PFAS IN NEW ZEALAND
CURRENT KNOWLEDGE AND THE STEPS FORWARDS

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First trans-Tasman workshop on PFAS

Research into PFAS contamination and remediation has been extremely active over the last years, in particular in Australia and North America. While New Zealand is working proactively to identify potentially contaminated sites, research activities have been limited up to now. A workshop was organized in September 2019 at the University of Auckland with the aim to facilitate and catalyze trans-Tasman discussions on issues related to PFAS. Participants came from industry, government and research institutions. This brief summarizes the main points discussed and the priorities identified to improve the management of PFAS use and contamination in New Zealand.

What are PFAS?

Poly and per fluorinated alkyl substances (PFAS) represent a large family (4000+) of man-made chemicals with unique properties. PFAS are film forming, lipid and water repellent, and resistant to biotic and abiotic degradation processes. These properties made PFAS ideal for a range of successful applications since the 1950s including firefighting foams, textiles and paint. The unique properties of PFAS also make them very challenging to manage once they are released into the environment. Many PFAS are bioaccumulative and subject to long range transport (1). Perfluoroalkyl acids (PFAAs), a sub-group of PFAS including PFOS and PFOA, are indefinitely persistent in the environment. Many other PFAS can degrade in the environment to form these PFAAs (2). Human exposure occurs mainly through the consumption of contaminated water and food, and current epidemiological studies suggests association with a number of adverse human health effects, including lipid metabolism, immunological markers and birth weight (3). Only a few PFAS are currently restricted by regulation. PFOS and PFOA are the most studied and are now listed under the Stockholm Convention (all uses of PFOS were phased out in NZ but some uses of PFOS remain possible under the Convention).

PFOS and PFOA are the two most studied PFAS, now regulated under the Stockholm Convention.
Data for the other 4000+ PFAS is relatively scare.

Global contamination and challenges

- **Analytical challenges**: analysis of the PFAAs in complex environmental matrices is relatively advanced, however our ability to detect and quantify most other PFAS remains limited. PFAS most often occur at low concentrations, in unknown and complex mixtures. Analytical sensitivity and accuracy suffer from interfering substances, sample contamination and the lack of suitable analytical standards.
- **Environmental fate and hazard**: the complex chemistry of PFAS prevents the use of protocols and models applied for other contaminants. Obtaining empirical data is thus often critical for risk assessment. Toxicity criteria and guideline values have become more available in recent years for some key PFAAs but are lacking for the wider group of PFAS.
- **Remediation approaches**: PFAS do not behave like other organic contaminants and approaches validated for other organics cannot be assumed to be effective for PFAS (4). Destroying PFAS is currently commercially done by high temperature methods, which are not economically viable for very large scale application. Methods for removing PFAS from water are effective (e.g. activated carbon, ion exchange and foam fractionation). The solid or liquid waste streams from these treatments cannot generally be disposed of in landfill due to the potential release of PFAS over time and are either stockpiled or destroyed by high temperature methods.

Activities in the region

In Australia, the Department of Defence initiated a comprehensive program to investigate and manage PFAS contamination on and around Defence properties (28 sites). Class actions against The Department of Defence from landholders are undergoing at several sites. Many other sites including airports and fire training grounds are also under

investigation. **In NZ**, the **All-of-government** initiative (5) was launched in 2018 to create a Governance group comprising senior officials and a Working group comprising technical/communication advisors. The initiative allowed investigations at NZDF and FENZ sites, the development of mitigation actions, and active involvement in the revision of the PFAS NEMP: National Environmental Management Plan produced by the Heads of EPAs of Australia and NZ (6).

Possible sources of PFAS in New Zealand

Typical point sources of PFAS in the environment include industry (PFAS manufacturers and/or users), and sites where intensive firefighting training took place (e.g. military, airport). Industrial sources are believed to be limited in NZ (no PFAS manufacturer in Australia nor NZ), and sites where firefighting training took place are currently being investigated. Landfill leachate and waste water treatment (e.g. discharge of contaminated water, application of contaminated biosolids) are expected to be one of the major point sources of PFAS contamination in NZ but supporting data is currently unavailable. Finally, it would be worthwhile investigating imports from countries still producing and using PFAS in large quantities as some products may contain PFAS (intentionally or not).

The next steps to improve the management of PFAS in NZ

- **Transdisciplinary** approaches are necessary to tackle issues related to PFAS and efficient **communication** strategies involving all stakeholders throughout the entire management chain need to be (re)established.
- **Monitoring** to identify the main sources of contamination, including sites where firefighting foam was used or stored, landfill leachate, waste water and biosolids.
- The **full diversity of PFAS** chemistry should be better recognised. If possible, monitoring and experimental studies should cover the full spectrum including long and short chain, anionic, cationic and zwitterionic PFAS.
- Better consideration of **local specifics** when assessing the risk associated with PFAS. For instance, limited data is currently available on the impact of local soil properties or climate on the fate of PFAS. Similarly, data is very limited on the ecotoxicity and bioaccumulation of PFAS in native species (e.g. fish and avian species) or species that are culturally important (e.g. eels) and may be important sources of PFAS intake through diet.
- Development of more sustainable **remediation and waste treatment** strategies that are adapted to the local context and reduce NZ reliance on waste export to tier countries.
- We recommend a **One Health** approach in which all the elements of our ecosystems are considered, with a particular attention to key species for NZ ecosystem functioning (e.g. marine mammals, livestock).
- Fully integrate NZ **cultural heritage and values** in the management of PFAS use and contamination.

What NZ policy makers can do?

- Continue **restricting** the use of PFAS when possible e.g. EPA recent proposed phase-out of PFAS in firefighting foams (7)
- Develop **HAIL** (Hazardous Activities and Industries List) guidance related to PFAS (MfE)
- Improve **monitoring** e.g. by including PFAS in the 3-Waters and biomonitoring programme (MoH)
- Support collaborative research with Australia to improve ecological **guideline values**

Trans-Tasman workshop (02-03 Sept. 2019, University of Auckland)

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