

Controlling chloramines in indoor swimming pools

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The importance of indoor swimming pool maintenance

Swimming pools must be maintained properly to prevent the spread of disease. Pools need good disinfection and filtration to ensure the removal of pollutants and the destruction of microorganisms. Good ventilation is essential to remove any air impurities and reduce condensation.

Indoor swimming pools and chloramine

Chloramines (also known as combined chlorine) are sometimes a problem in indoor pools, especially in pools used by infants who are not toilet-trained or other groups of incontinent people where urine contamination may be high.

Chloramines form when free chlorine reacts with pool contaminants, primarily ammonia and urea from urine and sweat. Chloramines reduce the disinfection power of free chlorine. Trichloramines are the most troublesome chloramines as they can cause irritation to the skin, eyes and respiratory tract. Pools with a high concentration of trichloramine have a strong chlorine-like odour. A properly operated pool should not have a strong chlorine-like odour.

Combined chlorine (chloramine) should not exceed 1mg/L in a public swimming pool and should never exceed half the free chlorine concentration.

NSW Health Public Swimming Pool and Spa Pool Guidelines

Preventing chloramine problems

1. Superchlorination

Superchlorination is used to control chloramines, however if it is not performed properly it can result in more problems for the pool operator.

Superchlorination must be carried out when the pool is closed and adequate ventilation must be provided to remove any trichloramine that may form. Regular superchlorination may be necessary and this is dependent upon the ammonia nitrogen concentration (combined chlorine).

Superchlorination should be achieved by the addition of free chlorine at ten times the combined chlorine concentration. The aim is to achieve breakpoint, which is the point at which free chlorine is present with very little, if any chloramine. Breakpoint reactions are dependent upon pH, temperature, contact time, and initial concentrations of chlorine to ammonia and chlorine to ammonia nitrogen.

A pool expert should be consulted to ensure that superchlorination is carried out in a safe and efficient manner.

2. Shock dosing with 'Chlorine Dioxide' and 'Oxygen Shock' products

Some pool operators shock-dose their pools with chlorine dioxide to control chloramines. However this treatment is expensive and may result in the formation of chlorite and chlorate, which may cause health risks.

Potassium Monopersulfate or 'Oxygen Shock' products are also used to control chloramines in heavily used pools. These products lower the chlorine demand by oxidising pool contaminants.

3. UV light treatment systems

To assist with the management of chloramines UV light treatment systems may be installed in indoor swimming pool circulation systems.

UV light systems (using medium pressure lamps) assist with the destruction of chloramines. Recent evidence suggest that UV light systems provide additional disinfection by inactivating microorganisms, especially protozoans such as *Cryptosporidium* (*Crypto*).

The use of UV light treatment systems is in addition to a residual disinfectant such as chlorine or bromine.

4. Ozone

Ozone is also used to control chloramines and has good disinfection properties, however ozone treatment systems are very expensive to operate and maintain.

Pools utilising ozone disinfection must also use a residual disinfectant such as chlorine, and the residual ozone must be removed before the water is returned to the pool.

5. Dilution with fresh water

Sometimes pools need to be diluted with fresh water to control chloramines. Dilution with fresh water may also be necessary to control total dissolved solids (TDS).

To conserve water, NSW Health supports the use of rainwater tanks to top-up swimming pools, provided first flush systems and other controls are in place to protect public health.

6. Ventilation

Adequate ventilation is essential for efficient removal of chloramines and other air impurities. This needs to be undertaken without causing drafts and requires the expertise of a suitably qualified professional.

Re-circulation of pool air through an air conditioning system is not normally recommended where there is a chloramine problem as volatile disinfection by-products can build-up and may cause health problems.

Ventilation design depends on the bather load, disinfection type and building design and size. The ventilation system needs to be able to efficiently remove chloramines to maintain bather comfort.

AS1668. 2–1991 *'The use of mechanical ventilation and air-conditioning in buildings Part 2: Mechanical ventilation for acceptable indoor-air quality'*, should be consulted. (AS 1668.2–2002 has not been adopted by NSW).

7. Pool Policy

Pool policies, which require patrons to shower before entering a pool and which exclude infants who are not toilet-trained without proper waterproof swimming pants or swim nappies are an important, but often neglected area of pool management.

For more information about swimming pools and public health contact your local council, public health unit or visit our website: www.health.nsw.gov.au