or interfere with healthy fetal development.¹⁵

2.14 This section canvasses the reported health impacts of MNPs, PFAS and toxics on fertility outcomes, gynaecological conditions, in utero health, maternal health and early-life exposure.

Fertility

2.15 The committee heard that across the world, many countries are experiencing declines in fertility rates, alongside falling sperm counts and stagnant IVF success rates.¹⁶ Substantial evidence to the committee highlighted a link between exposure to MNPs, PFAS and associated toxics with impacts on fertility for both

¹⁴ Dr Jacinta Martin et al., *Submission 40*, p. 4.

¹⁵ Dr Jacinta Martin et al., *Submission 40*, p. 4.

¹⁶ See, for example, Responsible Future (Illawarra Chapter), *Submission 47*, [p. 6]; Dr Matt O'Mullane, General Manager, Food Safety Branch, Food Standards Australia New Zealand, *Committee Hansard*, 27 March 2026, p. 52.

men and women,¹⁷ which are explored below as potential explanations for these trends.

2.16 For instance, Dr Jacinta Martin and her colleagues outlined that human and animal studies have associated PFAS exposure with a range of reproductive outcomes. Outcomes relevant specifically to fertility included the following:

Female reproductive health:

- PFAS build up in ovary tissue and follicular fluid (the fluid that surrounds the egg)
- Changes in markers of ovarian reserve (egg supply) and egg quality
- Reduction in fertility and fecundability (defined as the probability of achieving a pregnancy within one menstrual cycle)

Male reproductive health:

- PFAS can build up in male reproductive tissues and disrupt fertility
- Changes in reproductive hormone levels, including testosterone
- Reduced semen quality, sperm production, concentration, and motility and the molecular mechanisms of environmental stress
- Changes in gene regulation in developing sperm cells and mature sperm¹⁸

2.17 At a public hearing, Dr Rebecca Robker of the Robinson Research Institute outlined similar findings from her lab's study on the effects of PFAS on fertility:

My lab recently completed a study that sheds light on the mechanisms by which PFAS may cause reduced female fertility. In this study, we gave female mice PFAS at very low doses. In fact, we used doses that are identical to what's present in the tap water. We comprehensively examined their eggs and embryos, and we found signs of cellular dysfunction. Importantly, we found that there were effects on the eggs and embryos detected in even the daughters and granddaughters of the mice that had been exposed to PFAS in the drinking water.¹⁹

¹⁷ See, for example, No More Plastic Packaging, *Submission 8*, p. 2; RACGP, *Submission 11*, p. 4; Australian Medical Association, *Submission 12*, p. 2; Plastic Pollution Coalition/The Last Plastic Straw, *Submission 14*, [p. 2]; National Female Infertility Advisory Group, *Submission 16*, p. 1; Robinson Research Institute, *Submission 25*, p. 6; Australian Nursing and Midwifery Federation, *Submission 26*, p. 8; Doctors for the Environment Australia, *Submission 30*, p. 4 and p. 5; Plastics and Female Infertility Research Team, *Submission 32*, p. 2; Dr Jacinta Martin et al, *Submission 40*, p. 4; Minderoo Foundation, *Submission 41*, p. 3; Responsible Future (Illawarra Chapter), *Submission 47*, [p. 4]; Mrs Lucinda (Lucy) Lines, Founder, Two Lines Fertility, *Committee Hansard*, 19 March 2026, p. 7; Dr Bradley Clarke, *Committee Hansard*, 20 March 2026, p. 39.

¹⁸ Dr Jacinta Martin et al., *Submission 40*, p. 4. Citations omitted.

¹⁹ Dr Rebecca Robker, Professor and Head, Reproduction and Development, Robinson Research Institute, Adelaide University, *Committee Hansard*, 19 March 2026, p. 2. Note: Appendix 1 outlines the committee's site visit to Adelaide University to view ongoing research focussed on determining the effects of per- and polyfluoroalkyl substances (PFAS) on female fertility, which was led by Dr Rebecca Robker and Dr Cameron Shearer.

- 2.18 Further, the Australian Academy of Health and Medical Sciences submitted that population-level observations of trends, such as semen quality and altered levels of estradiol (the primary female sex hormone), are increasingly supporting associations between EDCs exposure and reproductive health and fertility.²⁰
- 2.19 Additionally, Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) noted that while evidence regarding the direct effects of microplastics on human fertility are still emerging, early findings suggest potential disruption of the hypothalamic pituitary gonadal axis, which ‘tightly regulates’ the processes of oocyte production and spermatogenesis.²¹
- 2.20 Relatedly, Engineers Australia highlighted that early data indicates the presence of MNPs in testes and reproductive fluids, with animal models demonstrating impaired spermatogenesis following chronic low-dose exposure.²²

Bisphenol exposure

- 2.21 When considering impacts on reproductive health, the National Female Infertility Advisory Group and the Plastics and Female Infertility Research Team specifically highlighted the link between bisphenol exposure and infertility outcomes.²³
- 2.22 The Plastics and Female Infertility Research Team, led by Dr Jessie Sutherland and Dr Alex Peters, described BPA as a ‘hormone hacker’ and explained that exposures to bisphenol can prematurely deplete ovarian reserve or impair egg quality.²⁴
- 2.23 They outlined findings from their systematic review of every published research study (107 in total) that measured mammalian oocyte health following bisphenol exposure, which found that:
- 86% (30/35) of controlled dietary exposure studies on BPA in animal models documented adverse effects on ovary development, oocyte morphology, or oocyte chromosome alignment.
 - 40% (14/35) of studies reported adverse effects at or below the Australian tolerable daily intake for BPA.
 - 92% (12/13) of controlled dietary exposure studies on BPA alternatives in animal models documented adverse effects on ovary development, oocyte morphology, and/or oocyte chromosome alignment.

²⁰ Australian Academy of Health and Medical Sciences, *Submission 67*, p. 11.

²¹ RANZCOG, *Submission 6*, p. 2.

²² Engineers Australia, *Submission 3*, p. 3.

²³ National Female Infertility Advisory Group, *Submission 16*, [p. 1]; Plastics and Female Infertility Research Team, *Submission 32*, p. 1 and 2.

²⁴ Plastics and Female Infertility Research Team, *Submission 32*, p. 1 and 2.

- 52% (11/21) of all human observational studies showed associations between higher urinary BPA levels and reduced antral follicle counts (mature ovarian oocytes) or oocyte yield in IVF patients.²⁵

2.24 At a public hearing, Dr Sutherland emphasised to the committee the harm that bisphenols can cause:

What is called 'unexplained infertility' clinically is consistent with what we see scientifically. Bisphenol exposure harms eggs, and damaged eggs cannot sustain successful conception or IVF ... The science shows harm is plausible. The lived experience shows harm is already occurring.²⁶

Gynaecological conditions

2.25 According to RANZCOG, microplastics and EDCs have been implicated in several gynaecological conditions. For instance, higher levels of BPA have been consistently associated with increased androgen concentrations, which RANZCOG explained is 'a central feature' of polycystic ovary syndrome (PCOS) pathogenesis.²⁷

2.26 It also noted that emerging evidence indicates that BPA analogues, which have been developed as substitutes for BPA, are also associated with PCOS, suggesting that they may not offer a safer alternative.²⁸

2.27 Similarly, endometriosis has been associated with exposure to EDCs and toxicants, including phthalates, dioxins and polychlorinated biphenyls. RANZCOG also stated that the earlier onset of menopause and premature ovarian insufficiency have been associated with EDCs like phthalates, PFAS, and persistent organic pollutants.²⁹

In utero transmission, placental function and foetal development

2.28 Inquiry participants discussed the association between microplastics and in utero transmission, placental function and foetal development. For instance, RANZCOG stated that microplastics have been identified in placental tissue, amniotic fluid and umbilical cord blood, which has raised concerns about early development exposure.³⁰

²⁵ Plastics and Female Infertility Research Team, *Submission 32*, p. 2.

²⁶ Dr Jessie Sutherland, Chief Investigator, Plastics and Female Infertility Research Team, University of Newcastle, *Committee Hansard*, 20 March 2026, p. 48.

²⁷ Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG), *Submission 6*, p. 2. Note: polycystic ovary syndrome is a multisystem condition that affects endocrinological, reproductive, cardiometabolic, dermatologic and psychological health.

²⁸ RANZCOG, *Submission 6*, p. 2.

²⁹ RANZCOG, *Submission 6*, p. 3.

³⁰ RANZCOG, *Submission 6*, p. 5.

- 2.29 In its submission, the Royal Australian College of General Practitioners (RACGP) highlighted similar findings from a 2023 systematic review which ‘reported evidence that microplastics can translocate from the maternal circulation to the foetus, indicating that the placenta may not constitute a complete barrier to these particles’.³¹
- 2.30 RACGP stated that this raises concerns that developing organs and systems could be exposed during windows of foetal growth, which could have implications for developmental outcomes.³²
- 2.31 Engineers Australia also submitted that observational studies have identified correlations between higher MNP burdens in the placenta and reduced foetal growth metrics.³³
- 2.32 Similar findings were reported by Dr Jacinta Martin and her colleagues in relation to PFAS. PFAS have been detected in several biological samples, including:
- Maternal blood and Umbilical Cord blood
 - Fetal and Placental tissue
 - Amniotic fluid (the fluid surrounding the baby during pregnancy)
 - Breast milk³⁴
- 2.33 Dr Martin and her colleagues also emphasised the potential consequences of disruption to placental function:
- The placenta is not simply a barrier between mother and baby. It is also a hormone-producing organ that regulates fetal growth and development. Disruption of normal placental function has been linked to changes in fetal growth, altered immune development, and long-term metabolic health.³⁵

Maternal health and pregnancy outcomes

- 2.34 When discussing the impacts of plastic-associated exposures on maternal health and pregnancy outcomes, Doctors for the Environment Australia emphasised the importance of the prenatal period:
- The prenatal period represents a critical window of vulnerability due to children’s unique patterns of exposure combined with the sensitivity of early development to hazardous chemicals.³⁶

³¹ Royal Australian College of General Practitioners (RACGP), *Submission 11*, p. 3.

³² RACGP, *Submission 11*, p. 3.

³³ Engineers Australia, *Submission 18*, p. 3.

³⁴ Dr Jacinta Martin et al, *Submission 40*, p. 5.

³⁵ Dr Jacinta Martin et al, *Submission 40*, p. 5.

³⁶ Doctors for the Environment Australia, *Submission 30*, p. 5.

- 2.35 RANZCOG stated that there is a growing body of evidence which demonstrates that environmental toxins have impacts on outcomes such as miscarriage, preterm birth, hypertensive disorders of pregnancy, gestational diabetes, perinatal mortality and long-term childhood development. For instance, a range of animal, in vitro and observational human studies have shown association between elevated BPA levels and miscarriage.³⁷
- 2.36 Doctors for the Environment Australia also highlighted that plastic-associated exposures during pregnancy are linked to increased risks of miscarriage, prematurity, stillbirth and low birth weight. It stated that plastic additive chemicals disrupt endocrine function, with PFAS exposure also being linked to high blood pressure during pregnancy.³⁸

First 1000 days of life

- 2.37 In addition to reproductive health concerns, some inquiry participants also discussed links between early-life exposure to MNPs, PFAS, and other toxics with later-in-life health outcomes.³⁹
- 2.38 In a joint submission, the Centre for Safe Air, the Lung Foundation, THRIVE, and the University of Queensland's Child Health Research Centre explained that the first 1000 days are critical for development:

The first 1,000 days of life constitute a critical window of development, starting from conception and continuing through to two years of age. During this period, endocrine, metabolic, immune, pulmonary, and neurodevelopmental systems are highly malleable and more susceptible to environmental exposures.⁴⁰

- 2.39 Dr Timothy Chaston from the Centre for Safe Air emphasised to the committee that the behaviours of children also mean they have a higher vulnerability to microplastics:

Evidence shows that infants and toddlers also have substantially higher daily intake of micro- and nanoplastics because they have more hand-to-mouth behaviour.⁴¹

- 2.40 The Centre for Safe Air, the Lung Foundation, THRIVE, and the University of Queensland's Child Health Research Centre elaborated that although

³⁷ RANZCOG, *Submission 6*, p. 3.

³⁸ Doctors for the Environment Australia, *Submission 30*, pp. 4–5.

³⁹ See, for example, Australian Multicultural Action Network Inc, *Submission 2*, [p. 5]; No More Plastic Packaging, *Submission 8*, p. 2; RACGP, *Submission 11*, p. 4; Australian Medical Association, *Submission 12*, p. 2; Australian Nursing and Midwifery Federation, *Submission 26*, p. 9; Doctors for the Environment Australia, *Submission 30*, p. 5.

⁴⁰ Centre for Safe Air, the Lung Foundation, THRIVE, and the University of Queensland's Child Health Research Centre, *Submission 61*, p. 4.

⁴¹ Dr Timothy Chaston, Centre Affiliate, Centre for Safe Air, *Committee Hansard*, 20 March 2026, p. 33.

longitudinal data are lacking, current research on MNPs and PACs identifies several plausible mechanisms through which early-life exposures may influence later health, including inflammation and oxidative stress, endocrine disruption and epigenetic modification.⁴²

2.41 RACGP also identified that exposure to MNPs and PACs during early development disrupts endocrine, immune, metabolic and neurodevelopmental pathways. These disruptions are linked to increased risks of obesity, diabetes, cardiovascular disease, immune dysfunction, and impaired cognitive outcomes later in life.⁴³

2.42 Responsible Future (Illawarra Chapter), a community organisation, highlighted similar health outcomes that have been associated early-life EDC exposure, such as:

- Obesity – Certain endocrine-disrupting chemicals act as “obesogens,” altering fat metabolism and increasing the risk of excess weight gain.
- Diabetes – Exposure to endocrine-disrupting chemicals has been linked to insulin resistance and increased risk of type 2 diabetes.
- Cardiovascular disease – exposure to hormone-disrupting chemicals can alter metabolism, blood pressure regulation and inflammation, potentially increasing the risk of heart disease later in life.⁴⁴
- Cognitive and behavioural disorders – Prenatal exposure to mixtures of endocrine-disrupting chemicals has been associated with neurodevelopmental changes and behavioural outcomes in children.⁴⁵

2.43 Further, Doctors for the Environment Australia highlighted that early life exposure to toxic chemicals are compounded by other factors, such as socioeconomic status and what nearby industries they are exposed to.⁴⁶

2.44 Similar concerns were raised by Ms Susanne Tegen, Chief Executive of the National Rural Health Alliance, who outlined the unique occupational exposures experienced by rural and remote Australians:

Many rural industries—such as agriculture, mining, waste management and manufacturing—involve higher occupational exposure to chemicals and plastics. You just have to look at the history of lead and asbestos to know that some of these industries have higher risks. When emerging hazards such as microplastics are poorly understood or inadequately monitored, or there are long delays in identifying and responding to these environmental

⁴² Centre for Safe Air, the Lung Foundation, THRIVE, and the University of Queensland’s Child Health Research Centre, *Submission 61*, p. 4.

⁴³ RACGP, *Submission 11*, p. 4.

⁴⁴ Doctors for the Environment Australia, *Submission 30*, p. 5.

⁴⁵ Responsible Future (Illawarra Chapter), *Submission 47*, [p. 6].

⁴⁶ Doctors for the Environment Australia, *Submission 30*, p. 5.

health threats, I fear that these will exacerbate health issues and disease risk factors experienced by the people who live in rural and remote Australia.⁴⁷

2.45 Relatedly, the Australian Multicultural Action Network (AMAN) noted that in culturally and linguistically diverse and migrant families, this developmental window often coincides with:

- Settlement stress and financial hardship;
- Overcrowded or substandard housing with higher dust and mould burden;
- Heavy reliance on packaged, ultra-processed foods due to cost, convenience, or lack of culturally appropriate fresh options;
- Limited access to child health nurses, developmental screening and early intervention due to language and system navigation barriers.⁴⁸

2.46 As such, AMAN submitted that children in these settings may experience higher exposure to microplastics at the time their bodies are most vulnerable.⁴⁹

Cardiovascular impacts

2.47 Evidence to the committee discussed the possible relationship between microplastic accumulation in the body and adverse cardiovascular impacts, including increased risk of heart attack and stroke.

2.48 The National Heart Foundation of Australia (Heart Foundation) outlined emerging evidence that MNPs have been found in cardiovascular tissues, including the atherosclerotic plaques, which it explained are 'the main cause of heart attack, strokes and sudden cardiac death'.⁵⁰

2.49 It also noted that there is emerging evidence that the presence of these plastics in these tissues is associated with higher rates or increased severity of these conditions.⁵¹

2.50 Further, experimental studies in animal models have demonstrated that MNPs can induce oxidative stress, inflammatory responses, endothelial dysfunction and metabolic disturbances.⁵²

2.51 The Heart Foundation noted that these processes 'further support biological plausibility of cardiovascular disease risk', as they are recognised pathways in cardiovascular disease pathogenesis and are particularly relevant in early life

⁴⁷ Ms Susanne Tegen, Chief Executive, National Rural Health Alliance, *Committee Hansard*, 27 March 2026, p. 2.

⁴⁸ Australian Multicultural Action Network Inc, *Submission 2*, [p. 5].

⁴⁹ Australian Multicultural Action Network Inc, *Submission 2*, [p. 5].

⁵⁰ The National Heart Foundation of Australia (Heart Foundation), *Submission 58*, p. 3.

⁵¹ Heart Foundation, *Submission 58*, p. 3.

⁵² Heart Foundation, *Submission 58*, p. 3.

because cardiovascular disease accumulates across the life course and may be shaped by early environmental exposures.⁵³

2.52 Similarly, Dr Lisa Murphy, Chief Executive Officer of the Stroke Foundation, told the committee that microplastics are ‘being found in the arterial plaques, which line our arteries that are causing stroke’. Dr Murphy elaborated by highlighting findings which found that patients with detectable microplastics in their arterial plaques had a four and a half times greater risk of heart attack, stroke or death.⁵⁴

2.53 Dr Murphy also discussed the basis of the potential link between stroke and microplastics exposure:

Emerging evidence is pointing to a link between stroke and microplastics, and the basis of this is the inflammation that microplastics and nanoplastics cause, the oxidated stresses and the damage to blood vessels lining, as well as the subsequent immune disruption.⁵⁵

Endocrine-disrupting chemicals

2.54 Inquiry participants discussed the association between EDCs and a range of other health outcomes, including matters such as increased rates of cancer in young people and respiratory diseases.

2.55 For instance, RACGP noted that plastic-associated endocrine disruptors are linked to hormone-related cancers, immune suppression, asthma, respiratory disease, and chronic inflammatory conditions. It also identified that PFAS exposure is associated with impaired immune responses and reduced vaccine effectiveness.⁵⁶

2.56 The Australian Medical Association also noted that microplastics and PFAS have been implicated in endocrine disruption, immune dysregulation, and possible carcinogenic pathways in experimental studies.⁵⁷

2.57 The Centre for Safe Air, the Lung Foundation, THRIVE, and the University of Queensland’s Child Health Research Centre also highlighted respiratory findings in young children and adults:

In children up to five years of age, observational studies have reported associations between prenatal and postnatal EDC exposure and allergic

⁵³ Answers to questions taken on notice by the National Heart Foundation of Australia at a public hearing on 27 March 2026; received 15 April 2026, p. 3.

⁵⁴ Dr Lisa Murphy, Chief Executive Officer, Stroke Foundation, *Committee Hansard*, 27 March 2026, p. 16.

⁵⁵ Dr Lisa Murphy, Chief Executive Officer, Stroke Foundation, *Committee Hansard*, 27 March 2026, p. 16.

⁵⁶ RACGP, *Submission 11*, p. 4.

⁵⁷ Australian Medical Association, *Submission 12*, p. 3.

conditions such as asthma, wheezing, and allergic rhinitis. The association between EDC exposure and reduced lung function in children remains uncertain.

...

In adults, EDC exposure has been linked in some studies with chronic respiratory diseases via plausible mechanisms such as oxidative stress, inflammation and scarring. However, mechanisms remain incompletely characterised and causality is not clear.⁵⁸

- 2.58 Additionally, Doctors for the Environment Australia outlined that in groups of people that have been highly exposed to plastic-associated chemicals through their work or poisoning incidents, links have also been found to increased risks of various cancers, such as non-Hodgkins lymphoma, breast cancer and liver cancer in females.⁵⁹

⁵⁸ Centre for Safe Air, the Lung Foundation, THRIVE, and the University of Queensland's Child Health Research Centre, *Submission 61*, p. 5.

⁵⁹ Doctors for the Environment Australia, *Submission 30*, p. 6.

Chapter 3

Evidence and research

- 3.1 The committee heard that while scientific interest and analytical capability are rapidly advancing, foundational elements in the current Australian research and monitoring framework for micro- and nanoplastics (MNPs) are still absent.¹ Further, many inquiry participants highlighted that there are significant evidence gaps regarding the impacts of MNPs, per- and polyfluoroalkyl substances (PFAS) and associated toxics on human health.²
- 3.2 This chapter begins by exploring the gaps in the evidence base, which include inconsistent research methods, issues relating to contamination and quality control, challenges in establishing causality, and the need to better understand exposure pathways. It then outlines the effects these gaps have on policy formulation.
- 3.3 Next, ways to improve the evidence base are considered. This includes:
- utilising existing studies and biobanks;
 - encouraging collaboration across a range of disciplines, and;
 - accelerating research through establishing a human biomonitoring program, longitudinal research studies and calling for targeted research.
- 3.4 Then, these challenges and opportunities are reflected in a case study that explores the current evidence base on fertility and reproductive health.
- 3.5 The chapter concludes by considering calls for a precautionary approach to managing the potential health impacts of MNPs, PFAS and EDCs due to the evolving evidence base.

Data collection and methods

- 3.6 This section explores the existing limitations in data collection and methods related to MNPs, PFAS and EDCs. This includes inconsistent measurement and

¹ Queensland Alliance for Environmental Health Sciences, University of Queensland, *Submission 31*, p. 11.

² See, for example, Cancer Epidemiology Division, Cancer Council Victoria, *Submission 1*, [p. 2]; Australian Nursing and Midwifery Federation, *Submission 26*, p. 12; Australian Centre for Disease Control, *Submission 27*, p. 2; Queensland Alliance for Environmental Health Sciences, University of Queensland, *Submission 31*, p. 10; Plastics Industry Pipe Association of Australia Pty Ltd, *Submission 34*, p. 2 and p. 3; Dr Jacinta Martin et al., *Submission 40*, p. 5; Dr Alexander Waller, *Submission 44*, p. 1; Responsible Future (Illawarra Chapter), *Submission 47*, [p. 13]; National Heart Foundation of Australia, *Submission 58*, p. 9; Australian Academy of Science, *Submission 60*, [p. 1]; Centre for Safe Air, the Lung Foundation, THRIVE, and University of Queensland's Child Health Research Centre, *Submission 61*, p. 6; Solving Plastic Waste Cooperative Research Centre, *Submission 64*, [p. 4].

detection methods, and issues relating to contamination and quality control in studies.

Inconsistent measurement and detection methods

- 3.7 Inquiry participants expressed concerns that there are inconsistencies in how both MNPs and PFAS are measured and detected. For instance, the Cancer Epidemiology Division at Cancer Council Victoria submitted that there is currently ‘no established gold-standard for measuring MNPs and plastic-associated chemicals at scale in human biological samples’.³
- 3.8 This was also emphasised by Professor Oliver Jones, a professor of chemistry at RMIT, who stated that:
- ... no formal guidelines or standardised methods exist for microplastic research. Scientists use different techniques to detect and measure microplastics and report results in different units. This makes it difficult to compare/interpret published research.⁴
- 3.9 More broadly, Professor Jones called for funding to develop ‘better methods and more reproducible methods.’⁵ This was echoed by Professor Brad Clarke, who emphasised that ‘measurement has to be prioritised and there has to be an investment in it’.⁶
- 3.10 Similarly, Ms Sarah Collier, Director of Membership and Sustainability at the Australian Food and Grocery Council (AFGC) highlighted the AFGC’s support for ongoing investment for improved measurement capability.⁷
- 3.11 Further, Cancer Council Australia described the lack of standardised methods as a ‘major limitation’ for the collection, preparation, quantification, and characterisation of microplastics in human studies. As such, it stressed the ‘urgent need’ to develop ‘widely accepted, consistent exposure assessment methodologies’ to advance microplastics research.⁸
- 3.12 Dr Jacinta Martin and her colleagues identified similar issues related to measurement in PFAS research. They submitted that ‘differences in which chemicals are measured, how samples are analysed, and how results are

³ Cancer Epidemiology Division, Cancer Council Victoria, *Submission 1*, [p. 3].

⁴ Professor Oliver Jones, *Submission 24*, p. 3.

⁵ Professor Oliver Jones, Private capacity, *Committee Hansard*, 20 March 2026, p. 25.

⁶ Professor Bradley Clarke, Private capacity, *Committee Hansard*, 20 March 2026, p. 41.

⁷ Ms Sarah Collier, Director, Membership and Sustainability, Australian Food and Grocery Council, *Committee Hansard*, 27 March 2026, p. 9.

⁸ Cancer Council Australia, *Submission 13*, p. 7.

reported make it difficult to compare findings across studies or track trends over time'.⁹

Nanoplastics

3.13 In addition to discussions concerning microplastics, some inquiry participants also highlighted the specific challenges in measuring and detecting nanoplastics. For example, the Nano and Microplastics Research Consortium at Flinders University explained that the analytical detection methods for particles below one micrometre are not nationally standardised and exposure metrics are inconsistent.¹⁰

3.14 This was echoed by the National Heart Foundation of Australia (Heart Foundation), who noted that:

Detection of nanoplastics is particularly challenging due to their extremely small size, complex distribution within tissues, dynamic physicochemical properties, and the absence of sufficiently sensitive and standardised analytical methods.¹¹

3.15 Consequently, the Nano and Microplastics Research Consortium emphasised that it would be prudent to support the development of standardised methods for detecting and quantifying nanoplastics in environmental and biological samples.¹²

Working towards accurate measurement

3.16 The committee heard about the importance of research collaboration for improving measurement and detections methods. For instance, Dr Nina Wootton, a researcher at Adelaide University, told the committee that researchers need to work together:

What we need is to get all the researchers in the room to work together. Different people have different methods. No one likes using another person's methods, because they have long-term datasets or their laboratory is set up in a certain way that is effective. We need to be able to all work together so we have methods that can be comparable but, very importantly, accurate.¹³

3.17 Evidence from the Minderoo Foundation highlighted that this work is already occurring. It noted that over 30 international scientists have convened and proposed a new framework to move towards the accurate measurement of

⁹ Dr Jacinta Martin et al., *Submission 40*, p. 8.

¹⁰ Flinders University – Nano and Microplastics Research Consortium, *Submission 21*, p. 2.

¹¹ National Heart Foundation of Australia, *Submission 58*, p. 9.

¹² Flinders University – Nano and Microplastics Research Consortium, *Submission 21*, p. 2.

¹³ Dr Nina Wootton, Researcher, Adelaide University, *Committee Hansard*, 19 March 2026, p. 12.

MNPs exposure in humans, which will in turn ‘enable direct investigation of the impacts of MNPs on human health’.¹⁴

- 3.18 Further, Professor Sarah Dunlop, Director of Plastics and Human Health at the Minderoo Foundation, told the committee at a public hearing of a group of analytical chemists who are also working together on measurement:

Over two years ago, we set up a group, an international group of specifically analytical chemists, who try and measure micro-nano plastics. It's called the Plastics Measurements Brains Trust. We've met three times now. The first time, we published a paper giving a clarion call for more rigorous science. The second time, we published a framework to increase the confidence in our findings of measuring micro-nano plastics. ... We've just had a third meeting in Brisbane whereby we are developing a checklist to operationalise how this framework actually works.¹⁵

Contamination and quality control

- 3.19 The committee heard that contamination and quality control in microplastics studies are a ‘persistent concern’.¹⁶ For example, the Cancer Epidemiology Division at Cancer Council Victoria noted that uncertainty exists regarding the amount and variety of plastic contamination related to the instruments used for collection of biological samples in cohort studies.¹⁷

- 3.20 This was reiterated by Dr Jessie Sutherland, Chief Investigator of the Plastics and Female Infertility Research Team, University of Newcastle. When discussing testing challenges, Dr Sutherland told the committee that ‘we collect everything in plastic’ and ‘we test everything in plastic’.¹⁸

- 3.21 Similarly, Professor Oliver Jones noted that plastics can contaminate samples without researchers realising:

Many labs are also full of plastic, plastic gloves, plastic pipettes, plastic tubes and containers. It is easy to contaminate samples without realising, so you don't know whether any plastic you find came from the sample or the lab you processed it in. Even something as simple as laboratory gloves have been shown to give false readings of microplastics in both Py-GC-MS and

¹⁴ Minderoo Foundation, *Submission 41*, p. 5.

¹⁵ Professor Sarah Dunlop, Director, Plastics and Human Health, Minderoo Foundation [by video link], *Committee Hansard*, 20 March 2026, p. 25.

¹⁶ National Heart Foundation of Australia, *Submission 58*, p. 9; Centre for Safe Air, the Lung Foundation, THRIVE, and University of Queensland's Child Health Research Centre, *Submission 61*, p. 6.

¹⁷ Cancer Epidemiology Division, Cancer Council Victoria, *Submission 1*, [p. 3].

¹⁸ Dr Jessie Sutherland, Chief Investigator, Plastics and Female Infertility Research Team, University of Newcastle, *Committee Hansard*, 20 March 2026, p. 50.

spectroscopic analysis due to the presence of stearate (a type of fat) in the gloves to help stop them from sticking together.¹⁹

- 3.22 Relatedly, the Sustainable Materials Research and Technology (SMaRT) Centre at the University of New South Wales Sydney (UNSW) cautioned that many commonly used methods can generate signals that resemble plastic polymers even when they are not present, particularly if contamination control and validation steps are insufficient.²⁰
- 3.23 As such, the UNSW SMaRT Centre warned that without rigorous standardisation, there is a risk that ‘background noise, laboratory contamination, or misassigned chemical signatures may be mistaken for evidence of widespread internal accumulation’.²¹
- 3.24 Consequently, Professor Jones emphasised the need for improved methods:
- There is thus a pressing need for robust, selective, sensitive, and high-throughput methods capable of generating reliable, quantitative data, as well as a unified approach to collecting and reporting such data, that includes a measure of uncertainty associated with the measurements.²²
- 3.25 Similarly, the Centre for Safe Air, the Lung Foundation, THRIVE, and University of Queensland’s Child Health Research Centre emphasised that in order to improve reliability, studies require ‘rigorous contamination controls, careful selection of appropriate detection methods, and transparent reporting of methodological limitations and uncertainties’.²³

The challenge of establishing causality

- 3.26 The committee heard that there is a range of risk factors that can contribute to ill-health.²⁴ This caused some inquiry participants to discuss the challenge of establishing causality specifically between exposure to MNPs, PFAS and EDCs and adverse health outcomes.
- 3.27 For instance, Chemistry Australia discussed causal limitations and consequently cautioned against attributing fertility impacts to a single factor:

Reproductive health outcomes are influenced by a wide range of well-established factors, including age, lifestyle, underlying medical conditions,

¹⁹ Professor Oliver Jones, *Submission 24*, p. 4. Citation omitted. Note: Py-GC-MS stands for ‘pyrolysis gas chromatography-mass spectrometry’, a common method used to detect microplastics in tissues.

²⁰ UNSW SMaRT Centre, *Submission 29*, p. 6.

²¹ UNSW SMaRT Centre, *Submission 29*, p. 6.

²² Professor Oliver Jones, *Submission 24*, p. 4.

²³ Centre for Safe Air, the Lung Foundation, THRIVE, and University of Queensland’s Child Health Research Centre, *Submission 61*, pp. 6–7.

²⁴ Chemistry Australia, *Submission 65*, p. 8; Australian College of Rural and Remote Medicine, *Submission 63*, p. 2.

and access to healthcare. Demographic trends, particularly delayed parenthood, are widely recognized as major contributors to observed changes in fertility rates. Moreover, recent data demonstrate variability in reproductive trends across populations.

... These findings highlight the complexity of reproductive health and caution against attributing changes in fertility to a single environmental factor, particularly in the absence of robust causal evidence.²⁵

3.28 Dr Sofianos Andrikopoulos, Chief Executive Officer of the Australian Diabetes Society, highlighted similar challenges in establishing causal links to diabetes:

... there are associations between these pollutants and diabetes. We don't know whether that's causal or not. We don't know whether you can sit there and say, 'Yes, if you are going to be exposed to a particular amount or level of these environmental pollutants, micronano plastics, then you will definitely get type 1 or type 2 diabetes.' I think the evidence continues to be associative, and that's why ... I suggest that we need a lot more research to understand the role, the impact, of microplastics.²⁶

3.29 Similarly, Associate Professor Julian Rait, Vice President of the Australian Medical Association, told the committee that:

Based on the current evidence, there have been emerging associations presented between microplastic and PFAS exposure and adverse reproductive, developmental, cardiovascular, endocrine, immune and chronic health outcomes. However, these associations remain insufficient to establish causality with certainty or to quantify population level action with confidence.²⁷

Ethical considerations impeding research

3.30 Dr Leila Cusack from Doctors for the Environment Australia noted that ethical considerations make it difficult to establish causality in research on microplastics and other toxics:

... research into the health impacts of microplastics and other toxic chemicals is complex. For human health impacts, it is not ethically possible to deliberately expose people to potentially harmful substances, which is how experimental research is performed to show causation. In addition to extrapolation from laboratory and animal studies, researchers must rely on observational data in humans, which in this context represents the most appropriate evidence available.²⁸

²⁵ Chemistry Australia, *Submission 65*, p. 8. Citations omitted.

²⁶ Dr Sofianos Andrikopoulos, Chief Executive Officer, Australian Diabetes Society, *Committee Hansard*, 27 March 2026, p. 35.

²⁷ Associate Professor Julian Rait, Vice President, Australian Medical Association, *Committee Hansard*, 27 March 2026, p. 1.

²⁸ Dr Leila Cusack, Member, Research, Education and Advocacy Committee, Doctors for the Environment Australia, *Committee Hansard*, 20 March 2026, p. 2.

3.31 Due to these ethical limitations, the Australian Academy of Health and Medical Sciences (AAHMS) echoed the importance of observational studies:

Scientists cannot deliberately expose human subjects to toxic doses of contaminants in experimental settings, so establishing causal relationships between exposures and health outcomes depends on association evidence from observational studies in the real world, and evidence from laboratory studies of how the substances cause harm.²⁹

3.32 Relatedly, in the absence of randomised controlled trials on humans in this space, evidence to the committee highlighted that both animal and in vitro studies play an important role in studying the potential health impacts of toxics, including EDCs.³⁰

Gaps in knowledge on exposure pathways

3.33 The committee heard that there are knowledge gaps regarding the potential human exposure pathways to MNPs. The Australian Academy of Science explained that exposure pathways are not ‘sufficiently quantified to assess human health risks’ and that specific gaps exist regarding ‘what types, sizes and concentrations of microplastics are exposed to in their external environment and where along a product’s life cycle microplastics are shed’.³¹

3.34 Relatedly, the Solving Plastic Waste Cooperative Research Centre noted that significant knowledge gaps exist regarding the long-term ecological impacts of microplastics and potential human exposure pathways. It highlighted that emerging contamination pathways require further investigation, such as wastewater discharges, agricultural soils and airborne particles.³²

3.35 Similarly, airborne exposure to microplastics was also highlighted as both an emerging concern,³³ and as a pathway that has limited evidence on the impacts on human health.³⁴

3.36 Some inquiry participants consequently called for greater research and investment into microplastic exposure pathways. For instance, Dr Timothy

²⁹ Australian Academy of Health and Medical Sciences (AAHMS), *Submission 67*, p. 3. Note: an observational study is a ‘research design/method where researchers observe and record data without intervention or treatment. These studies can identify associations between exposures and health outcomes but generally cannot prove causation on their own.’ AAHMS, *Submission 67*, p. 9.

³⁰ Australian Academy of Science, *Submission 60*, [pp. 3–4]; Dr Nicholas Chartes, *Submission 28*, Attachment 2, [p. 29].

³¹ Australian Academy of Science, *Submission 60*, [p. 2].

³² Solving Plastic Waste Cooperative Research Centre, *Submission 64*, [p. 6].

³³ Dr Timothy Chaston, Centre Affiliate, Centre for Safe Air, *Committee Hansard*, 20 March 2026, p. 33.

³⁴ Natural Turf Alliance, *Submission 46*, p. 6 and p. 8.

Chaston, Centre Affiliate, Centre for Safe Air, highlighted to the committee the need to understand exposures:

It's early days for the science, and we still need to really build that evidence ... We know from history that there are lots of industrial chemicals and other anthropogenic environmental factors that do cause disease, and we know about them now, but environmental microplastics are emerging. We can only recommend to advocate for the research that's required to understand the exposures, model them and measure them and to understand the health effects.³⁵

3.37 Responsible Future (Illawarra Chapter) also identified the need for improved monitoring of microplastic exposure pathways, including a coordinated national research strategy to better understand exposure pathways and potential health impacts.³⁶

Policy implications

3.38 The Centre for Safe Air, the Lung Foundation, THRIVE, and University of Queensland's Child Health Research Centre discussed the consequences of these gaps in the evidence base:

These gaps constrain our ability to determine real-world exposure levels, understand whether and how MNPs enter and behave within the human body, and assess whether everyday exposure contributes meaningfully to health risks.³⁷

3.39 Similarly, the Heart Foundation explained that evidence gaps limit 'Australia's ability to set evidence-based limits or safety benchmarks for micro- and nanoplastics in water, food, air, or consumer products'.³⁸

3.40 Relatedly, when discussing PFAS and microplastics, the Australian Medical Association noted that there is 'insufficient high-quality human evidence to define exposure thresholds, quantify individual risk, or support the development of specific clinical guidance'.³⁹

3.41 This was reflected in evidence from Food Standards Australia New Zealand (FSANZ), who identified issues regarding 'substantial scientific and methodological limitations, including the absence of harmonised analytical methods, insufficient exposure data, and a lack of toxicological evidence demonstrating adverse health effects relevant to human dietary exposure' as

³⁵ Dr Timothy Chaston, Centre Affiliate, Centre for Safe Air, *Committee Hansard*, 20 March 2026, p. 35.

³⁶ Responsible Future (Illawarra Chapter), *Submission 47*, p. 8 and p. 13.

³⁷ Centre for Safe Air, the Lung Foundation, THRIVE, and University of Queensland's Child Health Research Centre, *Submission 61*, p. 6.

³⁸ National Heart Foundation of Australia, *Submission 58*, p. 9.

³⁹ Australian Medical Association, *Submission 12*, p. 2.

reasons why it cannot currently reliably quantify dietary exposure, or establish guidance values or maximum levels of microplastics in food.⁴⁰

- 3.42 FSANZ noted that without these ‘foundation elements’, the establishment of enforceable standards would not be scientifically robust nor practically effective.⁴¹

Improving the evidence base

- 3.43 This section considers potential solutions to improve the evidence base, including utilising existing studies, encouraging research collaboration, and ways to accelerate research outcomes.

Utilising existing studies and biobanks

- 3.44 Inquiry participants highlighted a range of pre-existing evidence that could be used to improve the evidence base. For instance, Dr Rebecca Robker from the Robinson Research Institute told the committee about biobanks that could be used to learn more about exposures:

There are multigenerational biobanks that have been collected as part of specific studies for another purpose. But we could absolutely, should absolutely, be using these to backtrack and learn more about exposures, because it does need to be around transgenerational effects and these multigenerational cohorts can do that.⁴²

- 3.45 Dr Nina Wootton emphasised a similar sentiment to the committee when discussing the Barwon infant health cohort study:

They've got 10-year datasets tracking the mothers when they're pregnant and then the babies as they're born and associated diseases. Also, this is all association related, as you heard. I think that's super beneficial, because we need to have these long-term studies to understand the long-term effects. The same studies are being done overseas. There's one in Japan. I think there's one in Norway that has 15 years of data. We can utilise some of these things as well because these are international problems. Australia is not unique.⁴³

- 3.46 The Cancer Epidemiology Division at Cancer Council Victoria highlighted other existing biological specimens that could be of use for research on MNPs, PFAS and plastic-associated chemicals:

The biological specimens collected by cohort studies such as the Melbourne Collaborative Cohort Study and the [Australia Breakthrough Cancer] Study are critical resources required to generate high-quality evidence of the

⁴⁰ Food Standards Australia New Zealand, *Submission 10*, [p. 1].

⁴¹ Food Standards Australia New Zealand, *Submission 10*, [p. 1].

⁴² Dr Rebecca Robker, Professor and Head, Reproduction and Development, Robinson Research Institute, Adelaide University, *Committee Hansard*, 19 March 2026, p. 4.

⁴³ Dr Nina Wootton, Researcher, Adelaide University, *Committee Hansard*, 19 March 2026, p. 14.

potential role that micro- and nanoplastics (MNPs) and plastic-associated chemicals (PACs), including per- and polyfluoroalkyl substances (PFAS) play in the development of cancer in humans.⁴⁴

- 3.47 When considering existing biobanks, Dr Robker also noted the importance of improving data linkages across studies:

We are suggesting that there are better mechanisms to link different biobanks and cohorts, including these very valuable ones in Western Australia and in other places in Australia so that those are linked and can also utilise information—for instance, occupational exposure data and other maternal health records. Better linkages of existing valuable resources that we have is a first step that could be relatively quick and could give information about expose timeframes and exposure effects.⁴⁵

- 3.48 In relation to EDCs and PFAS, the Australian Multicultural Action Network similarly called for strengthening data linkage between environmental monitoring, cancer registries and chronic disease datasets to ‘enable better detection of patterns and hotspots’.⁴⁶

Collaboration needs

- 3.49 Inquiry participants highlighted the need for collaboration to advance research outcomes. The Plastics Industry Pipe Association of Australia submitted that ‘collaboration between government, industry, universities and research organisations is essential to advancing understanding of microplastics research and improving research quality’.⁴⁷

- 3.50 Relatedly, Dr Cameron Shearer, a Senior Lecturer at Adelaide University, stressed to the committee collaborative work is necessary to filling knowledge gaps on PFAS:

Significant gaps remain in our understanding of PFAS exposure, toxicity, long-term behaviour and remediation. These challenges span chemistry, toxicology, engineering, public health and environmental science, and will require coordinated multidisciplinary teams to ensure solutions are practical and scalable and protect our communities.⁴⁸

- 3.51 This was echoed by the Robinson Research Institute, which submitted that large interdisciplinary teams comprised of experts like ‘toxicologists, reproductive biologists, epidemiologists, clinicians, chemists, exposure scientists, and data

⁴⁴ Cancer Epidemiology Division, Cancer Council Victoria, *Submission 1*, [p. 2].

⁴⁵ Dr Rebecca Robker, Professor and Head, Reproduction and Development, Robinson Research Institute, Adelaide University, *Committee Hansard*, 19 March 2026, p. 8.

⁴⁶ Australian Multicultural Action Network Inc., *Submission 2*, [p. 7].

⁴⁷ Plastics Industry Pipe Association of Australia, *Submission 34*, p. 5.

⁴⁸ Dr Cameron Shearer, Senior Lecturer, Adelaide University, *Committee Hansard*, 19 March 2026, p. 11.

scientists' are necessary to find 'the most effective solutions ... to counter these complex environmental, biological, social and policy issues'.⁴⁹

- 3.52 Additionally, when asked about the importance of collaboration on a broader, international scale, Dr Daniella Dougherty, Head of Clinical Evidence at the Heart Foundation told the committee that:

I genuinely think, in any research, the more collaboration the better ... We work in such silos; we repeat research; we're wasting money in that regard. So any collaboration—especially if you can find countries that are really similar to Australia's demographic. But I'm always for collaboration, because multiple minds are better than one mind.⁵⁰

- 3.53 Professor Steve Wesselingh, Chief Executive Officer of the National Health and Medical Research Council (NHMRC), explained that there a number of bilateral and multilateral programs that the NHMRC engages with. This includes the United Kingdom's Medical Research Council, Canadian Institutes of Health Research and the NHMRC-Horizon Europe Program.⁵¹

- 3.54 Professor Wesselingh elaborated that these partnerships provide an opportunity:

I think the bilateral and multilateral agreements that we have give us an opportunity to look for these sorts of areas where coordination across the world is helpful, and we've done that in areas like platform trials with the UK, dementia and other areas where there's worldwide work. I agree this could well be one of those areas that we could discuss with our colleagues in the EU, Canada and Asia.⁵²

Accelerating research

- 3.55 The committee heard that encouraging new research is necessary to accelerate evidence outcomes for MNPs, PFAS and EDCs. This includes biomonitoring programs, longitudinal research, and targeted calls for research, which are discussed below.

⁴⁹ Robinson Research Institute, *Submission 25*, pp. 5–6.

⁵⁰ Dr Danielle Dougherty, Head, Clinical Evidence, Heart Foundation, *Committee Hansard*, 27 March 2026, p. 21.

⁵¹ Professor Steve Wesselingh, Chief Executive Officer, National Health and Medical Research Council [by video link], *Committee Hansard*, 27 March 2026, p. 42.

⁵² Professor Steve Wesselingh, Chief Executive Officer, National Health and Medical Research Council [by video link], *Committee Hansard*, 27 March 2026, p. 42.

National biomonitoring and longitudinal research

- 3.56 Inquiry participants called for national research efforts to include longitudinal research studies and the establishment of a human biomonitoring program.⁵³
- 3.57 For instance, the Queensland Alliance for Environmental Health Sciences, a research centre within the University of Queensland, described human biomonitoring as ‘the gold standard for assessing human exposure to chemicals, by measuring concentrations of chemical exposure biomarkers in human fluids and tissues to assess aggregated exposure’.⁵⁴
- 3.58 Similarly, the Australian Medical Association emphasised the need for longitudinal data and biomonitoring:
- 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.⁵⁵
- 3.59 The Australian Academy of Health and Medical Sciences also noted that Australia ‘stands out among comparable nations such as Canada, the United States, Germany, South Korea, and Japan for not operating a population-level human biomonitoring program.’⁵⁶
- 3.60 When discussing the establishment of a national human biomonitoring program, both Professor Brad Clarke and the Australian Academy of Health and Medical Sciences stated that it should be led by the Australian Centre for Disease Control (Australian CDC).⁵⁷
- 3.61 The Australian Academy of Health and Medical Sciences elaborated that the Australian CDC should be funded for this work and that the Australian Bureau of Statistics National Health Measures Survey should serve as the biospecimen

⁵³ Note: A longitudinal study is a ‘research design/method that involves collecting data from the same individuals over an extended period, allowing researchers to observe changes or trends in relation to ongoing exposures. Human biomonitoring is a ‘means of assessing exposure levels to chemical substances in human bodies through the analysis of samples such as blood, gametes or urine’. Australian Academy of Health and Medical Sciences, *Submission 67*, p. 20.

⁵⁴ Queensland Alliance for Environmental Health Sciences, The University of Queensland, *Submission 31*, p. 1.

⁵⁵ Australian Medical Association, *Submission 12*, p. 2.

⁵⁶ Australian Academy of Health and Medical Sciences - *Policy Statement, Establishment of a national human biomonitoring program*, additional information received 8 April 2026, p. 3.

⁵⁷ Professor Bradley Clarke, Private capacity, *Committee Hansard*, 20 March 2026, p. 39; Answers to questions taken on notice by the Australian Academy of Health and Medical Sciences at a public hearing on 20 March 2026; received 8 April 2026.

collection and sampling platform,⁵⁸ with the Australian CDC providing scientific oversight, health intelligence and policy guidance.⁵⁹

- 3.62 Professor Brad Clarke also emphasised that biomonitoring should prioritise vulnerable populations, including pregnant women and children.⁶⁰ This was echoed by the Australian Academy of Health and Sciences, who suggested that vulnerable cohorts should be oversampled to ensure they are adequately represented.⁶¹
- 3.63 Professor Zoe Wainer, Director-General of the Australian CDC, told the committee that the Australian CDC has published an open tender to support a biomonitoring pilot study to better understand feasibility and assess approaches for potential future biomonitoring arrangements.⁶²
- 3.64 Ms Emily Harper, Deputy Director-General for Public Health at the Australian CDC, noted that the study is ‘relatively small in nature’ and is ‘unlikely to give us the population-level side of things’ as it is a pilot study. However, Ms Harper also noted that the focus is on better understanding ways of conducting biomonitoring in Australia, which will inform future deliberations:

A lot of the focus here is really on exploring and better understanding some of the most effective and efficient ways of conducting biomonitoring in the Australian context, whether that's looking at, for example, using discarded samples or at the sort of information, products or materials that might already be readily available ... The importance of the pilot is that it informs future deliberations as to what our future biomonitoring program may, should or could look like.⁶³

Calls for research

- 3.65 Some inquiry participants highlighted targeted calls as a way to accelerate research. For instance, Professor Renea Taylor, Associate Dean, Centres and Institutes in the Faculty of Medicine, Nursing and Health Sciences at Monash

⁵⁸ Note: The National Health Measures Survey is a ‘periodic survey of blood and/or urine collected from people aged 12 years and above’. Answers to questions taken on notice by the Australian Academy of Health and Medical Sciences at a public hearing on 20 March 2026; received 8 April 2026, [p. 6].

⁵⁹ Answers to questions taken on notice by the Australian Academy of Health and Medical Sciences at a public hearing on 20 March 2026; received 8 April 2026, [p. 6].

⁶⁰ Professor Bradley Clarke, Private capacity, *Committee Hansard*, 20 March 2026, p. 39.

⁶¹ Answers to questions taken on notice by the Australian Academy of Health and Medical Sciences at a public hearing on 20 March 2026; received 8 April 2026, [p. 7].

⁶² Professor Zoe Wainer, Director-General, Australian Centre for Disease Control, *Committee Hansard*, 27 March 2026, p. 55.

⁶³ Ms Emily Harper, Deputy Director-General, Public Health, Australian Centre for Disease Control, *Committee Hansard*, 27 March 2026, p. 56.

University, told the committee that a targeted call could create momentum in microplastics research:

I think, in the targeted calls for areas that are really important, like environmental health, it creates momentum. It allows us to make a focus. When I look around the faculty and ask who's doing microplastics research, there's a little bit here and a little bit there, but it's not coordinated, because no-one has given them a green light to say, 'Go ahead.' When the funding calls come out and say it's a priority area, we just all align up, and we're ready to go.⁶⁴

3.66 Similarly, Dr Andrikopoulos from the Australian Diabetes Society told the committee that he believes there should be a 'targeted call for research to look into microplastics', and that the (NHMRC) could 'tackle this with a targeted call for research into type 2 diabetes in Aboriginal communities and the environmental insults, including microplastics'.⁶⁵

3.67 Additionally, Dr Dougherty from the Heart Foundation told the committee that targeted calls could help to fill gaps in research specifically for the potential impacts on heart health:

Researchers—especially early career researchers, PhD students, people trying to get into the research field—are always trying to find gaps in research. So, if you start to take decisive action now, saying this is a priority area, those gaps will start to be filled by research. They will start to have the long-term outcomes.

...

I think that, if you say action is required, people will come and fill those gaps, and that will be beneficial for all of us and beneficial for heart health outcomes in the long term.⁶⁶

3.68 When asked about how Targeted Calls for Research (TCRs) originate, Professor Wesselingh from the NHMRC noted that there a number of available pathways, including suggestions via a community portal but also recommendations from government and Senate inquiries.⁶⁷

⁶⁴ Professor Renea Taylor, Associate Dean, Centres and Institutes, Faculty of Medicine, Nursing and Health Sciences, Monash University, *Committee Hansard*, 20 March 2026, p. 14.

⁶⁵ Dr Sofianos Andrikopoulos, Chief Executive Officer, Australian Diabetes Society [by video link], *Committee Hansard*, 27 March 2026, pp. 36–37.

⁶⁶ Dr Daniella Dougherty, Head, Clinical Evidence, Heart Foundation, *Committee Hansard*, 27 March 2026, pp. 17–18.

⁶⁷ Professor Steve Wesselingh, Chief Executive Officer, National Health and Medical Research Council [by video link], *Committee Hansard*, 27 March 2026, p. 40.

Reproductive health and fertility: a case study

Evidence to the committee illustrated that the challenges and opportunities discussed in the above sections are clearly reflected in reproductive health and fertility research.

Current evidence has not yet established whether, or to what degree, MNPs, PFAS and other sources of EDCs may impair fertility. However, as noted by the Australian Academy of Health and Medical Sciences (AAHMS), it does suggest that there is a plausible mechanism that warrants further investigation.⁶⁸

Inquiry participants discussed a range of ways to improve fertility research outcomes. For instance, AAHMS stated that to improve our understanding, better methods of quantifying bioaccumulation and more longitudinal human research will be required.⁶⁹ Similarly, Dr Martin called for a precautionary approach, which could include monitoring systems that capture exposure across the lifespan, particularly during early life, as well as sustained investment in long-term and mechanistic research.⁷⁰

Dr Martin also called for the establishment of a national reproductive toxicology surveillance network, which would involve bringing bodies together to advance research outcomes:

If we can start putting together the information that we have with these toxicological approaches and linking up with our fertility clinics to gather information—there's a lot of really good information out there. It's very hard to access as a reproductive biologist, but, if we can start bringing all of these bodies together and start working together, we'll be able to answer those questions more easily.⁷¹

Additionally, Dr Ingo Koeper, a Professor at Flinders University, suggested that TCRs should have a focus on fertility to build the body of evidence between decreasing fertility rates and exposure to microplastics:

I think, if this were on the political agenda as something that's important to look at, that would probably trigger more funding and tell the funding bodies, 'Put this higher on your list of priorities.' We then could apply for the funding and, obviously, get more funding and do more research.⁷²

⁶⁸ Australian Academy of Health and Medical Sciences, *Submission 67*, p. 11.

⁶⁹ Australian Academy of Health and Medical Sciences, *Submission 67*, p. 11.

⁷⁰ Dr Jacinta Martin, Private capacity, *Committee Hansard*, 20 March 2026, p. 48.

⁷¹ Dr Jacinta Martin, Private capacity, *Committee Hansard*, 20 March 2026, p. 51.

⁷² Dr Ingo Koeper, Professor, Flinders University, *Committee Hansard*, 19 March 2026, p. 20.

When asked whether TCRs could have an explicit focus on fertility and reproductive health, Professor Wesselingh agreed that this would be possible as TCRs can have a series of goals, which is not an uncommon design feature.⁷³

Precautionary approach

3.69 Although the evidence base is still growing, inquiry participants overwhelmingly called for the government to adopt a precautionary approach to managing MNPs, PFAS and EDCs,⁷⁴ as ‘uncertainty is not a reason for inaction’.⁷⁵

3.70 The Australian Medical Association outlined its support for a precautionary public health response:

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 response.⁷⁶

3.71 The Australian Nursing and Midwifery Federation also called for precautionary action due to plausible associations with adverse health effects:

Whilst noting that the evidence strength varies across outcomes and scientific uncertainty remains in several domains, the breadth and consistency of plausible associations between microplastics and PFAS with health harms, constitute a reasonable basis for precautionary action from the Australian government.⁷⁷

3.72 Responsible Future (Illawarra Chapter) drew parallels to substances such as asbestos, lead and tobacco to emphasise the need for a precautionary approach:

History has repeatedly demonstrated that environmental health risks can remain underestimated for decades before their full societal impacts become

⁷³ Professor Steve Wesselingh, Chief Executive Officer, National Health and Medical Research Council [by video link], *Committee Hansard*, 27 March 2026, p. 41.

⁷⁴ See, for example, Australian Medical Association, *Submission 12*, p. 1; Engineers Australia, *Submission 18*, p. 2; I’m Plastic Free, *Submission 22*, [p. 11]; Australian Nursing and Midwifery Federation, *Submission 26*, p. 12; Australian Centre for Disease Control, *Submission 27*, p. 2; Doctors for the Environment Australia, *Submission 30*, p. 9; Dr Jacinta Martin et al., *Submission 40*, p. 7; Dr Alexander Waller, *Submission 44*, p. 3; Responsible Future (Illawarra Chapter), *Submission 47*, [p. 15]; Food Packaging Forum Foundation, *Submission 48*, p. 2; Ms Susie Crick, *Submission 51*, p. 6; Councillor Kal Glanznig; *Submission 53*, p. 2; Product Safety Solutions, *Submission 57*, p. 6; Total Environment Centre, *Submission 62*, [p. 1]; Australian Academy of Health and Medical Sciences, *Submission 67*, p. 4; Dr Nicholas Chartres, *Submission 70*, [p. 3]; Dr Lisa Murphy, Chief Executive Officer, Stroke Foundation [by video link], *Committee Hansard*, 27 March 2026, p. 16.

⁷⁵ Australian Academy of Health and Medical Sciences, *Submission 67*, p. 15.

⁷⁶ Australian Medical Association, *Submission 12*, p. 1. Citation omitted.

⁷⁷ Australian Nursing and Midwifery Federation, *Submission 26*, p. 12.

clear. Substances such as asbestos, lead and tobacco were widely used long before their health consequences were fully understood. Without proactive monitoring, research and precautionary policy responses, the cumulative effects of widespread plastic pollution and associated chemical exposures could emerge as a significant public health challenge.⁷⁸

3.73 Likewise, Mrs Lucinda Lines, Founder of Two Lines Fertility, considered that causality challenges should not prohibit action:

The way that I tend to view it is it's much like the climate change debates in the nineties. I'm old enough to remember when everyone was trying to draw causality – this is causing that – and there were a lot of people debating it. At the time, there was also another group of people saying, 'Well, you could spend the next 20 years debating that causality and making that link really clear, or we could look at what the suggested things to do are and just do them anyway,' ...⁷⁹

3.74 The calls for a precautionary approach were reiterated by the Australian CDC. It noted the limitations of the evidence base and stated that a precautionary approach that involves Australian Government agencies, state and territory governments, and public health organisations is advisable.⁸⁰

⁷⁸ Responsible Future (Illawarra Chapter), *Submission 47*, [p. 15].

⁷⁹ Mrs Lucinda (Lucy) Lines, Founder, Two Lines Fertility, *Committee Hansard*, 19 March 2026, pp. 3 – 4.

⁸⁰ Australian Centre for Disease Control, *Submission 27*, p. 2.

Chapter 4

Adopting a precautionary approach

- 4.1 While the evidence base is still emerging, inquiry participants stressed that ‘uncertainty is not a reason for inaction’.¹ As examined in Chapter 3, evidence gaps point to the need for a precautionary, harm-reduction approach.
- 4.2 This chapter explores what a precautionary approach to the management of micro and nanoplastics (MNPs), per- and polyfluoroalkyl substances (PFAS) and endocrine-disrupting chemicals (EDCs) may entail. It first considers public awareness and education, and the types of education campaigns and activities, which can assist the public to take a precautionary approach to their exposure to these substances.
- 4.3 Then, the chapter discusses how we can reduce our exposure to MNPs, PFAS and EDCs through product innovation and regulations. This includes international examples, which may be considered by Australia.
- 4.4 Finally, the chapter outlines some of the specificities and considerations pertaining to rural and remote communities in relation to exposure to MNPs, PFAS and other substances.

Education and information

- 4.5 This section considers levels of public awareness and education on MNPs and the types of education campaigns and activities that could assist the public in taking a precautionary approach, with specific consideration paid to healthcare professionals as well as reproductive health.

Public awareness

- 4.6 Inquiry participants highlighted that in Australia, there is a paucity in public awareness of MNPs, as well as their sources and pathways.²
- 4.7 For example, the Royal Australian College of General Practitioners (RACGP) commented that ‘public awareness of the breadth and significance of microplastic and nanoplastic exposures remains limited’.³
- 4.8 Similarly, the Solving Plastic Waste Cooperative Research Centre noted that while public awareness of plastic pollution has increased significantly in

¹ Australian Academy of Health and Medical Sciences, *Submission 67*, p. 15.

² See, for example, Australian Medical Association, *Submission 12*, [p. 5]; UNSW SMaRT Centre, *Submission 29*, p. 9; Royal Australian College of General Practitioners, *Submission 11*, p. 5; Responsible Future (Illawarra Chapter), *Submission 47*, [p. 13]; Ms Rebecca Norris, *Submission 59*, [p. 4].

³ Royal Australian College of General Practitioners, *Submission 11*, p. 5.

Australia over the past decade, awareness of microplastics is comparatively limited due to the invisible nature of these contaminants.⁴

- 4.9 Relatedly, the Australian Centre for Disease Control (Australian CDC) highlighted that while public interest is high, ‘many people are aware of microplastics but less familiar with exposure pathways or uncertainties in health evidence’.⁵

The need for evidence-based messaging

- 4.10 When discussing general education and informative efforts, the committee heard that prevention messaging should be evidence-based, focusing on addressable risk factors with clear health benefits while avoiding unnecessary alarm.⁶

- 4.11 In its submission, Cancer Council Australia emphasised that:

... public communication on the risks of microplastics and opportunities to prevent exposure must only be based on clear evidence regarding potential health impacts, and consequently, health benefits from reduced exposure.⁷

- 4.12 It also advised that prevention messaging should focus on areas where there is ‘robust evidence and well-known modifiable public health risk factors that can be addressed, with clear health benefits as a result’, to curtail public concern and distress.⁸

- 4.13 Importantly, Australian Science Communicators conveyed that there are risks if ‘emerging or uncertain findings are presented as settled evidence’, resulting in ‘oversimplified or alarmist messaging’ which can erode public trust if certain claims are later revised or contested, as was demonstrated during the COVID-19 pandemic.⁹

⁴ Solving Plastic Waste Cooperative Research Centre, *Submission 64*, [p. 4].

⁵ Australian Centre for Disease Control, *Submission 27*, p. 4.

⁶ See, for example, SA Water Innovation, *Submission 4*, [p. 4]; Cancer Council Australia, *Submission 13*, pp. 5–6; Engineers Australia, *Submission 18*, p. 2; Australian Science Communicators, *Submission 19*, pp. 2–3; Dr Jacinta Martin et al., *Submission 40*, p. 3; Name Withheld, *Submission 55*, [p. 2, p. 4]; Chemistry Australia, *Submission 65*, p. 2, p. 12; Australian Academy of Health and Medical Sciences, *Submission 67*, p. 4, p. 18.

⁷ Cancer Council Australia, *Submission 13*, p. 5.

⁸ Cancer Council Australia, *Submission 13*, p. 5.

⁹ Australian Science Communicators, *Submission 19*, p. 1.

- 4.14 Other inquiry participants warned about the lack of balance in media reporting and how media are often spreading misinformation about MNPs, pointing to the need of clear communication.¹⁰
- 4.15 Dr Jacinta Martin and her colleagues highlighted that well-designed communication frameworks can ‘empower individuals, reduce misinformation, and support preventative action without undermining confidence in public health institutions’.¹¹
- 4.16 The Australian Science Communicators emphasised that ‘clear, evidence-based communication that carefully contextualises risk is therefore critical to ensuring public understanding while maintaining confidence in essential health and medical systems’.¹²

Healthcare professionals

- 4.17 The committee heard of the importance of equipping clinicians with ‘reliable, authoritative information while avoiding unwarranted alarm or misinterpretation of emerging evidence’.¹³
- 4.18 In its submission, the Australian Medical Association noted that 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’.¹⁴

Reproductive health

- 4.19 Dr Jacinta Martin and her colleagues highlighted a specific need for communication on fertility. Dr Martin and her colleagues said that by developing targeted educational material and clinical guidance modules for fertility clinics, ‘obstetric services and general practice would enable health professionals to provide informed counselling for patients attempting to conceive or that are currently pregnant’.¹⁵ This includes:

...guidance on when environmental exposure assessment may be appropriate and how to communicate risk in a balanced, patient-centred manner. Well-designed communication frameworks can empower

¹⁰ See, for example, Australian Centre for Disease Control, *Submission 27*, p. 4; Professor Oliver Jones, Private capacity, *Committee Hansard*, 20 March 2026, pp. 24–25.

¹¹ Dr Jacinta Martin et al., *Submission 40*, p. 7.

¹² Australian Science Communicators, *Submission 19*, p. 2.

¹³ Australian Medical Association, *Submission 12*, [p. 5]. See, also, Royal Australian and New Zealand College of Obstetricians and Gynaecologists, *Submission 6*, p. 5; Australian Science Communicators, *Submission 19*, p. 2.

¹⁴ Australian Medical Association, *Submission 12*, [p. 5].

¹⁵ Dr Jacinta Martin et al., *Submission 40*, p. 7.

individuals, reduce misinformation, and support preventative action without undermining confidence in public health institutions.¹⁶

Reducing the burden on patients

4.20 The committee heard that it is unrealistic to expect patients to bear full responsibility for identifying and reducing microplastic exposures, particularly in clinical settings.¹⁷

4.21 The National Female Infertility Advisory Group stated that 'education should not rely on patients finding information themselves or finding out about the risks for the first time when they reach a fertility specialist'.¹⁸ It submitted that 'education efforts should aim to reduce the burden on individuals by embedding trusted system-level guidance':

It should come from trusted sources integrated across the reproductive lifespan at multiple touchpoints. We recommend the development of simple, accessible, standardised resources to empower clinicians and educators to provide guidance confidently, enabling consumers to understand and act. Removing the need for individuals to seek out alternative information sources that may be incomplete or inaccurate.¹⁹

4.22 Dr Rebecca Robker, Professor and Head of Reproduction and Development at the Robinson Institute at the University of Adelaide, also stressed the importance of informed risk communication when providing advice to patients:

You do not want to alarm people and you do not want them to feel extreme pressure and guilt that it's somehow up to them and their own personal intake of these compounds, because the compounds are everywhere, as I mentioned, in things they cannot control. So there needs to be a higher level of avoidance of them in our environment. It's not up to the individual to try to control that themselves.²⁰

Current government information

4.23 The Department of Health, Disability and Ageing noted that some government resources already provide information on microplastics that are aligned with

¹⁶ Dr Jacinta Martin et al., *Submission 40*, p. 7.

¹⁷ See, for example, Royal Australian and New Zealand College of Obstetricians and Gynaecologists, *Submission 6*, p. 5; Dr Jessie Sutherland, Chief Investigator, Plastics and Female Infertility Research Team, University of Newcastle, *Committee Hansard*, 20 March 2026, p. 50.

¹⁸ National Female Infertility Advisory Group, *Submission 16*, p. 4.

¹⁹ National Female Infertility Advisory Group, *Submission 16*, p. 4.

²⁰ Dr Rebecca Robker, Head of Reproduction and Development, Robinson Institute, University of Adelaide, *Committee Hansard*, 19 March 2026, p. 7.

the precautionary approach and reflects the current state of scientific evidence whilst acknowledging uncertainties.²¹

- 4.24 For instance, the Western Australia (WA) Department of Health released a factsheet on microplastics and public health, which includes information on what microplastics are, how these substances are released into the environment, the extent of human exposure and the effects on health.²²
- 4.25 The WA Department of Health has also developed consumer information guidelines on how to reduce microplastic exposure to the benefit of both human health and the environment.²³ It outlines where microplastics are found, how they can be absorbed in our bodies, current initiatives undertaken by the WA Government and ways consumers can limit exposure.²⁴
- 4.26 The Department of Health, Disability and Ageing also highlighted additional consumer information sources from the Commonwealth Scientific and Industrial Research Organisation, Food Standards Australia and New Zealand and the Australian CDC.²⁵

Community-based initiatives

- 4.27 The committee received evidence on the positive impact of community engagement and citizens science programs on increasing awareness and education, highlighting practical prevention measures.²⁶

²¹ Answers to questions taken on notice by the Department of Health, Disability and Ageing at a public hearing on 27 March 2026, *Attachment B*; received 22 April 2026, [p. 2].

²² Answers to questions taken on notice by the Department of Health, Disability and Ageing at a public hearing on 27 March 2026, *Attachment B*; received 22 April 2026, [pp. 1–3].

²³ Answers to questions taken on notice by the Department of Health, Disability and Ageing at a public hearing on 27 March 2026, *Attachment B*; received 22 April 2026, [pp. 1–3].

²⁴ Answers to questions taken on notice by the Department of Health, Disability and Ageing at a public hearing on 27 March 2026, *Attachment B*; received 22 April 2026, [pp. 1–3].

²⁵ See: Commonwealth Scientific and Industrial Research Organisation, *Plastic and our food supply's safety and security*, www.research.csiro.au/foodsafety/plastic-and-our-food-supplys-safety-and-security/ (accessed 23 April 2026); Food Standards Australia and New Zealand, *Microplastics in food*, www.foodstandards.gov.au/consumer/our-safe-food-supply/microplastics (accessed 23 April 2026); Food Standards Australia and New Zealand, *Food packaging*, <https://www.foodstandards.gov.au/business/food-safety/food-packaging> (accessed 23 April 2026); Australian Centre for Disease Control, *Microplastics and health report*, <https://www.cdc.gov.au/resources/publications/microplastics-and-health-report> (accessed 23 April 2026).

²⁶ See, for example, Solving Plastic Waste Cooperative Research Centre, *Submission 64*, [p. 5]; Total Environment Centre, *Submission 61*, [p. 1]; Dr Thava Palanisami, Group Leader, Australian Plastic Research and Innovation Lab; and Chief Investigator, Healthy Environments and Lives National Research Network, National Health and Medical Research Council, *Committee Hansard*, 27 March 2026, pp. 25–26.

- 4.28 In its submission, I'm Plastic Free explained that independent platforms, including its own, have attempted to provide information as government-led education campaigns remain limited and noted that isolated education efforts cannot substitute for coordinated national public health messaging.²⁷
- 4.29 To date, most programs have focused on environmental pollution. For example, the Solving Plastic Waste Cooperative Research Centre explained that citizen science programs and community monitoring have 'demonstrated considerable success in increasing awareness of microplastic pollution by allowing participants to directly observe microplastics in environmental samples'.²⁸
- 4.30 This is reflected in the work of the Total Environment Centre and its establishment of the Australian Microplastic Assessment Program (AUSMAP), which commenced in 2018 and is now Australia's largest and longest-running citizen science program monitoring microplastics.²⁹
- 4.31 Dr Thava Palanisami, Group Leader of the Australian Plastic Research and Innovation Lab, as well as Chief Investigator at the Health Environments and Lives National Research Network, told the committee of the community-based work he undertook with the AUSMAP team:

We sampled around Australia in partnership with AUSMAP, the Australian Microplastic Assessment Project, with my good friend and colleague Dr Scott Wilson. We built the national sampling methodology. What we want to do is work with citizen scientists and schoolkids and train them on handpicking microplastics from the beach. We trained more than 4,000 participants, and then we characterised more than two million microplastics. That helped with creating a database—it's called the AUSMAP hot spot map—where you can see how many sites in Australia with microplastics are there.³⁰

School programs

- 4.32 During a hearing, Associate Professor Mark Green explained that there are opportunities with developing school education programs, stressing the importance of starting education early about microplastics.³¹

²⁷ I'm Plastic Free, *Submission 22*, pp. 4–5.

²⁸ Solving Plastic Waste Cooperative Research Centre, *Submission 64*, [p. 5].

²⁹ Total Environment Centre, *Submission 61*, [p. 1].

³⁰ Dr Thava Palanisami, Group Leader, Australian Plastic Research and Innovation Lab; and Chief Investigator, Healthy Environments and Lives National Research Network, National Health and Medical Research Council, *Committee Hansard*, 27 March 2026, pp. 25–26.

³¹ Associate Professor Mark Green, Private capacity [by video link], *Committee Hansard*, 27 March 2026, pp. 24, 27 and 33.

- 4.33 Professor Green stressed the need for education to highlight ‘how much our environment can affect our fertility’ and to tailor education programs to the age level that the program is being provided to.³²
- 4.34 Relatedly, Mrs Lucinda (Lucy) Lines, Founder, Two Lines Fertility, noted the importance of introducing practical strategies to minimise unnecessary exposures, embedding this education in schools, in tandem with broader health education to help build awareness well before people make decisions around fertility.³³

Limiting MNPs and PFAS in consumer products

- 4.35 The committee heard that fostering product innovation, introducing regulations and developing national standards are key to reducing our exposure to MNPs and PFAS. These matters are discussed below.

Fostering industry innovation

- 4.36 Responsible Future (Illawarra Chapter) highlighted the importance of fostering industry innovation to reduce our exposure to MNPs and PFAS.³⁴
- 4.37 The Solving Plastic Waste Cooperative Research Centre suggested focusing on better product design that integrates sustainable principles at the ‘earliest stages of development’ (known as eco-design), in order to help minimise MNP shedding and hazardous chemical additives.³⁵ It noted that this could include incentivising industry to prioritise ‘durability, material selection and circularity’, so that products can lower their contribution to pollution.³⁶
- 4.38 It provided some examples that the government could incentivise industries to do or mandate:
- ... the use of washing machine filters, developing filters for municipal wastewater treatment plants specifically designed to capture microfibres, or encouraging the textile industry to innovate in fibre composition and fabric design to reduce the shedding of microplastics.³⁷

- 4.39 The UNSW SMaRT Centre recommended that government regulation for industry should focus on encouraging a redesign of their goods, production processes and machinery to use minimal amounts of plastic:

³² Associate Professor Mark Green, Private capacity [by video link], *Committee Hansard*, 27 March 2026, p. 27.

³³ Mrs Lucinda (Lucy) Lines, Founder, Two Lines Fertility, *Supplementary Information Following Public Hearing*, additional information received 2 April 2026, [p. 2].

³⁴ Responsible Future (Illawarra Chapter), *Submission 47*, [p. 15].

³⁵ Solving Plastic Waste Cooperative Research Centre, *Submission 64*, [p. 7].

³⁶ Solving Plastic Waste Cooperative Research Centre, *Submission 64*, [p. 7].

³⁷ Solving Plastic Waste Cooperative Research Centre, *Submission 64*, [p. 7].

Production methods should be also ensured that plastic products have minimal degradation during their use and at the end of the product life [so] less volume of plastic waste ends up in the environment.³⁸

- 4.40 It also made clear that any coordinated strategy should ensure that the government supports sovereign capability in advanced materials processing and funds 'transitional research that bridges laboratory analysis and industrial-scale deployment'.³⁹
- 4.41 Responsible Future (Illawarra Chapter) added that government efforts should focus on funding industry to develop 'plastic-free materials, safer chemical alternatives and circular economy solutions that reduce reliance on persistent synthetic polymers'.⁴⁰
- 4.42 The committee heard that work is already underway in this space. For example, Dr Thava Palanisami told the committee at a public hearing in Canberra of an initiative he is working on to phase out plastic-based credit cards in favour of seaweed-based credit cards. Dr Palanisami stated that plastic-based credit cards:
- ... generate around 1½ tonnes of plastic PVC waste per month, and they want to reduce the use of petroleum plastics. Each credit card that we have has nine layers of PVC. So, we took the opportunity to redesign, and now they are in the commercial stage of introducing a green card. The green card will be based on seaweed...⁴¹

Strengthening extended producer responsibility

- 4.43 The committee heard that the growing issue of microplastics highlights the need to strengthen extended producer responsibility (EPR), which refers to shifting more accountability onto manufacturers for the full lifecycle of their products.⁴²
- 4.44 The RACGP recommended mandating the EPR, which could encourage manufacturers to reduce the amount of fragility of plastics entering the environment, given that they will need to pay for end-of-life management.⁴³
- 4.45 Product Safety Solutions further stated that business and industry have both the opportunity and responsibility to promote safe products.⁴⁴ As such, it recommended that the government should work closely with consumer product

³⁸ UNSW SMaRT Centre, *Submission 29*, p. 7.

³⁹ UNSW SMaRT Centre, *Submission 29*, p. 10.

⁴⁰ Responsible Future (Illawarra Chapter), *Submission 47*, [p. 15].

⁴¹ Dr Thava Palanisami, Group Leader, Australian Plastic Research and Innovation Lab; and Chief Investigator, Healthy Environments and Lives National Research Network, National Health and Medical Research Council, *Committee Hansard*, 27 March 2026, p. 31.

⁴² Solving Plastic Waste Cooperative Research Centre, *Submission 64*, [p. 7].

⁴³ Royal Australian College of General Practitioners, *Submission 11*, p. 5.

⁴⁴ Product Safety Solutions, *Submission 57*, p. 4.

suppliers, particularly importers and retailers, to determine how products and market practices can be adapted to reduce exposures, using practical measures and forward-looking strategies.⁴⁵

- 4.46 The RACGP also provided considerations to help support industries to transition, including improving collection, sorting, and recycling infrastructure to keep plastics in the economy and introducing taxes, subsidies, or quotas to shift markets toward low-plastic alternatives.⁴⁶

Limited regulations in Australia

- 4.47 The inquiry heard that legislation and regulation of microplastics are still under development and that, at present, Australia relies on a combination of voluntary industry commitments and fragmented jurisdiction-specific regulations to address pollution.⁴⁷

- 4.48 Doctors for the Environment Australia explained that Australia's approach to plastic pollution and toxic chemical contamination has largely been 'fragmented and inadequate, relying on individual states and territories to develop inconsistent protections rather than implementing comprehensive national regulations'.⁴⁸

- 4.49 This is reflected at a national level with no single, accountable agency that has 'both the mandate and the capability to systematically monitor and characterise population-level environmental exposures and their associated health impacts'.⁴⁹ The result is that:

...chemical regulation in Australia is predominantly prospective — focusing on the assessment of chemicals before introduction — rather than ongoing or retrospective surveillance. Once a chemical is in circulation, there is no coordinated, continuous program to assess population exposure levels, verify compliance with regulatory conditions, or examine associations between measured exposures and health outcomes.⁵⁰

⁴⁵ Product Safety Solutions, *Submission 57*, p. 4.

⁴⁶ Royal Australian College of General Practitioners, *Submission 11*, p. 5.

⁴⁷ Solving Plastic Waste Cooperative Research Centre, *Submission 64*, [p. 5].

⁴⁸ Doctors for the Environment Australia, *Submission 30*, p. 7.

⁴⁹ Answers to questions taken on notice by the Australian Academy of Health and Medical Sciences at a public hearing on 20 March 2026; received 8 April 2026, [p. 4].

⁵⁰ Answers to questions taken on notice by the Australian Academy of Health and Medical Sciences at a public hearing on 20 March 2026; received 8 April 2026, [p. 4].

National standard

- 4.50 The committee heard that the absence of a nationally consistent standard for microplastics in consumer products highlights the need for clear regulation and coordinated policy.⁵¹
- 4.51 The RACGP stated that ‘coordinated regulatory action, national product standards for plastics and hazardous chemical additives, and monitoring frameworks are essential to protect population health’.⁵² It also expressed support for the adoption of a national standard for consumer products to reduce microplastic exposures, in particular, ‘a tightening of regulations to reduce microplastic production through reductions in upstream plastic production, which will have the greatest impact’.⁵³
- 4.52 The UNSW SMaRT Centre raised that a national product standard that specifically targets microplastics shedding, additives and durability would address prevention at the source, improve market certainty and innovation incentives and align Australia with other international trade partners.⁵⁴
- 4.53 On the other hand, the Cancer Council Australia contended that the potential benefits of introducing a national standard for consumer products are unclear. However, it suggested that any national standard should be ‘developed based on consultation between relevant statutory authorities concerning potential benefits for all aspects of human health, and the environment’.⁵⁵
- 4.54 Product Safety Solutions identified that if the government were to implement a national standard, it should:
- be truly national in design, scope and guidance, especially, if picked up in regulation, in application and enforcement;
 - closely align with international practice; and
 - align with consumer product education efforts (or vice versa).⁵⁶
- 4.55 Relatedly, Product Safety Solution submitted that, given the product scope challenges, a national standard containing ‘general principles and universally applicable guidelines may be appropriate’.⁵⁷ As such, ‘any standard/s already

⁵¹ See, for example, Australian Academy of Health and Medical Sciences, *Submission 67*, p. 18; Solving Plastic Waste Cooperative Research Centre, *Submission 64*, [p. 5].

⁵² Royal Australian College of General Practitioners, *Submission 11*, p. 5.

⁵³ Royal Australian College of General Practitioners, *Submission 11*, p. 5.

⁵⁴ UNSW SMaRT Centre, *Submission 29*, p. 8.

⁵⁵ Cancer Council Australia, *Submission 13*, p. 6.

⁵⁶ Product Safety Solutions, *Submission 57*, p. 9.

⁵⁷ Product Safety Solutions, *Submission 57*, p. 9.

published by the International Organisation for Standardisation (ISO) or another trusted standards body would be the best starting point for Australia'.⁵⁸

International regulation

4.56 Throughout the inquiry, the committee heard about examples of regulations in overseas jurisdictions which limit exposure to MNPs.

Microplastics regulation in the European Union

4.57 At a public hearing, Dr Jacinta Martin told the committee that the European Union's (EU) regulation is considered the 'gold standard' that Australia should draw inspiration from.⁵⁹

4.58 The Climate Centre submitted that the EU drives the regional approach in Europe to waste reduction and the circular economy, especially within the past decade.⁶⁰

4.59 The EU also applies a precautionary approach to the inclusion of chemicals in consumer products through its 'registration, evaluation and restriction of chemicals' via its REACH regulation (which stands for *Registration, Evaluation, Authorisation, and Restriction of Chemicals*).⁶¹ Key enforcement features of REACH include that:

- REACH places the burden of proof on companies. To comply with the regulation, companies must identify and manage the risks linked to the substances they manufacture and market in the EU, actively reducing reliance on the most toxic chemicals, or face fines, criminal penalties or product bans; and
- REACH has already banned additional unnecessary and harmful primary sources of MPs, including non-compliant plastic fertilising products and plastic seed coatings (from late 2028) rubber crumb infill and plastic pesticides commencing from late 2031.⁶²

4.60 Further, COPAR Pty Ltd referenced research, which stated that the EU has arguably the strictest legislation of hazardous substances globally, with already 26 000 substances registered in the region.⁶³

4.61 In 2023, the EU adopted a restriction under its REACH regulation called the Commission Regulation EU 2023/2055 (known as the 'microplastics restriction'),

⁵⁸ Product Safety Solutions, *Submission 57*, p. 9.

⁵⁹ Dr Jacinta Martin, Private capacity, *Committee Hansard*, 20 March 2026, p. 50.

⁶⁰ The Climate Centre, *Submission 15*, [p. 5].

⁶¹ Product Safety Solutions, *Submission 57*, p. 6.

⁶² Total Environment Centre, *Submission 62*, [p. 8].

⁶³ COPAR Pty Ltd, *Submission 17*, p. 11.

which restricts the placing on the market of synthetic polymer microparticles (smaller than 5 millimetres) intentionally added to products.⁶⁴ This means microplastics added to key products such as cosmetics, detergents, fertilisers, glitter, sports infill, and more are being banned or phased out. The EU also prioritises a progressive restriction of Bisphenol A (BPA), phthalates, and proposed a broad PFAS ban under REACH.⁶⁵

- 4.62 The committee also heard that tyre-derived products (such as crumb rubber) has sparked a lot of attention as a key contributor to particle air pollution, which is known to impact human health.⁶⁶
- 4.63 In 2024, the European Commission adopted the Euro 7 regulation, which tackles emissions from brakes and tyres and tightens the requirements for exhaust emissions from internal combustion engine vehicles.⁶⁷

Microplastics regulation in California

- 4.64 The committee heard evidence of an initiative in California of a safer consumer program that identifies hazardous chemicals, places them on a priority list, and then requires manufacturers to look for an alternative chemical to use in the product, or to issue a warning that is made and put in a public position when the chemical is either used in a product or used in a facility or a shop.⁶⁸
- 4.65 At a hearing Dr Chartres explained:
- ... the department of toxic substances in the state of California has a safer consumer program whereby, if there are chemicals that are identified as being hazardous, they can be put on a list of priority chemicals and then either the manufacturer has to look for an alternative chemical to use in the product or a warning is made and put in a public position when the chemical is either used in a product or used in a facility or a shop.⁶⁹
- 4.66 According to the Queensland Alliance for Environmental Sciences, California Proposition 65 is a 'powerful chemical-disclosure and consumer-warning law

⁶⁴ Elan Energy Matrix, *Submission 43*, Attachment 1, pp. 6–7.

⁶⁵ Ms Rebecca Norris, *Submission 59*, [p. 4].

⁶⁶ Dr Timothy Chaston, Centre Affiliate, Centre for Safe Air, *Committee Hansard*, 20 March 2026, p. 33.

⁶⁷ Elan Energy Matrix, *Submission 43*, Attachment 1, p. 7. See, also Council of the EU, Press release, *Euro 7: Council adopts new rules on emission limits for cars, vans and trucks*, <https://www.consilium.europa.eu/en/press/press-releases/2024/04/12/euro-7-council-adopts-new-rules-on-emission-limits-for-cars-vans-and-trucks/> (accessed 8 May 2026)

⁶⁸ Dr Nicholas Chartres, Senior Research Fellow, Faculty of Medicine and Health, University of Sydney, *Committee Hansard*, 27 March 2026, p. 27.

⁶⁹ See: Dr Nicholas Chartres, Senior Research Fellow, Faculty of Medicine and Health, University of Sydney, *Committee Hansard*, 27 March 2026, p. 27.

that has driven widespread product reformulation and significantly increased public awareness of harmful chemical exposures'.⁷⁰

- 4.67 Proposition 65 also requires the state of California to regularly maintain a list of chemicals that cause cancer, reproductive harms, or developmental harm.⁷¹

Regional and rural considerations

- 4.68 The committee heard that Australians living outside of metropolitan areas are more likely to be exposed to environmental contaminants through water supplies, food systems, workplaces, air, natural environments and proximity to contaminated land.⁷²

- 4.69 The Australian Academy of Health and Medical Sciences similarly identified that some communities, such as people living in rural, remote, or industrial areas, families with limited access to non-plastic consumer alternatives, some culturally and linguistically diverse communities, and workers in certain occupations are disproportionately more likely to have higher exposure and bioaccumulation rates of certain contaminants.⁷³

- 4.70 When asked whether there is sufficient awareness amongst First Nations communities around the risks to health, particularly fertility and pregnancy, Ms Sandra Creamer, Chief Executive Officer of the Australian Women's Health Alliance told the committee that there is not enough information on potential harms:

I don't think there's enough information that goes on, and people don't generally talk about what's happening. We know that in remote communities, especially in Indigenous communities, they're so reliant on plastic bottles, especially for drinking water, because of the E. coli and sulphur that is there in the vast majority of Indigenous communities. But it's not a conversation ... I've travelled around remotely to a lot of communities, and it's not something that they have a discussion about.⁷⁴

- 4.71 As such, the committee heard that any policy changes should account for these specific cohorts. Ms Susanne Tegen, who is the Chief Executive of the National Rural Health Alliance, told the committee that rural communities, including

⁷⁰ Queensland Alliance for Environmental Health Sciences, The University of Queensland, *Submission 31*, p. 5.

⁷¹ Dr Nicholas Chartres, *Submission 70*, p. [31]. See, also, State of California, Office of Environmental Health Hazard, *About Proposition 65*, www.oehha.ca.gov/proposition-65/about-proposition-65 (accessed 16 April 2026).

⁷² Ms Susanne Tegen, Chief Executive, National Rural Health Alliance, *Committee Hansard*, 27 March 2026, p. 2.

⁷³ Australian Academy of Health and Medical Sciences, *Submission 67*, p. 7.

⁷⁴ Ms Sandra Creamer, Chief Executive Officer, Australian Women's Health Alliance [by video link], *Committee Hansard*, 20 March 2026, p. 17.

Indigenous populations, require policy that ‘recognises rural realities rather than policy that imposes metropolitan assumptions’.⁷⁵

- 4.72 Ms Tegen further urged the committee to consider recommendations that embed rural and remote equity into environmental and public health regulation and to ensure that rural communities are not left to manage emerging environmental risks alone ‘when the government has the tools to make the difference and corporates have the capacity’.⁷⁶

⁷⁵ Ms Susanne Tegen, Chief Executive, National Rural Health Alliance, *Committee Hansard*, 27 March 2026, p. 3.

⁷⁶ Ms Susanne Tegen, Chief Executive, National Rural Health Alliance, *Committee Hansard*, 27 March 2026, p. 3.

Chapter 5

Committee view

- 5.1 Micro- and nanoplastics (MNPs), per- and polyfluoroalkyl substances (PFAS) and other toxics, such as endocrine-disrupting chemicals (EDCs), are present in almost everything we use in our daily lives and are ubiquitous in our environment. From the outset of the inquiry, all participants made it clear to the committee that there is a critical need to better understand how these chemicals interact with living organisms and what impacts they have on human health.
- 5.2 Although evidence on the impact on human health is still emerging and there are differing views and interpretations among scientists and organisations, there was consensus among inquiry participants that we should adopt a precautionary approach to our exposure to MNPs, PFAS and other toxics.
- 5.3 Importantly, throughout the inquiry it became clear that uncertainty is not a reason for inaction. Actions could and should be taken in a range of policy areas and programs to accelerate research, education and innovation to understand and minimise any potential human health effects.
- 5.4 In its deliberation, the committee adopted the precautionary principle, and this chapter presents the committee's views on the evidence and its recommendations aimed at ensuring that we do not remain passive while waiting for definite scientific evidence. Delaying action may result in adverse but preventable health outcomes.

The need for a whole of government approach

- 5.5 The committee heard that environmental public health in Australia is currently governed through a fragmented collection of agencies and policies. Historically, there appears to have been a clear demarcation between the regulation of environmental impacts of pollutants and the health impacts of pollutants, with little consideration paid to the fact that these two factors usually interact. Environmental issues can and should be considered through a public health lens, and vice versa.
- 5.6 The Australian Industrial Chemicals Introduction Scheme assesses and regulates chemicals but does not conduct human biomonitoring. The Department of Health, Disability and Ageing has a health remit but lacks the environmental exposure intelligence to identify priorities. The Department of Climate Change, Energy, the Environment and Water assesses the risks to ecosystems from industrial chemicals and provides advice to the Australian Industrial Chemical Introduction Scheme but does not have a direct role in assessing the risks of chemicals to human health.

- 5.7 As was made apparent to the committee, this fragmented governance arrangement has meant that no single government agency has had both the mandate and the capability to monitor and characterise environmental exposures and their associated health impacts.
- 5.8 The assessment and management of the impacts of microplastics, PFAS and EDCs cannot operate in silos according to government portfolio allocations. In essence, we need to bring together environmental protection, human health concerns, consumer safety and industry standards. The committee urges departments and agencies to work together, and with the states and territories, on this matter. The committee is encouraged by the recently established Australian Centre for Disease Control's role in protecting the health of Australians from environmental risks and considers that it must play a convening role in spearheading this work across the whole of government.
- 5.9 The committee notes that the Australian Centre for Disease Control already facilitates whole of government approaches for health and environmental matters, which is reflected in its work in leading the implementation of the National Health and Climate Strategy.
- 5.10 The committee encourages the Australian Centre for Disease Control to leverage learnings from its work in this space and to apply it to a whole of government response to the potential health impacts of microplastics and PFAS, which should also include a national strategy.
- 5.11 This strategy should explicitly take into account the needs of priority cohorts, including regional, rural and remote communities, and First Nations communities, noting they are more likely to be exposed to environmental contaminants.

Recommendation 1

- 5.12 The committee recommends that the Australian Government mandate the Australian Centre for Disease Control to coordinate a whole of government approach to the monitoring of the potential impacts of micro- and nanoplastics and per- and polyfluoroalkyl substances on human health, with a view of developing a national strategy by 2028.**

Past parliamentary inquiries

- 5.13 Multiple parliamentary committees have conducted inquiries that investigated topics relating to PFAS, plastics, and microplastics, with some also considering the potential impacts on human health. As canvassed in Chapter 1, both Senate and House committees have made a range of recommendations that are relevant to the findings of this inquiry, such as designing a chemicals biomonitoring program and commissioning research to determine the impacts of microplastic ingestion, inhalation and skin contact on human health.

- 5.14 The committee notes that at the time of writing, these reports have overdue government responses.¹ The committee is disappointed that the government has not responded to these reports in a timely manner. Committee inquiries play an important role in translating identified problems into the formulation of better policy approaches. Had the recommendations made by these committees been considered and responded to by the government on time, it is fair to suggest that important work could be underway to better understand the health risks that these contaminants may pose to our population.
- 5.15 The committee urges the government to respond to these committee reports. To do otherwise is a disservice to the community and to the committees that represent them.
- 5.16 The committee considers the recommendations made by the Senate Select Committee on PFAS pertinent to the findings of this inquiry. In particular, the committee reiterates the recommendations on cosmetics, clothing and personal care products.

Recommendation 2

- 5.17 The committee recommends that the Australian Government work with relevant stakeholders to assess per- and polyfluoroalkyl substances (PFAS) contamination in clothing, textiles, floor coverings and furniture, identify key resources and import pathways, reduce contaminated imports and improve the safe disposal of legacy PFAS-contaminated textile waste.**

Recommendation 3

- 5.18 The committee recommends that, as a priority, the Australian Government works to enforce the PFAS ban in relation to cosmetics and personal care products, including period products.**

Potential health impacts

- 5.19 The committee received a wealth of evidence about the potential health impacts of MNPs, PFAS and other toxics. Inquiry participants were never sensationalist or alarmist when discussing potential adverse health outcomes. Instead, discussions and recommendations were always balanced and considered. The committee thanks all inquiry participants for sharing their time and expertise in such a measured way.

¹ House of Representatives Standing Committee on Climate Change, Energy, Environment and Water, *Inquiry into plastic pollution in Australia's oceans and waterways*, May 2024; Senate Environment and Communications References Committee, *No time to waste – Waste reduction and recycling policies*, April 2025; Senate Select Committee on PFAS (per and polyfluoroalkyl substances), *Final report*, November 2025.

- 5.20 The committee acknowledges the reported potential impacts of MNPs and PFAS on reproductive health, developmental outcomes in children and cardiovascular health. The committee heard that a growing body of research considers that these chemicals can act as endocrine disruptors, impacting hormones, reproductive health, and the immune system. In particular, the committee was told that they may play a significant role in relation to reproductive health and infertility, which can be challenging to navigate, deeply personal and costly, both financially and emotionally.
- 5.21 As human health-related concerns grow, the committee agrees with inquiry participants that accelerating research should be a key priority. The committee also noted that in addition to research, inquiry participants stressed the importance to minimise our exposure to MNPs and PFAS where possible. Whilst some measures would need regulatory considerations and will be discussed later in the chapter, simple changes can reduce non-essential exposure. These include stopping heating plastic containers in microwaves, avoiding plastic cups, and choosing food products not covered in unnecessary plastic packaging.

Data collection and methods

- 5.22 The committee heard that currently, there is no gold standard for measuring and detecting MNPs or PFAS. This makes it difficult to interpret the findings of studies, to compare results or to track trends over time. This also leads to scientific disagreements, confused messaging and, at times, the discredit of some valuable work.
- 5.23 The committee notes that questions regarding safe levels of exposure and consumption cannot be answered confidently until standardised methodologies are developed. In other words, you cannot regulate what you cannot measure.
- 5.24 The committee also heard that contamination and quality control in microplastics are a persistent concern that can lead to contaminated samples or misleading results.
- 5.25 As such, the committee is of the view that the development of rigorous, nationally standardised methods for measurement, exposure assessment and contamination control is imperative to improving the evidence base on MNPs and PFAS. This is the fundamental building block that, once in place, will enable future regulatory decision-making to be effective and grounded in strong science.
- 5.26 To date, the work on MNPs and PFAS has mostly come from the environmental space. It is now time for public health agencies to take a leadership role. The committee is of the view that the Australian Centre of Disease (Australian CDC) is an appropriate body to facilitate this work, noting its work to support nationally consistent interpretation of environmental health hazards.

Recommendation 4

5.27 The committee recommends that the Australian Centre for Disease Control, in consultation with relevant stakeholders, develop nationally standardised methods for measurement, exposure assessment and contamination control of micro- and nanoplastics and per- and polyfluoroalkyl substances in human samples.

Exposure pathways

5.28 The committee heard that there are significant knowledge gaps regarding human exposure pathways to microplastics. Available studies focus on detecting microplastics in human tissue samples but generally do not include comprehensive exposure assessment.

5.29 The committee notes that airborne exposure is a particular pathway that currently has limited evidence for the impacts on human health and is therefore an emerging concern that requires greater attention. Further research is required to understand exposures, to model them and measure them, and to understand the health effects.

5.30 It would be helpful to quantify the most common exposure routes (inhalation and ingestion via specific food and drink sources) so that appropriate, proportionate and effective policy responses can be developed.

Biomonitoring and longitudinal research

5.31 Inquiry participants overwhelmingly recommended establishing a national biomonitoring program to assess human exposure to PFAS and MNPs. The committee notes that Australia lags behind comparable countries like the United States, Canada, Germany, South Korea, and Japan, which all operate a population-level human biomonitoring program.

5.32 Currently, without a biomonitoring program, we lack the necessary information to understand the extent of contaminants bioaccumulation across Australian communities and whether there are health impacts.

5.33 The committee is encouraged to hear that momentum is already underway to establish a biomonitoring program in Australia. The committee welcomes the work that the Australian Centre for Disease Control is undertaking regarding the public tender for a pilot study to better understand feasibility and assess approaches for potential future biomonitoring arrangements.

5.34 The committee also acknowledges that the Senate Select Committee on PFAS recommended that the government consult with relevant stakeholders on designs for a national, longitudinal chemicals biomonitoring program and associated longitudinal PFAS health research projects.

- 5.35 The committee echoes the call for a national biomonitoring program and notes that samples already exist from a range of studies and biobanks, which could assist in fast tracking outcomes.
- 5.36 The committee is of the view that a national biomonitoring program should be implemented through existing national public health infrastructure via the Australian CDC, which would be able to leverage the outcomes of its biomonitoring pilot study. This work should be undertaken in conjunction with the Australian Academy of Health and Medical Sciences and other relevant stakeholders.
- 5.37 The committee heard throughout the inquiry that the development of a biomonitoring program and longitudinal studies should consider incorporating a focus on monitoring exposure levels in infants, pregnant women and Aboriginal and Torres Strait Islander peoples. Longitudinal studies will be essential to clarify the potential role of MNPs and PFAS in human health. The committee notes that one of the Medical Research Future Fund funding priorities is currently to support multidisciplinary and cross-sectoral research to address health challenges linked to environmental factors.

Recommendation 5

- 5.38 The committee recommends that Australian Centre for Disease Control commissions research to better understand exposure pathways to micro- and nanoplastics, including a national, micro- and nanoplastics and per- and polyfluoroalkyl substances biomonitoring research program.**

Recommendation 6

- 5.39 The committee recommends that the Medical Research Future Fund consider funding longitudinal human studies of Australian cohorts to further understand the potential links between micro- and nanoplastics and per- and polyfluoroalkyl substances' exposure with adverse health outcomes.**

The role of National Health and Medical Research Council

- 5.40 The committee is of the view that the National Health and Medical Research Council has an important role to play in advancing research outcomes on MNPs, PFAS and EDCs.

Collaboration needs

- 5.41 The committee heard that collaborative work across multidisciplinary teams will be necessary to fill the current knowledge gaps. These substances do not exist in silos according to research specialities, and as such, will require experts from a range of fields, such as toxicology, biology, epidemiology, chemistry and environmental science, to work together to find effective solutions.

- 5.42 The committee strongly encourages the NHMRC, through its domestic, bilateral and multilateral programs, to leverage its convening role to not only bring Australian researchers together, but to foster collaboration and coordination with their international colleagues on these matters.

Targeted Calls for Research

- 5.43 The committee heard that targeted research calls could accelerate evidence outcomes. The committee is encouraged by the willingness of stakeholders who expressed their eagerness to respond to these calls and to fill knowledge gaps in identified priority areas.
- 5.44 The committee also notes the evidence from the NHMRC that its Targeted Calls for Research (TCRs) can be established in response to parliamentary inquiry findings, and that TCRs can have a series of goals in their design.
- 5.45 As has been made evident throughout the report, the committee sees an obvious and clear need for further research in this space, and as such, sees value in the NHMRC opening a TCR for the impacts of MNPs, PFAS and EDCs on human health. The committee is of the view that reproductive health and fertility should be an identified priority area within this TCR.
- 5.46 The committee anticipates that the evidence generated from this TCR could assist in answering several existing questions in the evidence base, including questions regarding causality, whether these chemicals can be dangerous to human health, and at what level their presence is potentially harmful.

Recommendation 7

- 5.47 The committee recommends that the National Health and Medical Research Council open a Targeted Call for Research into the impact of micro- and nanoplastics, per- and polyfluoroalkyl substances and endocrine-disrupting chemicals on human health.**

Education and information

- 5.48 The committee heard that while public interest in MNPs, PFAS and EDCs is increasing in Australia, evidence indicates that understanding of exposure pathways remains limited.
- 5.49 The committee heard that there is a growing volume of misinformation circulating in a range of media about MNPs, PFAS and other toxics. The media stories often contain sensationalised or decontextualised claims, skewing perception of risks, contributing to confusion, and in some cases generating unnecessary alarm.
- 5.50 As such, the committee considers there is a clear need for evidence-based messaging and consumer education, including on how to reduce our exposure to these substances. The committee is of the view that the Australian Centre for Disease Control is best placed to develop a range of communication products

that appropriately contextualises emerging science and supports informed, proportionate responses. This could include factsheets, multimedia content and age-appropriate educational material for use in schools to improve public understanding and maintain confidence in our health institutions.

Recommendation 8

5.51 The committee recommends that the Australian Centre for Disease Control develop a range of communication products on micro- and nanoplastics and per- and polyfluoroalkyl substances to provide evidence-based guidance to the public. This should include health considerations and ways to reduce exposure.

Limiting MNPs and PFAS in consumer products

Fostering innovation

5.52 The committee recognises that fostering industry innovation is critical to reducing exposure to MNPs and PFAS in consumer products. By doing so, it ensures that individuals do not bear sole responsibility.

5.53 Evidence highlighted the importance of embedding sustainable principles, such as eco-design, at the earliest stages of product development to minimise material shedding and hazardous chemical use. The committee notes opportunities for the Australian Government to support industries by incentivising improved product design, focusing on the use of safe alternative materials, alongside supporting Australia's sovereign capability to translate research into industrial scale deployment.

5.54 The committee considers that continued federal investment in innovative solutions, including safer material substitutes and circular economy approaches, will be essential to reducing pollution at its source.

Recommendation 9

5.55 The committee recommends that the Australian Government consider allocating funding to support industry innovation to reduce micro- and nanoplastics and per- and polyfluoroalkyl substances in products at the source.

Strengthening extended producer responsibility

5.56 The committee considers that strengthening extended producer responsibility (EPR) is necessary to shift greater accountability onto manufacturers for the full lifecycle of their products. Evidence indicated that current arrangements place an undue burden on consumers, limiting effective source reduction of plastic pollution.

- 5.57 The committee acknowledges the work underway by the Department of Climate Change, Energy, the Environment and Water to reform packaging regulation, aimed at minimising the environmental impacts of packaging materials through requiring certain companies to improve design, recycling and product stewardship. It considers this an important foundation for Australia to build on. However, more needs to be done. It is important that Australian jurisdictions work towards nationally aligned product stewardship schemes.
- 5.58 The committee notes that well-designed EPR schemes, supported by improved recycling infrastructure, product standards, targeted bans and appropriate economic incentives, can drive more sustainable production and consumption patterns.

Recommendation 10

- 5.59 The committee recommends that the Australian Government work with state and territory governments to consider how to expand extended producer responsibility schemes to expand and harmonise product stewardship legislations and accelerate the transition to the manufacturing of products that are more durable, easier to recycle and made from safer, less harmful materials.**

Regulation

- 5.60 The committee heard that Australia's current approach to regulating MNPs, PFAS and EDCs remains limited and fragmented. To date, most legislation aimed at reducing MNPs and PFAS, and therefore exposure, has been made at the state and territory level. This has resulted in substantial jurisdictional variation.
- 5.61 The committee notes that previous inquiries have recommended that the government update the National Plastics Plan. The committee echoes this recommendation and encourages the Department of Climate Change, Energy, the Environment and Water (DCCEEW) to engage in this work as a matter of priority, as it will greatly assist in reducing our exposure to MNPs.
- 5.62 Further, the committee acknowledges that DCCEEW has previously funded research on microplastics through the National Environment Science Program Phase 2 (NESP 2). The committee understands that NESP 2 will conclude in 2027 and that a mid-term evaluation of NESP2 made recommendations for a future phase of the program, but that as of December 2025, the design of any future program has not been considered or agreed by the Australian Government.
- 5.63 The committee urges the government to extend the funding arrangements under NESP2 to a future program to ensure that this important work can continue beyond 2027.

Recommendation 11

5.64 The committee recommends that the Australian Government consider extending investment for the National Environment Science Program beyond 2027.

Overseas jurisdictions

5.65 The committee notes that international jurisdictions, including the European Union and California, have adopted more comprehensive and precautionary regulatory approaches. The committee therefore considers that Australia would benefit from examining these models to inform any future policies.

5.66 As such, the committee believes it would be appropriate for the Department of Climate Change, Energy, the Environment and Water to undertake a review of regulatory frameworks in leading international jurisdictions, with a view to identifying best practice approaches to apply in the Australian context.

5.67 The findings of this review should be considered by the Australian Centre for Disease Control and other agencies to support a nationally coordinated and evidence-based policy response.

Recommendation 12

5.68 The committee recommends that the Department of Climate Change, Energy, the Environment and Water undertake a review of regulatory approaches in leading international jurisdictions for the management of micro- and nanoplastics, per- and polyfluoroalkyl substances and endocrine-disrupting chemicals, with the view of developing a coordinated, whole-of-government regulatory response.

Senator Penny Allman-Payne
Chair
Greens Senator for Queensland

Additional Comments from Labor Senators

Introduction

- 1.1 We thank the committee, submitters and witnesses who contributed to this inquiry.
- 1.2 The inquiry considered complex and emerging issues relating to micro- and nanoplastics, PFAS, endocrine-disrupting chemicals and other toxics, and their potential impacts on human health.
- 1.3 We acknowledge the public concern about microplastics and other persistent substances. These concerns are understandable given the widespread presence of microplastics in the environment, food, water, air and consumer products, and the uncertainty about their potential long-term health implications.
- 1.4 Public concern should be taken seriously. It should also be addressed in a way that is scientifically rigorous, proportionate and capable of supporting practical responses by governments, regulators, industry and consumers.

Evidence gaps and methodological limitations

- 1.5 We consider that Chapter 3 of the report is central to any responsible consideration of these issues. That chapter makes clear that, while scientific interest and analytical capability are advancing rapidly, there remain significant gaps in the evidence base.
- 1.6 These gaps include inconsistent measurement and detection methods, contamination and quality-control issues, difficulty establishing causality, and incomplete understanding of exposure pathways.
- 1.7 The committee heard that there is currently no established gold standard for measuring micro- and nanoplastics and plastic-associated chemicals at scale in human biological samples.
- 1.8 The committee also heard that researchers use different detection methods and report results in different ways. This makes it difficult to compare studies, identify trends, assess exposure or draw firm conclusions that can be translated into policy settings.
- 1.9 Contamination and quality control are also persistent challenges. Biological samples may be collected, stored, processed or analysed using plastic materials, which can complicate findings and affect confidence in results.
- 1.10 These methodological issues are not minor technical matters. They go directly to whether governments, regulators and clinicians can assess exposure, compare results, identify trends, set thresholds, develop guidance or regulate with confidence.

- 1.11 We therefore consider that claims about health impacts should be communicated carefully. Public concern should not be dismissed, but neither should uncertainty be presented as settled evidence.

Causality and interpretation of health evidence

- 1.12 The committee heard evidence of emerging associations between exposure to microplastics, PFAS, endocrine-disrupting chemicals and a range of adverse health outcomes. These matters warrant attention and continued scrutiny.
- 1.13 However, the evidence remains complex and, in many areas, associative rather than causal. Human health outcomes such as fertility, pregnancy outcomes, cardiovascular disease, cancer and chronic conditions are influenced by many factors, including age, genetics, lifestyle, occupation, geography, underlying health conditions and other environmental exposures.
- 1.14 We consider it important that public policy does not attribute complex population-level health trends to a single factor without robust evidence.
- 1.15 We also recognise that establishing causality in this field is inherently difficult. It would not be ethical to deliberately expose people to potentially harmful substances in controlled human trials. As a result, evidence in this area necessarily relies on observational studies, mechanistic research, animal studies, in vitro studies, longitudinal cohorts and biomonitoring.
- 1.16 These forms of evidence are important, but they require careful interpretation. They also point to the need for stronger measurement, better exposure data and improved understanding of how micro- and nanoplastics and related substances may enter, move through or affect the human body.

Exposure pathways and practical mitigation

- 1.17 We note that exposure pathways are not yet sufficiently quantified to assess human health risks with confidence. This includes uncertainty about the types, sizes and concentrations of particles people are exposed to, where particles are shed across product lifecycles, and the relative significance of ingestion, inhalation, dermal exposure and medical exposure.
- 1.18 These gaps matter because they limit the ability to identify which sources contribute most to human exposure, which populations may be most affected, which interventions would be most effective, and where any regulatory effort should be prioritised.
- 1.19 We note that, while exposure cannot be eliminated entirely, many practical mitigation steps are available through consumer choice. Individuals and households concerned about avoidable exposure may choose, where practical, to reduce single-use plastics, avoid heating food in plastic containers, use glass or stainless-steel alternatives, select products with less plastic packaging,

consider lower-shedding textiles, and pay attention to product information about PFAS or other chemical treatments.

- 1.20 These consumer choices should not be presented as a complete response to a widespread environmental issue. However, they are practical steps that may reduce avoidable exposure while the evidence base continues to develop.

Public information and proportionate responses

- 1.21 We consider that public information in this area should be accurate, practical and proportionate. It should help Australians understand what is known, what remains uncertain, and what steps may reasonably reduce exposure without causing unnecessary alarm.
- 1.22 A precautionary approach may be appropriate where there is reasonable concern about potential harm. However, precaution should remain proportionate, evidence-informed and attentive to unintended consequences.
- 1.23 This is particularly important because microplastics, PFAS and endocrine-disrupting chemicals are not a single uniform risk category. They differ in source, use, persistence, exposure route, toxicity, substitutability and regulatory context.
- 1.24 Some uses may be unnecessary or readily replaceable. Other uses may be technically complex or important in medical, industrial or safety-critical settings. Any response should be capable of distinguishing between these circumstances.
- 1.25 We note the recommendations made by the committee. Those recommendations should be considered in light of the evidence gaps identified in Chapter 3, existing regulatory arrangements and institutional responsibilities, available resources, consumer behaviour, industry practice, and the need for responses to be practical, proportionate and supported by robust evidence.
- 1.26 As the evidence develops, governments, regulators, researchers, industry and consumers will all have roles to play in understanding and reducing potential risks from microplastics, PFAS and other toxics. We consider that future consideration of these matters should continue to be guided by scientific evidence, proportionate risk assessment and appropriate public communication and education.

Senator Dorinda Cox
Deputy Chair
Labor Senator for Western Australia

Senator Michelle Ananda-Rajah
Labor Senator for Victoria

Appendix 1

Site visit to Adelaide University laboratories

- 1.1 On Thursday, 19 March 2026, the committee took part in a site visit to Adelaide University to view ongoing research focussed on determining the effects of per- and polyfluoroalkyl substances (PFAS) on female fertility.¹
- 1.2 Committee Chair, Senator Penny Allman-Payne, as well as Senator the Hon Anne Ruston and Senator Wendy Askew were hosted by Professor Rebecca Robker and Dr Cameron Shearer at the Adelaide Health and Medical Sciences Building within the ART Discovery Labs.
- 1.3 The site visit commenced with an overview of the laboratories' work on PFAS, specifically the work on preclinical (mouse) models in which animals can be provided with precise amounts and types of PFAS compounds.

Figure 1.1 The committee with Dr Rebecca Robker



Left to right: Senator Penny Allman-Payne, Senator the Hon Anne Ruston, Senator Wendy Askew and Dr Rebecca Robker.

Types of assessments

- 1.4 The laboratory team demonstrated to the committee the types of assessments that can be performed on the reproductive tissues to pinpoint the cellular effects of PFAS exposure.
- 1.5 'Ex vivo ovulation' is a methodology which can be used to precisely examine how the egg is released from the ovary. In the experiments, the follicle (cellular structure containing the egg) can be treated with compounds to mimic environmental contaminants. Two research students, A. Mungur (Master of Biotechnology student) and T. Williams (PhD student) explained how these experiments are conducted and showed examples of their work, as well as a time-lapse movie of the ovulation process.

¹ The committee expresses its thanks to Dr Rebecca Robker and Dr Cameron Shearer for providing a summary report of the site visit, which can be accessed on the committee's additional information page for the inquiry. The information presented in this Appendix is sourced from this document.

- 1.6 To precisely view embryo development, the experiments conduct in vitro fertilisation using mouse eggs and sperm. PhD student M. Frost demonstrated the Computer-Assisted Sperm Assessment technology. Using this technique, it is possible to obtain comprehensive measurements of sperm motility and determine the effects of environmental contaminants.
- 1.7 Examples of mouse embryos immediately after fertilisation were shown. Research Assistant D. Holland demonstrated the method that is used, including in IVF clinics, to remove excess sperm and transfer the 1-cell stage embryos (zygotes) to the culture media in which they will develop for the next five days to the blastocyst stage (a group of approximately 80 cells). These types of in vitro experiments enable the researchers to change the environment of the embryo under controlled conditions and measure the effects.
- 1.8 To most precisely measure embryo development, the researchers use timelapse morphokinetics in which the embryo is imaged every 10 minutes for up to five days. The committee viewed a series of these movies which provide detailed information on the timing of cell division and the shape (morphology) of the embryo. The committee and the team discussed the stages of preimplantation embryo development and how different environments, including contaminants such as PFAS, can affect embryogenesis.
- 1.9 There are a number of methods to measure cell stress in embryos, and some of these assays were demonstrated and explained by Dr Yasmyn Winstanley. Specifically, examples were shown of embryo assessments for mtROS (a measure of oxidative stress), DNA damage (which influences whether cells can remain viable) and detection of inner cell mass (the cells that form the embryo) and trophoctoderm (the cells that form the placenta). The research found that the embryos of female mice exposed to PFAS had higher levels of cell stress and examples of each were shown.

Figure 1.2 The committee hearing from Dr Yasmyn Winstanley



Acknowledgement

- 1.10 Committee members are extremely grateful to Dr Rebecca Robker, Dr Cameron Shearer and the laboratory team for supporting the committee's visit and sharing their time and expertise. The committee also thanks Ms Pat Casbarra

(Adelaide University Senior Government Relations and Policy Adviser) for her time.

Appendix 2

Submissions and additional information

Submissions

- 1 Cancer Epidemiology Division, Cancer Council Victoria
- 2 Australian Multicultural Action Network Inc
- 3 Department of Climate Change, Energy, the Environment and Water
- 4 SA Water Innovation
- 5 National Health and Medical Research Council
- 6 Royal Australian and New Zealand College of Obstetricians and Gynaecologists
- 7 Textile Recyclers Australia Pty Ltd
- 8 No More Plastic Packaging
- 9 Cancer Australia
- 10 Food Standards Australia New Zealand
- 11 Royal Australian College of General Practitioners
- 12 Australian Medical Association
- 13 Cancer Council Australia
- 14 Plastic Pollution Coalition/The Last Plastic Straw
- 15 The Climate Centre
- 16 National Female Infertility Advisory Group
- 17 COPAR Pty Ltd
- 18 Engineers Australia
- 19 Australian Science Communicators
- 20 The PERTH Trial
- 21 Flinders University - Nano and Microplastics Research Consortium
- 22 I'm Plastic Free
- 23 Fidra
- 24 Professor Oliver Jones
- 25 Robinson Research Institute
- 26 Australian Nursing and Midwifery Federation
- 27 The Australian Centre for Disease Control
- 28 Australian Industrial Chemicals Introduction Scheme
- 29 UNSW SMaRT Centre
- 30 Doctors for the Environment Australia
- 31 Queensland Alliance for Environmental Health Sciences, The University of Queensland
- 32 Plastics and Female Infertility Research Team
- 33 Climate and Health Alliance
- 34 Plastics Industry Pipe Association of Australia Pty Ltd
- 35 Standards Australia
- 36 Accord Australasia

- 37 Waste Management and Resource Recovery Association of Australia
- 38 No More Butts
- 39 Vinyl Council of Australia
- 40 Dr Jacinta Martin et al
- 41 Minderoo Foundation
 - Attachment 1
 - Attachment 2
 - Attachment 3
- 42 Australian Dental Association
- 43 Elan Energy Matrix
 - Attachment 1
- 44 Dr Alexander Waller
- 45 Uncommodify Foundation Australia Limited
- 46 Natural Turf Alliance
- 47 Responsible Future (Illawarra Chapter)
- 48 Food Packaging Forum Foundation
- 49 Mr Robert Heron
- 50 Ms Jill Robinson
- 51 Ms Susie Crick
- 52 Mr Jack Davenport
- 53 Councillor Kal Glanznig
- 54 Name Withheld
- 55 Name Withheld
- 56 Name Withheld
- 57 Product Safety Solutions
- 58 National Heart Foundation of Australia
- 59 Ms Rebecca Norris
- 60 Australian Academy of Science
- 61 Centre for Safe Air, the Lung Foundation, THRIVE, and University of Queensland's Child Health Research Centre
- 62 Total Environment Centre
- 63 Australian College of Rural and Remote Medicine
- 64 Solving Plastic Waste Cooperative Research Centre
- 65 Chemistry Australia
- 66 Australian Plastics Research and Innovation Lab and NHMRC Healthy Environment and Lives (HEAL) National Research Network
- 67 Australian Academy of Health and Medical Sciences
- 68 Confidential
- 69 Australian Women's Health Alliance
- 70 Dr Nicholas Chartres
- 71 Maternal Health Matters
- 72 Ms Violeta Bojaxhi
- 73 Stroke Foundation

Additional Information

- 1 The Lancet Countdown on health and plastics.
- 2 Dr Rebecca Robker and Dr Cameron Shearer - Site visit to Adelaide University laboratories to view research investigating the effects of PFAS on female fertility.
- 3 Mrs Lucy Lines, Two Lines Fertility - Supplementary information.
- 4 Australian Academy of Health and Medical Sciences - Policy Statement, Establishment of a national human biomonitoring program.

Answer to Question on Notice

- 1 Answers to questions taken on notice by Mrs Lucy Lines, Two Lines Fertility at a public hearing on 19 March 2026; received 2 April 2026.
- 2 Answers to questions taken on notice by the Minderoo Foundation at a public hearing on 20 March 2026; received 2 April 2026.
- 3 Answer to a question taken on notice by Dr Jessie Sutherland and Dr Alex Peters at a public hearing on 20 March 2026; received 6 April 2026.
- 4 Answer to a question taken on notice by the Royal Australian and New Zealand College of Obstetricians and Gynaecologists at a public hearing on 20 March 2026; received 9 April 2026.
- 5 Answers to questions taken on notice by the Australian Academy of Health and Medical Sciences at a public hearing on 20 March 2026; received 8 April 2026.
- 6 Answer to a question taken on notice by the Stroke Foundation at a public hearing on 27 March 2026; received 14 April 2026.
- 7 Answers to questions taken on notice by the National Heart Foundation of Australia at a public hearing on 27 March 2026; received 15 April 2026.
- 8 Answers to questions taken on notice by the Department of Climate Change, Energy, the Environment and Water at a public hearing on 8 April 2026; received 22 April 2026.
- 9 Answer to a question taken on notice by the Department of Health, Disability and Ageing at a public hearing on 27 March 2026; received 22 April 2026.
- 10 Answer to a question taken on notice by the National Health and Medical Research Council at a public hearing on 27 March 2026; received 24 April 2026.

Appendix 3

Public hearings and witnesses

Thursday 19 March 2026

Adelaide Town Hall
David Spence Room
128 King William Street

Adelaide

Two Lines Fertility (in person)

- Mrs Lucinda (Lucy) Lines, Founder

Adelaide University (in person)

- Professor Rebecca Robker, Professor and Head, Reproduction and Development

Adelaide University (in person)

- Dr Cameron Shearer, Senior Lecturer

Adelaide University (in person)

- Dr Nina Wootton, Researcher

Adelaide University (in person)

- Professor Bronwyn Gillanders, Dean, School of Biological Sciences

The Nano Microplastics Research Consortium (in person)

- Associate Professor Melanie MacGregor, Associate Professor, Chemistry, Flinders University; and Leader
- Dr Ingo Koeper, Professor, Flinders University

Friday 20 March 2026

The Larwill Studio
48 Flemington Road

Parkville

The Royal Australian College of General Practitioners (in person)

- Dr Catherine Pendrey, Member, Climate and Environmental Medicine Specific Interest Group

Doctors for the Environment Australia

- Dr Genevieve Cowie (in person), Convenor, Research, Education and Advocacy Committee

- Dr Leila Cusack (in person), Member, Research, Education and Advocacy Committee
- Dr Katriona (Kate) Wylie (via videoconference), Executive Director

Monash University (in person)

- Professor Renea Taylor, Associate Dean, Centres and Institutes, Faculty of Medicine, Nursing and Health Sciences

Australian Academy of Health and Medical Sciences (in person)

- Professor Anne-Louise Ponsonby, Fellow

Australian Women's Health Alliance (via videoconference)

- Ms Sandra Creamer, Chief Executive Officer

Royal Australian and New Zealand College of Obstetricians and Gynaecologists (via videoconference)

- Dr Lauren Kite, Deputy Chair, Environmental and Sustainability Working Group

Minderoo Foundation (via videoconference)

- Professor Sarah Dunlop, Director, Plastics and Human Health

Professor Oliver Jones (in person), Private capacity

Cancer Council Australia (in person)

- Professor Bernard Stewart, Medico-scientific Adviser

Centre for Safe Air (in person)

- Dr Timothy Chaston, Centre Affiliate

Professor Ian Rae (in person), Private capacity

Dr Bradley Clarke (in person), Private capacity

University of Newcastle (in person)

- Dr Jessie Sutherland, Chief Investigator, Plastics and Female Infertility Research Team

University of Newcastle (in person)

- Dr Alexandra (Alex) Peters, Co-Investigator, Plastics and Female Infertility Research Team

Dr Jacinta Martin (in person), Private capacity

I'm Plastic Free (via videoconference)

- Mrs Simona Paganetto, Founder and Chief Executive Officer

Australian Council of Recycling (via videoconference)

- Ms Suzanne Toumbourou, Chief Executive Officer

Friday 27 March 2026

Committee Room 2S3

Parliament House

Canberra

Australian Medical Association (in person)

- Associate Professor Julian Rait, Vice President

National Rural Health Alliance (in person and via videoconference)

- Ms Gigi O'Sullivan, Strategic Project Manager
- Ms Susanne Tegen, Chief Executive

Australian Food and Grocery Council (in person)

- Ms Sarah Collier, Director, Membership and Sustainability
- Mr Scott McGrath, Director, Stakeholders, Engagement and Policy

Food Packaging Forum Foundation (via videoconference)

- Dr Jane Muncke, Managing Director and Chief Scientific Officer

Heart Foundation (in person)

- Dr Daniella Dougherty, Head, Clinical Evidence
- Dr Catherine Latham, Manager, Policy and Strategy

Stroke Foundation (via videoconference)

- Dr Lisa Murphy, Chief Executive Officer

Professor Martyn Kirk (via videoconference), Private capacity

University of Sydney

- Dr Nicholas Chartres (in person), Senior Research Fellow, Faculty of Medicine and Health

Associate Professor Mark Green (via videoconference), Private capacity

Dr Thava Palanisami (in person), Private capacity

Australian Diabetes Society (via videoconference)

- Dr Sofianos Andrikopoulos, Chief Executive Officer

National Health and Medical Research Council (via videoconference)

- Professor Steve Wesselingh, Chief Executive Officer

Australian Industrial Chemicals Introduction Scheme (in person and via videoconference)

- Mr Graeme Barden, Executive Director, Australian Industrial Chemicals Introduction Scheme

Australian Pesticides and Veterinary Medicines Authority (in person)

- Dr Ed Cram, Executive Director, Agricultural Chemicals

Food Standards Australia New Zealand (in person)

- Dr Sandra Cuthbert, Chief Executive Officer
- Dr Matt O'Mullane, General Manager, Food Safety Branch

Australian Centre for Disease Control (in person)

- Ms Emily Harper, Deputy Director-General, Public Health
- Mr Rajan Martin, Assistant Director-General
- Professor Zoe Wainer, Director-General

Department of Health, Disability and Ageing (via videoconference)

- Mr Graeme Barden, Executive Director
- Professor Michael Kidd, Chief Medical Officer
- Dr Claire Larter, Assistant Secretary, Regulatory Science Branch
- Dr Sarah Rumble, Assistant Secretary, Regulatory Integrity and Governance Branch

Wednesday 8 April 2026

Committee Room 2S1

Parliament House

Canberra

Department of Climate Change, Energy, the Environment and Water (in person)

- Ms Rachel Burgess, Head, Chemicals, Atmosphere and International Branch, Circular Economy Division
- Mr James Tregurtha, Head, Circular Economy Division