

APPLICATION OF A NEW METHOD FOR TRICHLORAMINE DETERMINATION IN AMBIENT AIR OF INDOOR SWIMMING POOLS

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Background and Aims: Trichloramine (NCl_3) is a volatile disinfection by-product (DBP) which is formed when chlorine in water reacts with nitrogen-containing compounds. NCl_3 is a strong mucous membrane irritant and it has been recently linked with respiratory symptoms and asthma in swimmers, mainly in children, and in pool attendants. However, there are some issues to clarify about NCl_3 exposure in indoor swimming pools and one of them deals with the analytical determination of NCl_3 in ambient air. The aim of this study was to investigate the feasibility of a new modified DPD/KI colorimetric method, recently proposed in literature, for the analysis of airborne NCl_3 in indoor swimming pools. The relationships between NCl_3 ambient air levels and some other DBPs in these environments were also evaluated.

Methods: Airborne NCl_3 levels were investigated in 20 indoor swimming pools. Technical characteristics and disinfection treatments were collected together with physical and chemical parameters in water. Trihalomethanes (THMs) levels in water and air were also investigated.

Results: The airborne NCl_3 levels ranged from 204 to 1020 $\mu\text{g}/\text{m}^3$ and the mean value was $648.7 \pm 201.4 \mu\text{g}/\text{m}^3$. High levels of combined chlorine in water were observed: only 25% of the investigated swimming pools showed levels $\leq 0,4 \text{ mg}/\text{l}$, which is the Italian limit value. The average and highest THMs levels in water were 41.4 and 134 $\mu\text{g}/\text{l}$, respectively. Mean ambient air THMs value was $86.0 \pm 47.9 \mu\text{g}/\text{m}^3$ and 187 $\mu\text{g}/\text{m}^3$ was the maximum value. Airborne NCl_3 levels were found associated only with combined chlorine ($r = 0.441$; $p < 0.05$) and with THMs levels in ambient air ($r = 0.554$; $p < 0.05$).

Conclusions: Airborne NCl_3 levels are in line with other studies in literature. However more than 50% of the investigated indoor swimming pools showed NCl_3 levels higher than the recommend provisional value of 500 $\mu\text{g}/\text{m}^3$, as suggested in WHO guidelines.