Firefighting foam in New Zealand:

a need for transparency and precautionary action

Dr Rye Senjen, February 2018

Toxic contamination caused by firefighting foams has been known since 2015

Despite knowing since 2015 that the NZ Defence Force Airforce bases at Ohakea, near Palmerston North and Woodbourne, near Blenheim are contaminated by toxic chemicals from firefighting foams, the military (and by implication the New Zealand Government) have only admitted this to be the case on the 7th of December 2017.

The chemicals in question, PFOS (perfluorooctanesulfonic acid) and PFOA (perfluorooctanoic acid) were not only used in firefighting foams, but have been used in a variety of consumer goods and even cosmetics, as well as many industrial applications. It has been known for many years that these compounds are toxic, bioaccumulative, travel over long distances and are very persistent, posing a global contamination problem. PFOS is banned under the Stockholm Convention and has only limited exempted uses. PFOA is expected to be banned in the near future. New Zealand is a signatory and has ratified the convention.

Long-term accumulation of PFOS and PFOA is of major concern

The Minnesota Department of Health, a world leader in PFOS/PFOA (PFC) regulation states:

> *"We now are able to measure PFCs in extremely small amounts (parts per trillion in water) and newer studies suggest long-term exposure in this range might affect the health of the most vulnerable members of the population."*[1]

Both PFOS and PFOA are extremely stable and do not hydrolyse, photolyse, or biodegrade under typical environmental conditions. They are extremely persistent in the environment, with a half-life (at 25 ºC) in water greater than 92 years for PFOA and greater than 41 years for PFOS.[2] Once in groundwater both chemicals can easily move long distances, with a great potential to affect water supplies.

Due to their long serum half-life in human beings (5.4 PFOS and 3.8 for PFOA[3]), there is an increasing risk over time that exposure will cause adverse effects. Both PFOA and PFOS are linked to an increased risk of cancer, endocrine disruption and reproductive harm.[4] Recent research suggests that PFOS concentrations at current levels in the population may already be causing adverse health impacts, in particular thyroid disease, endocrine impacts in women and immunotoxicity.[5, 6, 7, 8] PFOS and PFOA do not break down in the body and can be passed from one generation to the next via breast milk and *in utero*. Recent research indicates that very low levels of PFOS and PFOA may lead to adverse health effects. Therefore, there may be no safe level of exposure to PFOS and /or PFOA.[9]

Long-term accumulation of PFOS and PFOA is of major concern. There are likely no safe levels in groundwater/bore water, as the water is continually used and hence ever greater amounts will accumulate in human and animal bodies and in crops or gardens watered with this water.

The situation around the country

"But even now, most commercial airports were still using a firefighting foam that could be toxic, Airport Association chief executive Kevin Ward said."[10]

PFOS and PFOA-containing foam was used extensively at commercial airports, NZ Airforce bases and oil refineries throughout New Zealand and appears to still be in use. However no conclusive data are available, with some commercial airports admitting and then denying in a variety of media outlets the continued use of the toxic firefighting chemicals.

The Wellington Airport claims to not currently use toxic firefighting foam, but is undertaking site-wide testing to assess the historical use of firefighting foam. Christchurch airport claims to have stopped using the firefighting foam in question in the early 2000s, while Auckland and Palmerston North may still be using the toxic foam.[11] No information is currently available on other commercial airports.

Two NZ Airforce bases, Ohakea and Woodbourne, have been identified as having PFOS and PFOA ground water contamination.[12] It is unclear whether other NZ Airforce properties or former NZ Airforce properties are also affected.

We urgently need a full, frank and New Zealand wide inventory of the stockpiles, current usage and environmental contamination, as well as clear commitment to the timeline of responsible disposal of the stockpiles and a commitment to cease using any remaining toxic firefighting foam immediately.

Is there a 'safe' level for perfluorinated compounds such as PFOS and PFOA?

The latest research (from 2015) on PFOA recommends a limit in drinking water of 0.001 ppb.[13] The researchers argue regulatory agencies worldwide rely on superseded and out of date studies.

As PFOS and PFOA do not break down, are passed from one generation to the next via breast milk and *in utero*, and have in some cases demonstrated changes in gene expression at very low levels. **It is possible that like lead and mercury, there may be no safe level of exposure to PFOS and /or PFOA.**

NZ Government agencies are using outdated PFOS and PFOA benchmark levels

At present the New Zealand Government has confirmed that the toxic compounds have been detected in milk from farms neighbouring Ohakea, however claim the levels "pose no food safety risk". In addition, the drinking water from some properties have levels of toxic chemical above the Australian drinking water guidelines, which are currently used by the New Zealand Government. The Australian guidelines are 0.07 ppb for PFOS and 0.56 ppb for PFOA.[14]

The Government is refusing to release the actual results of the investigations and has given no justification why The Australian guidelines were chosen. Other governments around the world have been more open and more stringent in their approach. For instance, the Minnesota Department of Health recommends a 'safe' level of 0.027 ppb for PFOS and 0.035 ppb for PFOA. The U.S. states of New Jersey and Vermont set their own advisory level for PFOA in drinking water of 0.04 ppb and 0.02 ppb respectively.

The PFOS levels apparently acceptable in New Zealand are **more than two times** those acceptable in Minnesota. In the case of PFOA the levels are **more than 10 times higher**.

Remediation of PFOS- and PFOA-contaminated sites

Removal of persistent organic pollutants like PFOA and PFOS is never simply or cheap. Possible soil remediation technologies including excavation and landfilling, soil flushing, soil washing, chemical immobilization, encapsulation, vitrification, incineration, and in-situ chemical oxidation.[15] There are a number of overseas example were this type of decontamination has been more or less successful (for example, in Italy,[16] Germany[17] and Sweden[18]) and it is important to learn from these overseas examples. However whatever technique is chosen it should result in a complete destruction of the chemicals.

Recommendations

- **New Zealand guidance levels for PFOA and PFOS in water and soil need to be established that are based on leading edge research and taking into consideration the bioaccumulative nature of PFOA and PFOS.**
- **Results of all investigations into the toxic chemicals need to be transparent and publicly available.**
- **Communities need to know the extent of the problem and communities need to be involved in the decision making.**
- **Biomonitoring and blood testing affected communities is essential. The effects of both chemicals are likely to be long-term and will take years to be monitored.**
- **Clean up needs to be a priority.**
- **The use of toxic firefighting foam must be immediately discontinued.**

ENDNOTES

[1] http://www.health.state.mn.us/divs/eh/hazardous/topics/pfcshealth.html accessed 29 Jan 2018

[2] http://chm.pops.int/Implementation/IndustrialPOPs/PFOS/Overview/tabid/5221/Default.aspx accessed 31 Jan 2018

[3] http://chm.pops.int/Implementation/IndustrialPOPs/PFOS/Overview/tabid/5221/Default.aspx accessed 31 Jan 2018

[4] http://www.pops.int accessed 29 Jan 2018

[5] Melzer et al (2010) Association between serum perfluorooctanoic acid (PFOA) and thyroid disease in the U.S. National Health and Nutrition Examination Survey. *Environmental Health Perspectives* 118:686-92.

[6] Grandjean, P. and E. Budtz-Jørgensen (2013). Immunotoxicity of perfluorinated alkylates: calculation of benchmark doses based on serum concentrations in children. *Environmental Health* 12 (1): 1-77

[7] Watkins, D. J., G. A. Wellenius, et al. (2014). Associations between Serum Perfluoroalkyl Acids and LINE-1 DNA Methylation. *Environment International* (63): 71-76.

[8] Taylor KW, K Hoffman, KA Thayer, JL Daniels. (2014). Perfluoroalkyl chemicals and menopause among women 20-65 years of age (NHANES). *Environmental Health Perspectives*. 122(2):145-50.

[9] Grandjean, P. and E. Budtz-Jørgensen (2013). Immunotoxicity of perfluorinated alkylates: calculation of benchmark doses based on serum concentrations in children. *Environmental Health* 12 (1): 1-7 7

[10] https://www.stuff.co.nz/national/99724583/toxic-foam-reporting-delay-due-to-need-to-develop-testing-standards-says-defence-force accessed 28th Jan 2018

[11] https://www.stuff.co.nz/environment/100057264/nationwide-investigation-into-toxic-firefighting-foam-launched accessed 29 Jan2018

[12] https://www.stuff.co.nz/national/99625401/firefighter-foam-poses-water-risk-around-nz-air-bases accessed 28 Jan 2018

[13] Grandjean, P. and R. Clapp (2015). Perfluorinated Alkyl Substances: Emerging insights into health risks, *New Solutions: A Journal of Environmental and Occupational Health Policy*. 25(2): 147–163.

[14] http://www.health.nsw.gov.au/environment/factsheets/Pages/pfos.aspx accessed 28 Jan 2018

[15] Yao, Y & Sack, T.U. & Volchek, Konstantin & Brown, Carl. (2015). PFC-contaminated soil and its remediation strategies: A review. Proceedings of the 38th AMOP Technical Seminar on Environmental Contamination and Response. 314-339.

[16] For an overview of the response in the Venneto, Italy region to PFAS contamination see: http://www.euro.who.int/__data/assets/pdf_file/0018/340704/FINAL_pfas-report-20170530-h1200.pdf Accessed 29 Jan 2018

[17] http://greensciencepolicy.org/wp-content/uploads/2016/09/Rolland-Weber-PFOS-PFAS-German-activities-Final.pdf accessed 30 Jan 2016

[18] Banzhaf, S., Filipovic, M., Lewis, J., Sparrenbom, C. J., & Barthel, R. (2017). A review of contamination of surface-, ground-, and drinking water in Sweden by perfluoroalkyl and polyfluoroalkyl substances (PFASs). *Ambio*, *46*(3), 335–346. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5347527/ accessed 30 Jan 2018.