



# Nitrate in Drinking Water

## Environmental Health Guide

### Introduction

Many water supplied in Western Australia are derived from ground or bore water. Groundwater often can contain a number of chemical compounds. One particular compound that is sometimes found, is nitrate.

In Western Australia, elevated nitrate levels are usually in the natural process of plant decay underground that has occurred over geological time. Overseas contamination of drinking water by nitrate is more commonly associated with some form of pollution resulting from human activities. Nitrates are very soluble in water and can move easily through soil. Over time nitrates can accumulate in groundwater that may then be used as a drinking water supply.

### Does Nitrate in Drinking Water Pose a Health Hazard?

Nitrate poisoning is very rare and to date no case, due to nitrate in drinking water, has been recorded in Western Australian. Even at elevated levels, nitrate is not necessarily a health hazard for most adults. However, nitrate concentrations above 50mg/L can cause adverse health effects in infants under three months of age, and nitrate concentrations above 100mg/L can affect pregnant women and those adults with a rare metabolic condition called congenital glucose-6-phosphate dehydrogenase deficiency (an inability to metabolise sugar).

### Who is Most at Risk?

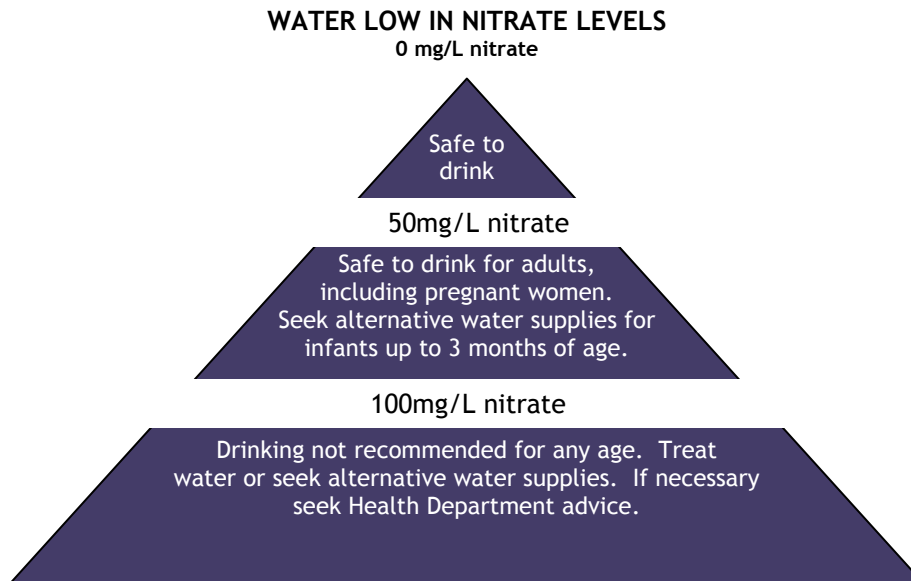
Infants less than three months of age are at risk from nitrate ingestion due to the conversion of the oxygen-carrying haemoglobin in their blood to an inert form known as methaemoglobin. This condition (methaemoglobinaemia) occurs when nitrate is consumed and converted to nitrite. The affected blood carries less oxygen than it should, turning blue and depriving the body of the oxygen it needs. Infants in the first three months of life are particularly susceptible to nitrite-induced methaemoglobinaemia because their stomach acid is not strong enough to stop the growth of bacteria that convert nitrate to nitrite.

### Symptoms of Nitrate Toxicity

The most noticeable symptom of nitrate/nitrite poisoning is a bluish skin colouring called cyanosis particularly around the eyes and mouth (the so-called "blue baby"). An infant with bluish skin should be taken to a doctor if excess nitrate intake is a possibility so that it can be tested for nitrate poisoning.

### What are Safe Levels of Nitrate in Drinking Water?

The 1996 Australian Drinking Water Guidelines, available from the National Health and Medical Research Council or from the website mentioned on the next page, recommend acceptable nitrate and nitrite concentrations based on health related criteria, as summarised below.



## WATER HIGH IN NITRATE LEVELS

### How to Reduce Nitrate Consumption

If your water supply has a nitrate concentration between 50 and 100mg/L it is important for carers who have to make up feeds for infants under three months of age to use either boiled rainwater or bottled water in preparing infant formulas or drinks. As always, breast-feeding is the best option, if possible.

Another option is to drink water treated by one of the methods described overleaf.

### How to Remove Nitrate from Water

Distillation, reverse osmosis or de-ionisation systems can remove nitrate by they are expensive and require careful maintenance. Boiling and simple in line filters do not remove nitrate.

- **Distillation systems** can remove nearly 100% of nitrate. However, they are energy intensive and most stills sold for home use have a limited capacity. In addition, continued removal of scale is necessary.
- **Reverse osmosis** systems can screen out most (but not all) nitrate. When purchasing reverse osmosis equipment be sure to ask how much nitrate will be removed. Liked distillers, most reverse osmosis units sold for home use have a limited capacity.
- **De-ionisation units** pass water through a tank filled with resin that absorbs nitrate. However, the resin must be regenerated periodically to maintain adequate levels of nitrate removal. Iron removal and water softening may also be necessary to keep the resin clean.

For more detailed information on these filter systems, please red our guide on water filters.

### The Role of Water Providers

Problems associated with nitrate have the ability to affect large and small scale water providers. Where nitrate concentrations are between 50 and 100mg/L, and there is no alternative supply, water providers may apply to the Executive Director, Public Health, for an exemption from the 50mg/L guideline. However, and application will only be granted where there are satisfactory arrangements to:

- Keep customers and hose occupiers regularly informed that the drinking water has nitrate concentrations of 50 to 100mg/L and is unsuitable for infants younger than three months of age.
- Provide information, through the local community health nurse, on the availability of alternative sources of bottled water for the consumption of infants younger then three months of age.
- Make information leaflets available to hotels and caravan parks for short stay occupants, informing them of the need to use bottled water for infants younger than three months of age.



## Summary

- **Elevated levels of nitrate** have been found in bore water in some parts of Western Australia.
- To date, **no illness has been attributed** to drinking water with elevated levels of nitrate in Western Australia.
- **Water with nitrate concentrations above 50mg/L** may pose a health risk to bottle fed infants, three months of age or younger.
- **Bottle-fed infants under three months of age** should be given either boiled rainwater or bottled water in infant formulas or drinks. Breast-feeding is the best option, if possible.
- **Water with nitrate concentrations above 100mg/L** should not be consumed. Seek advice from either your doctor or the health Department of WA.
- **Nitrate poisoning.** The most likely effect of nitrate poisoning is a “blue baby”. Immediately seek medical advice if your baby shows any symptom of bluish skin colouring particularly around the eyes and mouth, and excess nitrate intake is a possibility.
- **Water treatment** options such as distillation, reverse osmosis and de-ionisation will remove the nitrate from drinking water. Neither boiling nor conventional water filters will remove nitrate.

## Further Information:

More information is available from your Community Health Nurse, Local Government Environmental Officer, Local office of the Water Corporation

or

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