Environmental impacts of fluoridation

Rob Donald, BOPRC

Overview

- I will cover the potential environmental impacts of fluoridation of the Rotorua City water supply based on;
  - a summary of environmental fluoride levels from existing data
  - a brief analysis of risks
  - information on the fate of fluoride in the environment

- I cannot comment on the human health effects of fluoridation

Fluoride levels in the environment - water

- Rotorua springs*
  - 0.04 to 0.14 mg/litre
- Rotorua surface water*
  - 0.04 to 0.41 mg/litre
- Rotorua geothermal groundwater at Kuirau Park (BOPRC data)
  - 4.0 mg/litre
- Sea water
  - Around 1.3 mg/litre (literature range 0.86 – 1.5 mg/litre)

Fluoridation target level in NZ drinking water

- 0.7 to 1.0 mg/litre

* Reference: Groundwater Age and Chemistry, and Future Nutrient Loads for Selected Rotorua Lakes Catchments. GNS Science Report 2004/31.

Fluoride levels in the environment - soils

- Bay of Plenty soil levels*
  - 150 to 790 mg/kg
  - Highest on productive land where phosphate fertiliser is applied

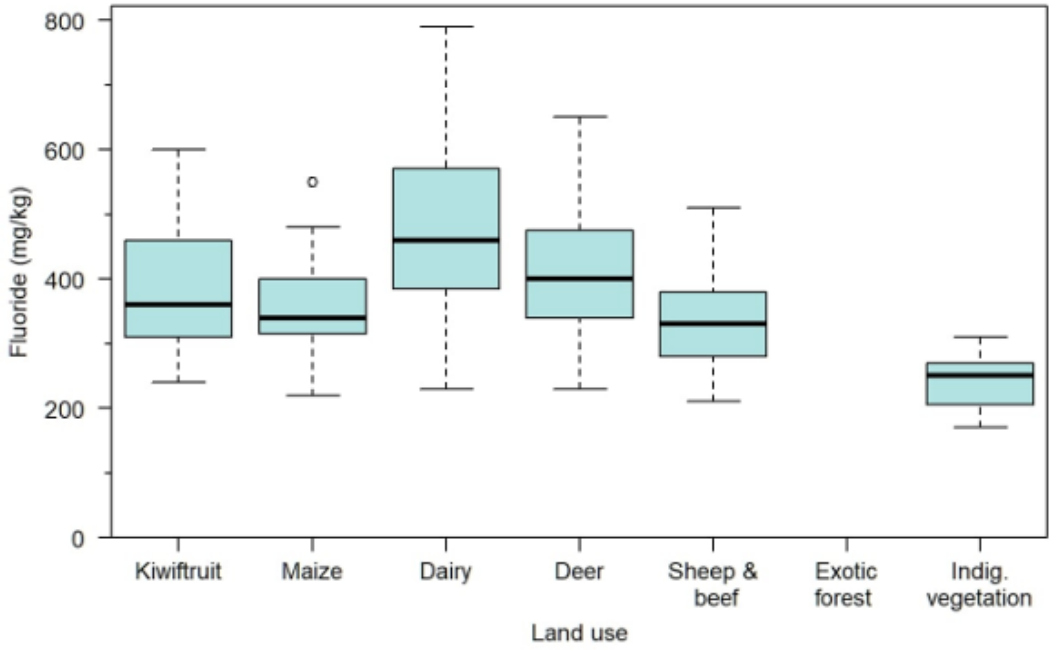

Figure 13 Measured fluoride soil concentrations by land use type.

* Reference: Soil quality and trace elements in Bay of Plenty region, state and trends 1998-2017. Bay of Plenty Regional Council Environmental Publication 2021/08.

Environmental risk – storage and use

- As with the use of any chemical, there are environmental risks associated with the storage and use of fluoride at the water treatment plants
- These risks are normally minimised using engineering and management controls, e.g.
  - appropriately designed containment and bunding at the dosing plant to contain spills
  - robust standard operating procedures to mitigate the risk if a spill occurs
- With these controls the risk to the environment is low

Environmental fate of fluoride – where will it go?

- Some fluoride will be absorbed by people drinking the water, as intended
- Most will be lost to the wastewater reticulation system from the normal household use of potable water
- From there, some fluoride would be removed with the solid waste generated in the wastewater treatment system
- The reminder would stay in solution during wastewater treatment and be spray irrigated with the final wastewater
- At a maximum concentration of 1.0 mg/litre in potable water the risks of adverse effects on soil or groundwater from the irrigated wastewater are low
  - However, it is recommended that RLC begin to monitor fluoride in the treated wastewater before, and for a period after fluoridation begins, to better understand the impact on fluoride levels

Environmental risk – aquatic life

- The Australian and New Zealand guidelines for fresh and marine water quality give a protection level for fluoride of 1.7 mg/litre*
  - This is the 95% species protection level for aquatic life (trout, koura etc.) in freshwater
  - Given a maximum fluoride concentration of 1.0 mg/litre in potable water, it is not possible for this protection level to be exceeded in Rotorua waterways because of fluoridation
- The overall conclusion is that there would be no unacceptable risk to aquatic life from the addition of fluoride to potable water

* ANZG 2024 Toxicant default guideline values for aquatic ecosystem protection: fluoride in freshwater, Australian and New Zealand guidelines for fresh and marine water quality.