Submission 13 July 2025 - Select Committee on PFAS (per and polyfluoroalkyl substances)
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To: The Select Committee on PFAS

Ref: Inquire into the extent, regulation and management of PFAS,

Dear Members of the Committee,

Subject: Submission Regarding the Impact of PFAS on Human Health, with Particular Focus on Thyroid Function

I am submitting this report to provide a detailed overview of my concerns related to the widespread contamination of **per- and polyfluoroalkyl substances (PFAS)** in Australia. This submission specifically highlights the potential health impacts associated with PFAS exposure, with a particular focus on **thyroid function**, as well as broader environmental, social, and economic consequences.

PFAS chemicals are highly persistent in both the environment and human body, raising serious concerns regarding their long-term effects on public health and ecosystems. Given the growing body of evidence.

Indicating adverse health outcomes from exposure to PFAS—ranging from endocrine disruption to cancer—this submission seeks to contribute to the committee's ongoing inquiry into the extent, regulation, and management of these substances.

Key areas addressed in this submission include:

- The extent of PFAS contamination in various environments, including water, soil, and food systems.
- The health risks, particularly those related to **thyroid dysfunction** and other endocrine disruptions.
- An examination of the current regulatory frameworks and their effectiveness in managing PFAS exposure and contamination.
- Recommendations for further actions to mitigate the risks posed by PFAS, including

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policy reforms, public health initiatives, and environmental management strategies.

PFAS (per- and polyfluoroalkyl substances) are a large group of synthetic chemicals known for their persistence in both the environment and human body. Studies have linked PFAS exposure to a range of serious health issues.

I want to focus on the key health impacts, including **thyroid function**, based on reliable and widely recognized sources.

Health Impacts of PFAS:

1. **Thyroid Disruption:**

   · PFAS have been associated with thyroid hormone disruption, particularly affecting the **hypothalamic-pituitary-thyroid axis**. This axis regulates the release of thyroid hormones that control metabolism, growth, and development.

   · Studies have shown that exposure to **PFAS chemicals** may lead to reduced levels of **T3 (triiodothyronine)** and **T4 (thyroxine)** hormones. Low levels of these hormones can result in **hypothyroidism** (underactive thyroid), which can cause symptoms like fatigue, weight gain, and difficulty regulating body temperature.

   · **PFOS** (perfluorooctane sulfonate) and **PFOA** (perfluorooctanoic acid), two of the most studied PFAS, are commonly found in drinking water, food, and consumer goods. These chemicals have been linked to **alterations in thyroid function** in humans and laboratory animals.

   · **The Endocrine Society** notes that PFAS act as **endocrine disruptors**, affecting thyroid hormone production, secretion, and metabolism.

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Key Studies on Thyroid Effects:

   · A **2019 study** published in *Environmental Health Perspectives* reviewed several studies and found that **PFAS exposure** may lead to thyroid dysfunction, especially in vulnerable populations such as children and pregnant women. This study suggests that the disruption of thyroid hormones can impair growth and brain development in children.

   · **A 2020 review** published in *Critical Reviews in Toxicology* concluded that PFAS exposure might lead to **both hypo- and hyperthyroidism**, but the evidence is more robust for **hypothyroidism**, especially in populations exposed to high levels of PFAS in drinking water.

   · A study in **2022** published in *Environmental Pollution* found associations between PFAS exposure and **alterations in thyroid hormone levels** in both

children and adults, indicating a possible link to thyroid disease.

2. **Cancer:**
   - **Kidney and testicular cancers** are the most strongly linked with PFAS exposure, particularly through **PFOA**. The **U.S. National Toxicology Program** (NTP) has classified PFOA as a "likely human carcinogen."
   - Studies suggest that prolonged exposure to high levels of PFAS in drinking water may increase the risk of cancers, particularly kidney and testicular cancers, through mechanisms that remain an area of active research.
3. **Immune System Dysfunction:**
   - PFAS exposure has been shown to **suppress immune system function**. A study in *Environmental Health Perspectives* found that exposure to PFAS reduces the effectiveness of vaccines in children, making them more susceptible to infections and diseases.
4. **Liver Damage:**
   - **PFAS exposure** is linked to **liver damage**. Studies have shown elevated liver enzymes and liver toxicity in populations with high PFAS exposure.
   - PFOA and PFOS are known to accumulate in the liver, and long-term exposure can cause **non-alcoholic fatty liver disease (NAFLD)**, a condition associated with **liver inflammation and damage**.
5. **Reproductive and Developmental Effects:**
   - Exposure to PFAS has been linked to **reproductive toxicity**, including decreased fertility, low birth weight, and developmental delays. Pregnant women exposed to PFAS might be at higher risk of preeclampsia, a condition characterized by high blood pressure and organ damage.
6. **Cholesterol Elevation:**
   - PFAS have been shown to cause **elevated cholesterol levels**, particularly high-density lipoprotein (**HDL**) and low-density lipoprotein (**LDL**) cholesterol, which could increase cardiovascular disease risk over time.
   - Research published in *Environmental Health Perspectives* found that elevated levels of **PFAS** in the blood are associated with higher cholesterol levels in humans.
7. **Endocrine Disruption:**
   - As **endocrine disruptors**, PFAS affect a range of hormonal systems beyond the thyroid. These chemicals can impact reproductive hormones, and even alter the development of the brain.

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Thyroid and PFAS: Specific Mechanisms of Action

PFAS have been identified as **endocrine-disrupting chemicals (EDCs)** because they can interfere with normal hormone function, particularly thyroid hormones. This occurs through several mechanisms:

- **Binding to thyroid hormone receptors**: PFAS can bind to the receptors that normally respond to thyroid hormones, altering their signaling and affecting the body's metabolic functions.
- **Interfering with hormone production**: PFAS exposure has been shown to reduce the synthesis of thyroid hormones, which affects their normal levels and leads to imbalances.
- **Influencing thyroid hormone metabolism**: PFAS chemicals can also alter the metabolism of thyroid hormones, changing how they are processed in the body, leading to either a **hypo-** or **hyperthyroid** state.

Why Thyroid Disruption Matters:

Thyroid hormones are critical for:

- **Regulation of metabolism**: Affecting energy use, heat production, and metabolic rate.
- **Developmental processes**: Essential for the development of the nervous system, especially in fetuses and young children.
- **Growth and organ function**: Regulates heart rate, muscle function, and general growth processes.

Recommendations for Protecting Public Health:

1. **Monitoring and reducing PFAS exposure** through regular environmental testing and cleaning of contaminated water supplies.
2. **Regulation and phase-out of PFAS** from consumer products, especially those related to food packaging and firefighting foam.
3. **Increased research** into the long-term health effects of PFAS exposure, particularly focusing on thyroid function, reproductive health, and the development of effective health guidelines.
4. **Supporting affected communities** with healthcare and monitoring services, especially those living near PFAS-contaminated areas.

Conclusion:

PFAS are widely recognized as harmful to human health, particularly in the disruption of thyroid function. The evidence linking PFAS exposure to thyroid dysfunction underscores

the importance of regulating these substances and preventing further contamination. The public health risks are significant, and continued research and action are necessary to mitigate long-term effects.

This report aims to inform the committee’s deliberations and provide a comprehensive understanding of the public health implications of PFAS exposure. I hope that the insights shared will contribute meaningfully to the committee's efforts to improve both regulatory measures and support for affected communities.

Thank you for your attention to this matter. I look forward to your consideration of this submission and the opportunity to contribute to the ongoing discussions surrounding PFAS management in Australia.

Yours sincerely,

Private Citizen