

Focus on BGIA's work

Institut für Arbeitsschutz der Deutschen Gesetzlichen Unfallversicherung

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Trichloramine in indoor swimming pools

Problem

When swimming pool water is disinfected with chlorine, trichloramine arises as a by-product of the reaction of chlorine with urea from human secretions. Trichloramine is suspected of causing respiratory complaints. In France a limit of 0.5 mg/m³ in the air has already been recommended for trichloramine.

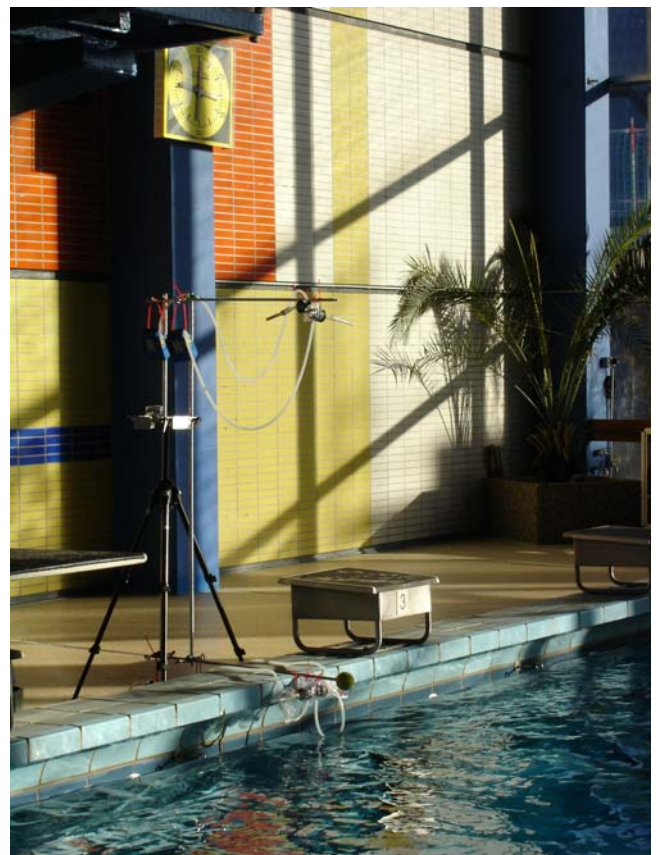
Because of trichloramine's poor water solubility, it is readily emitted from the pool water as a gas, which is perceived as the typical swimming pool odour. This gas emission is probably favoured by such factors as the number of swimmers in the water, water temperature and water turbulence. Measurements were carried out to determine the trichloramine levels in various types of swimming pool.

Activities

In 2005 and 2006, the BGIA developed a method for the measurement of trichloramine in swimming pool air by analogy with a method already practised in France. The method exploits the principle of the enrichment of trichloramine on an impregnated quartz fibre filter and its subsequent chemical conversion into chloride. Extraneous substances present in the air are intercepted by an upstream cartridge.

Measurement was carried out at a height of 1.5 m above the ground, which is the respiration height of pool attendants, and at a height of 20 cm above the water surface, swimmers' respiration height.

Measurements with equipment worn by pool staff were also performed.



Measurement set-up at a competition pool

In the course of a measurement programme, measurements were performed in about 80 indoor pools in 2006. A distinction was made between competition-type indoor pools, fun pools, therapy and thermal pools, and pure school swimming pools. Measurements were all carried out at the edge of the pool, and preferably close to pool features in order to determine the effect of water turbulence on the trichloramine concentration in the air.

Results and Application

The limit value of 0.5 mg/m³ recommended in France was only exceeded at a few swimming pools. The median trichloramine concentration in the pools investigated was about 0.2 mg/m³.

As expected, higher trichloramine concentrations occurred at the measurement height of 20 cm above the water surface than at 1.5 m. The measurements obtained with equipment worn by pool staff yielded in most cases values below the limit of quantification.

There were differences among the various pool types. While low concentrations were measured at therapy/thermal pools and at school swimming pools, the measured values at competition and fun pools were significantly higher. The reason for this is the larger number of users of these pools and pool features such as bubblers and flumes, the turbulence from which encourages the emission of trichloramine gas. This was confirmed with measurements right next to various features.

At pools whose ventilation systems are operated with up to 100% fresh air, lower concentrations were in most cases measured than at pools with less than 50% fresh air.

Area of Application

All operators of swimming pools, e.g. local and district authorities and therapy institutions

Additional Information

- Stickstofftrichlorid (Kennzahl 8623). In: BGIA-Arbeitsmappe Messung von Gefahrstoffen. 36th suppl. V/2006. Ed.: BGIA – Institut für Arbeitsschutz, Sankt Augustin. Erich Schmidt, Berlin 1989 – loose-leaf ed.
www.bgia-arbeitsmappedigital.de/8623

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