

Well managed pools pose a low risk of exposure to pool pathogens

ABSTRACT

Routine samples of pool water from pools in NW England (n=2306) were analysed for pool water quality over approximately three years. Samples were taken by a pool management company under on-going maintenance plans from 117 pools and spas across 72 sites. The pools were expected to be managed in accordance with the guidelines published by PWTAG. Unsatisfactory results for bromine treated samples (n=322) were lower for named pathogens and indicators but higher for Aerobic Colony Count (ACC). Overall, unsatisfactory results were low with only 7% of samples showing out of specification results on first analysis, the majority being ACC results. The data suggests that well managed pools should not pose a frequent risk of infection if control is maintained and the guidelines followed.

INTRODUCTION

The quality of swimming, spa and leisure pool water is a matter of public concern. The incidence of outbreaks of infection in pools is rare in the UK. The Pool Water Treatment Advisory Group reports an average of 15 outbreaks in the UK annually although individual sporadic infections may be higher. PWTAG publishes guidance on pool management. Spa pools have more difficulty in maintaining pool hygiene due to their high bather load and warmer temperature.

Operators of pools are required to analyse water from the pool each month for *E. coli* and coliforms, *Pseudomonas aeruginosa*, and Aerobic Colony Counts. Adverse results may cause the pool to be closed or its use restricted.

This study presents long term data from pools managed by a professional pool management company in NW England and shows contamination levels for many sites over a three year period.

METHODS

Samples of water were taken in sterile bottles dosed with sodium thiosulphate (Aurora Scientific Aquaplas bottles) and analysed within 24 hours of sampling. Analytical methods were in accordance with the Microbiology of Drinking Water monographs. Tests were conducted in a laboratory accredited by UKAS to ISO17025 for analysis of pool waters.

Unsatisfactory results which may require corrective action were taken to be:

- Coliforms or *E. coli* >0 cfu/100ml (MDW Part 4A 2009 methodology)
- *Ps. aeruginosa* >0 cfu/100ml (MDW Part 8)
- ACC at 22C/72h or 37C/24h >10cfu/ml (MDW Part 7)

For this retrospective study, samples were assessed for unsatisfactory condition on the basis of pool type (spa or other) and treatment regime employed (bromine or chlorine). The aim was to determine long-term patterns of pool condition and the effect of pool type and the choice of disinfectant employed upon the overall microbial condition of the waters.

RESULTS

Parameter	All pools (N)	% of all pools	Chlorine treated only (Nc)	% chlorine treated only	Bromine treated only (Nb)	% Bromine treated only	Spa pools only (Ns)	% Spa pools only
All samples	2306	100	1984	86	322	14	158	6.9
Presumptive coliforms	21	0.9	20	1.0	1	0.3	3	1.9
Presumptive <i>E. coli</i>	10	0.4	10	0.5	0	0	2	1.3
Confirmed <i>Pseudomonas aeruginosa</i>	33	1.4	27	1.4	6	1.9	8	5.1
Aerobic colony count at 22C/72h >10cfu/ml	153	6.6	124	6.3	29	9.0	13	8.2
Aerobic colony count at 37C/24h >10cfu/ml	156	6.8	125	6.3	28	8.7	12	7.6

Repeat sample data

From approximately three years worth of samples analysed, only 7.0% (167/2306) of samples were unsatisfactory on their first analysis and only 1.5% (35/2306) were unsatisfactory on second analysis. This may suggest that a significant proportion of unsatisfactory results could be due to sampling variation, sampler contamination or laboratory error.

Bromine or chlorine?

The number of individual pools treated with bromine was much lower but the data does not suggest any significant advantage to either treatment. The faecal indicators were isolated less frequently with bromine but the difference was not statistically significant. More data is required. There is a significant difference for aerobic colony counts ($p < 0.02$) in favour of chlorine but these counts are of dubious health impact and are measured simply to indicate overall effectiveness of the disinfectant regime and pool management activity.

CONCLUSION

The incidence of unsatisfactory results from this group of waters suggests that well-managed pools do not present a significant threat to public health, nor should they suffer frequent closure owing to adverse results. The application of good practice in pool management should result in satisfactory pool microbiological condition. The authors recommend that regulators and operators of pools should ensure good practice is established and maintained during pool operation. This should comprise good design, effective water treatment, monitoring and record keeping, together with active management of the pool and its environment.

With regard to the choice of disinfectant, there is little difference between bromine and chlorine. Although bromine may produce fewer positive results for the coliforms, it did show higher numbers of unsatisfactory ACC values. These higher values may lead to problems for pool operators and resampling but do not indicate a higher risk of infection. Spa pools showed persistently higher levels of coliform contamination with *Ps. aeruginosa* results significantly higher than for swimming pools. Spa pools require careful attention to maintain pool condition.

The authors are aware that the data lacks comparison data for pools that are not well managed. Further studies may show the incidence of unsatisfactory results in pools with ineffective treatment regimes and/or poor management. We would be particularly interested in such incidences in pools treated with non-halogen regimes that are currently being marketed but which are not currently recommended in the available guidance. We have anecdotal evidence of individual pools treated with non-halogen treatments showing high values for *Ps. aeruginosa* and ACC.