**Elevated Concentrations of Nitrate & Nitrite in Drinking Water**

**Introduction**

Nitrate is a soluble form of nitrogen, which is naturally present in the environment. It is produced during the natural decay of vegetable matter in soil or may be added as a fertiliser to arable land. Rainfall washes nitrate from the subsoil into ground and surface water and may give rise to elevated concentrations in drinking water.

Nitrates are natural compounds that can be found in the soil and are present in green vegetables. They are also used in processes for curing meat particularly ham. Nitrates are therefore found in the food we eat.

Elevated nitrate or nitrite levels can also indicate contamination of surface and ground waters from fertilisers, animal wastes or sewage effluents.

Whereas the use of chloramination as a residual disinfectant or use of chlorine as disinfectant when ammonium ions present can also cause elevated nitrite levels.

**Regulatory Standards**

The statutory limits for nitrate and nitrite in drinking water are based on World Health Organization (WHO) recommendations to protect bottle fed infants under six months, and particularly those in the 0-3 months age range from infantile methaemoglobinaemia (IM) or blue baby syndrome. This is a condition in which the ability of the blood to carry oxygen to the tissues of the body is impaired. Protection of this vulnerable subgroup will result in the protection of the rest of the population.

The Private Water Supplies Regulations (England) 2016 (as amended) state that nitrate concentrations should be below 50 milligrams per litre (mg/l) and nitrite concentrations should be below 0.5 (or 0.1 in the case of treatment works) milligrams per litre (mg/l).

Whilst there are prescribed standards for each parameter, both nitrate and nitrite may occur in drinking water supplies together, and therefore the legislation sets an accumulative standard for both parameters using nitrate nitrite formula. This states that for the water not to present a danger to human health, the sum of the ratio of nitrate and nitrite concentrations should not exceed 1mg/l.

Previously we have advised that babies tend to be more susceptible to nitrate, especially when they are under 6 months of age, and so babies who are being bottle-fed should not be given water with nitrate concentrations higher than 50 mg/l and/or nitrite concentrations above 1mg/l and the general population should not consume water when nitrate concentrations exceed 100 mg/l. However, recent further advice from the Public Health England (PHE) now known as the UK Health Security Agency (UKHSA), have recommended that no-one should consume water with a nitrate level above 50mg/l.

**Dealing with Nitrate or Nitrite Failures**

When concentrations of nitrate are above the standards, the precautions listed below should be followed until the supply can be made wholesome:

* Provide bottled water for drinking, cooking and teeth cleaning1.. The bottled water should be low in sodium and should be stored out of direct sunlight somewhere cool and dark to prevent algal growth.
* Clearly display at kitchen and bathroom sinks instructions that state ‘Do not drink tap water’ and provide an alternative source for drinking purposes.
* Give infants up to the age of 6 months ready-diluted liquid formula or make up feeds using bottled water.2.
* Alternatively, temporarily use mains water or an alternative potable water supply with a low nitrate level.

**Nitrate removal**

Nitrate removal is usually achieved by ion-exchange. Water is passed through a column of synthetic resin beads that remove anions including nitrate and exchange them for equivalent amounts of chloride. When the capacity for exchange is exhausted, the resin is regenerated by backwashing with a concentrated solution of sodium chloride. This restores the resin to its initial chloride form. The bed is then rinsed with clean water and returned to service. The waste solution and rinse waters, containing high concentrations of sodium chloride, as well as nitrate, are collected for disposal. Operation of an ion-exchange plant is normally fully automatic.

Nitrate can also be removed by some membrane processes and by biological denitrification.

Further advice on an appropriate system for your supply can be obtained from a water treatment specialist.

**Notes:**

* Nitrates do not accumulate in breast milk and babies can safely be breast-fed
* Boiling the tap water will not reduce nitrate levels and will increase the levels.
* Absorption via the skin is extremely low, so you can still use the water for bathing and washing.
* The Council is obliged by the Private Water Supplies Regulations 2016 (as amended) to make sure the supply is made safe if there is a ‘Potential Danger to Human Health’. Therefore, the installation of Nitrate reduction treatment and/or improvement of existing treatment or connection to alternative supply if necessary will be required.