



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

Senate Community Affairs References Committee

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on behalf of the PERTH Trial Investigators and Team (Prof Gerald Watts, Dr Amelia Harray, Dr Andrew Lucas and Kate Griffiths)

The PERTH Trial (Plastic Exposure Reduction Transforms Health) – Who we are and what we have achieved to date

<https://www.uwa.edu.au/projects/the-perth-trial>

The Plastic Exposure Reduction Transforms Health (PERTH) Trial is a world-first interventional study, measuring the effect of a low plastic diet and lifestyle on specific health markers of the Perth population. The Trial's first results have been accepted for publication in *Nature Medicine* (publication date TBC, anticipated March 2026) [1].

Based at the University of Western Australia and funded by the Minderoo Foundation, the PERTH Trial is a series of randomised controlled trials (RCT) investigating plastic-associated chemical (PAC) (such as bisphenols and phthalates) exposure and assessing strategies to reduce PAC exposure.

The objectives of the PERTH Trial are:

1. To detect the levels of PAC in the body.
2. To identify possible sources of exposure to PAC in the Perth population.
3. To investigate if reducing exposure to PAC results in decreased excretion from the body.
4. To determine whether reducing exposure to PAC improves specific health conditions (cardiometabolic health, male infertility).

Commencing in 2022 with our reference cohort study, we recruited 211 clinically healthy individuals (aged from 18–60 years, 59% biological female) from the Perth metropolitan area and assessed their exposure to PAC by measuring 20 separate associated chemicals in urine samples.

A subset of these participants (60) were then enrolled into a RCT to assess the effect of various intervention strategies (plastic-free food, kitchen utensils, body care products) to reduce PAC exposure. Testing for changes in these chemical concentrations in urine samples was taken before, and at the completion of, the 7-day intervention period. The initial data from this study



has been analysed and forms the basis of the paper accepted for publication in *Nature Medicine* [1].

A third study was a RCT consisting of a 4-week intervention (plastic-free food, kitchen utensils, body care products, cleaning products) on adults with cardiometabolic risk factors, testing the proposition that human exposure to PAC is harmful, and decreasing exposure will result in improved cardiometabolic health outcomes. This third PERTH Trial study, the cardiometabolic study, is the most comprehensive low plastic diet and lifestyle intervention RCT to be conducted globally [2].

In January 2026, we commenced planning for a fourth study – PERTH Trial Fertility, the first RCT to investigate the role of PAC in male fertility.

Introduction

Plastic comprises a polymer backbone and chemical additives, such as plasticisers, flame retardants, biocides, and UV stabilisers, which give plastic its unique and versatile properties. We are exposed to plastic during everyday life via food packaging, construction materials, household goods, transport, air, water and soil etc. Of the 16,000 chemicals added to plastic, 66% have no available hazard information and less than 6% are regulated globally [3].

It is widely acknowledged that plastic breaks up into microplastics and even smaller nanoplastics, with ample evidence for exposure from multiple sources, including food packaging, and reports of micro and nanoplastics in liver, kidney and brain samples [4], although these need to be confirmed due to uncertainty in the measurement science.

It is less well understood by the general public that chemical additives leach out from plastic and can enter human bodies. PAC, such as phthalates and bisphenols, found in many plastic products used by humans, are endocrine disrupting chemicals (EDC) that interfere with naturally occurring hormones, the activity of nuclear and steroid hormone receptors, and disrupt normal metabolism.

Phthalates and bisphenols are ingested, inhaled as particulates in household dust [5] or absorbed cutaneously. Human exposure to these common chemicals is direct, continuous, begins at gestation and persists across the lifespan [6, 7]. A national survey in the US [8] showed that 93% of the population had detectable levels of BPA, and concentrations of either BPA and/or phthalates are reportedly found in urine, serum, nasal secretions, semen, adipose and brain tissue [9-17].

Whilst we acknowledge and understand the Senate Community Affairs References Committee's emphasis on microplastics, we respectfully suggest that PAC may pose an even greater risk for human health and that more attention and funding should be directed towards research in this increasingly important area. This is crucial because of the recent trend towards 'regrettable substitution' of other unregulated PAC for those now restricted, for example, BPS for BPA [18].



Response to select Terms of Reference

(a) the impact of microplastics, toxics and forever chemicals on reproductive health

Declining fertility is an emerging and concerning trend globally. Despite advances in reproductive medicine, the role that modifiable diet, lifestyle and environmental exposures play in reproductive health is poorly understood. PAC, many of which are known endocrine disruptors, are ubiquitous in modern life and are biologically plausible contributors to metabolic and reproductive dysfunction [19, 20]. There is a critical need to investigate the effect of PAC on reproductive health through a robust, consumer-led, randomised controlled trial (RCT). This is the aim of PERTH Trial Fertility.

The premise of PERTH Trial Fertility is that pervasive exposure to the endocrine disrupting activity of a range of PAC disrupts normal biosynthesis of healthy spermatozoa resulting in tangible reductions in male reproductive function. The known endocrine disrupting activities of these plastic environmental pollutants is likely a causative agent interfering with the biological processes associated with healthy spermatogenesis.

Commencing participant recruitment in February 2026, PERTH Trial Fertility aims to fill a significant gap in current knowledge on the impact of PAC on reproductive health.

(c) cardiovascular impacts, including links between microplastic accumulation in arterial plaque and increased risks of heart attack, stroke and cardiovascular mortality; and

(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

A groundswell of scientific opinion asserts that PAC have a role in the pathophysiology of conditions including heart disease, birth outcomes and reproduction, obesity, type 2 diabetes, neurodevelopment, allergies and respiratory conditions that, to date, have been thought to be caused largely by genetics or lifestyle choices [21-24].

A large number of animal studies, and a restricted number of human studies, that deliver defined exogenous doses of PAC have been performed [25]. These studies demonstrate the disruption of various biological systems, such as the metabolic and reproductive systems.

However, it has mostly been observational epidemiological (association) studies that have examined internal exposures to PAC and identified consistent and statistically significant associations between exposure and adverse health outcomes from before birth and across our lifespan [21]. Although consistency is one factor that suggests 'cause', other more direct approaches are needed, with RCTs being the gold standard in human research.

This was the aim of the PERTH Trial Cardiometabolic study, the world's most comprehensive low plastic diet and lifestyle intervention RCT to be conducted. We have collected a huge amount of



data from this study and will be analysing and publishing it over the next few years, making a significant contribution to knowledge on how PAC impact human cardiometabolic health.

(h) the adequacy of current research, monitoring and measurement standards for microplastic contamination in Australia

There is a clear opportunity for investment in Australian-based research effort in this field to address the large number of unanswered questions concerning the health effects of plastic, including PAC. A causal link between reduced PAC exposure and better health outcomes would be evidence likely to attract a high degree of public health interest, necessary for strong political engagement in the promotion of regulatory change.

By providing scientific evidence of harm, research findings would create an opportunity for translation into policy and practice change and pressure industry innovation towards safer alternatives, supporting a reduction in plastics and improving health.

Conclusion

The PERTH Trial is, to the best of our knowledge, the most comprehensive RCT of an intervention designed to minimise exposure to plastic and PAC through diet and lifestyle conducted globally [2].

This research is possible due to the philanthropic support of the Minderoo Foundation. However, there is a clear gap in funding from Government and other sources to allow the full potential of this research to be explored.

We thank the Parliament of Australia's Community Affairs References Committee for inviting submissions on the *Impact of microplastics and other toxics on human health* and see this as a significant starting point for further policy development, collaboration and discussion.

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