

Managing Chloramines in Pools and Other Aquatic Facilities: A Quick Guide for Health Departments and Operators



Background

This quick reference guide can be used by local, state, tribal, and territorial health departments and aquatic venue operators as a tool for understanding the Centers for Disease Control and Prevention's (CDC's) most important recommendations for preventing chloramine exposure in aquatic environments. Visit CDC's Model Aquatic Health Code (MAHC) website at [cdc.gov/model-aquatic-health-code/php/our-work/index.html](https://www.cdc.gov/model-aquatic-health-code/php/our-work/index.html) for more detailed information.

What are Chloramines?



Chloramines are disinfection byproducts formed when free chlorine used in pools reacts with nitrogen-containing compounds like urine, sweat, or personal care products.¹ These compounds exist in three forms: **monochloramine**, **dichloramine**, and **trichloramine**, with trichloramine being the most volatile and irritating.²

Chloramines indicate the presence of contaminants in pool water.³ Additionally, trichloramines accumulate above the pool surface, especially in indoor environments with poor ventilation, causing irritation to the eyes, skin, and lungs.^{1,3}



What incidents occurred and what were the health effects?



From 2008 to 2017, an estimated 13,500 emergency department visits per year in the United States were linked to pool chemical injuries, including those related to chloramine exposure.⁴ These incidents often involved symptoms like coughing, wheezing, red eyes, and difficulty breathing.⁵

In studies of occupational exposures around swimming pools, improperly managed chlorine and chloramines caused acute respiratory distress in swim instructors and lifeguards.³ Such incidents frequently happen in indoor pools with poor air circulation, where trichloramines linger just above the water surface and can be inhaled during swimming or cleaning activities.³

What are the prevention strategies?



Swimmer Hygiene

Chloramines need nitrogen to form. Swimmers can help reduce nitrogen inputs by showering before entering the pool and not peeing in the pool.¹ Posting signage and educating swimmers can help understand their role in pool safety.

Chlorine Monitoring

Pool operators should measure both free and total chlorine levels frequently to calculate **combined chlorine** (combined chlorine is total chlorine minus free chlorine). Free chlorine refers to the amount of chlorine available in the water to actively disinfect or kill bacteria, viruses, and other pathogens, whereas total chlorine refers to the sum of both the free and combined chlorine. A combined chlorine level above **0.4 ppm** (mg/L) suggests excessive chloramines and the need for corrective action.¹

What is breakpoint chlorination?



When combined chlorine goes above 0.4 ppm, operators should superchlorinate (conduct **breakpoint chlorination**). This means adding about 10 times more chlorine to break down and remove harmful chloramines.¹

What is the importance of proper ventilation and chemical feed controls?



Ventilation

Proper ventilation is essential to remove chloramines from indoor pool airspace. Indoor pools must maintain a continuous flow of fresh air just above the water surface and ensure effective exhaust of air containing trichloramines.^{1,3}



Chemical Feed Controls

The Center for Disease Control and Prevention's (CDC's) Model Aquatic Health Code (MAHC) emphasizes that pool chemical-feed systems must have **interlock systems** that prevent the chemical pumps from operating if the recirculation pump is off.⁶ This prevents the release of concentrated chlorine gas or chloramines after system shutdowns.

Facilities should wait at least **five minutes** after starting recirculation before allowing people to return the pool after maintenance.⁶

What are the emergency response and safety measures?



Responding to Chloramine Exposure

Chloramine-related symptoms include burning eyes, coughing, or difficulty breathing. If swimmers experience any of these symptoms, they should immediately move to fresh air, rinse any exposed areas with clean water, and seek medical attention if symptoms persist.⁵

Training and Preparedness

Staff must be trained in pool chemical handling, emergency protocols, and ventilation systems. Equipment such as **eyewash stations**, **spill containment kits**, and **personal protective equipment (PPE)** should be readily available.⁵

The CDC's MAHC provides comprehensive guidance for pool operation, chemical safety, and injury prevention strategies.⁷

Additional Information

Refer to the following sections in the 2024 MAHC for more information:

Combined Chlorine (Chloramines): Compiled from 2024 MAHC Sections 5.7.4.4.2

Chemical-feed Interlock Controls: Compiled from 2024 MAHC Sections 4.7.3.2.1.3, and 5.7.3.5.1.2



Quick Reference Summary

Task	Recommended Action
Combined chlorine = (total chlorine – free chlorine)	≤ 0.4 ppm (MAHC 5.7.4.4.2) ⁸
Breakpoint chlorination	Add 10X combined chlorine
Ventilation	Provide cross-flow fresh air at water surface
Chemical-feed interlock	Prevent feed without active circulation (MAHC 4.7.3.2.1.3 and MAHC 5.7.3.5.1.2) ⁸
Maintenance wait time	Minimum 5 minutes after recirculation starts
Incident Reponse	Fresh air, rinse, seek medical care, report
Staff training and safety tools	Follow MAHC guidelines, ensure PPE/spill kits

[QUICK GUIDE]

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Resources



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6. Centers for Disease Control and Prevention. (2020). *Mini-MAHC + Annex: Chlorine gassing*. U.S. Department of Health and Human Services. <https://www.cdc.gov/model-aquatic-health-code/media/pdfs/Mini-MAHC-ANNEX-Chlorine-Gassing-508.pdf>
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Have Questions?

Contact mahcnet@naccho.org.



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