



Chloramines in Source Water

By the APSP Recreational Water Quality Committee (RWQC)

Many pool and spa pros know the main source of “combined chlorine” or chloramines in pools and spas is from the reaction of chlorine sanitizer with bather perspiration and waste. Less known is the fact that many municipalities use chloramines to treat tap water — a process known as chloramination — and thus unwanted chloramines are added to pools or spas when they’re filled or topped up using public water.

Chloramination is a process that mixes free chlorine (usually chlorine gas) and ammonia to form chloramines. EPA estimates that over 50 percent of large systems serving at least 10,000 people use chloramination.

The combined chlorine found in pools and spas is a combination of inorganic chloramines (monochloramine and dichloramine), organic chloramines (chlorinated creatinine, chlorinated uric acid), and other chlorinated organic waste materials. Monochloramine can be effectively removed by chlorine. It is difficult, however, to remove organic chloramines. The use of ultraviolet light or ozone can also remove

chloramines without having to add more chlorine.

REMEDIAL STEPS FOR POOLS & SPAS

FRESH FILLS. If possible, it is best to avoid using chloraminated tap water for fresh fills of pools and spas. If you must use chloraminated water as fill water, take the following remedial steps after filling the pool or spa: (1) If necessary, adjust the pH up to 7.2-7.8 and (2) oxidize the pool/spa using a non-stabilized chlorine oxidizer at 5-10 times the combined chlorine concentration to achieve an acceptable concentration less than 0.2 ppm.

MAKE UP WATER. Make up water is water that is added to a pool or spa to replace water that has been lost from evaporation, splash out, or backwashing. Make up water will not add significant concentrations of combined chlorine. When chloraminated make up water is added to a pool, the impact is much less than when chloraminated water is used to fill a pool. This impact may be of importance only

to operators of pools with high bather loads, where compliance with the maximum combined chlorine concentration is difficult.

After adding make up water, the pool water should be tested to determine the concentration of chloramines. If the combined chlorine concentration is unacceptable, the chloramines concentration can be reduced by adjusting the pH to 7.2-7.8 and oxidizing with non-stabilized chlorine at 5-10 times the combined chlorine concentration. After the desired combined chlorine concentration has been attained, balance the pH and alkalinity.

TESTING. Chloraminated water may present a problem with DPD testing of free chlorine concentration. Chloramine concentrations above 1 – 2 ppm can interfere with the free chlorine reading. To overcome this interference, a chemical called thioacetamide, which is carcinogenic, is available through many test kit manufacturers. It should be added immediately after the free chlorine DPD reagents. This freezes the reading and allows an accurate determination. A separate total chlorine test would be required after the free chlorine test. ~

REFERENCES

1. Gerald F. Connell, *The Chlorination/Chloramination Handbook*, Denver, CO: American Water Works Association, 1996, pp 44-46.
2. George Clifford White, *The Handbook of Chlorination*, 2nd Ed., New York: Van Nostrand Reinhold, 1986, pp 160-170.

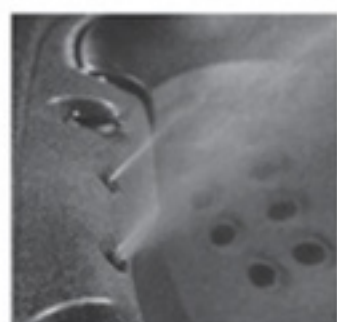
3. US. EPA, *Alternative Disinfectants and Oxidants, Guidance Manual*, April 1999
4. James M. Montgomery, *Water Treatment Principles and Design*, John Wiley & Sons, New York, NY, 1985.
5. Snoeyink, V.L., and Jenkins, D. *Water Chemistry*, Wiley, 1980.
6. *Federal register/vol.71, no.2/January 4, 2006.*

Hiding in the Biofilm

ONE OF THE MAIN REASONS chloramination is used in tap water is that it has been found to be effective in controlling bacteria re-growth. Bacteria are harbored in biofilm, which protects them from disinfection. Biofilm is a deposit consisting of microorganisms and microbial products. A biofilm forms in all drinking water distribution systems and in all pool and spa recirculation systems. In the absence of chlorine, any bacteria that escape from biofilm may multiply in the water.

Free chlorine (HOCl/OCl-) reacts rapidly with the outer protective mucous layer of a biofilm. Consequently, HOCl/OCl-, at the concentrations used in drinking water (< 4 ppm as Cl₂), is depleted at the surface of the biofilm and nothing remains to penetrate the biofilm and inactivate any bacteria within the biofilm. Furthermore, little or no chlorine residual remains at the end of the distribution system. The chloramination process provides a means to ensure that sanitizer concentrations, in the form of monochloramine, are maintained throughout the distribution system.

Cool Mist
System for
Summer
Months!



SPECIAL OFFER!!

USD \$795.00

951-414-0015 PH

951-600-7010 FAX

info@zikamistsystem.com

www.zikamistsystem.com



**For after market
installation**

 **Zika Mist System**
Patent Pending

POOL & SPA ACCESSORIES

- 3" & 1" Floating Chlorine Dispensers
- Negative Edge Water Leveler
- Clear Triangle Vac Head
- Water Level Control
- 18" Brushes
- Vac Head
- Nets



MP
Industries, Inc.

Tel: 714/375-7771

Fax: 714/375-7767

www.mp-industries.com • email: dmswim@aol.com