CONTACT DERMATITIS DUE TO BCDMH IN A HYDROTHERAPY POOL

As Occupational Physician advising National Aquatic Organisations (including the Pool Water Treatment Advisory Group) and having been the focus of enquiries concerning BCDMH problems since the 1983 British Medical Journal paper on the subject may I comment on the paper by Loughney and Harrison. They raise a number of wide-ranging issues of importance and also, in my opinion, overestimate both the ease of obtaining competent advice in this particular area and the relevance of COSHH, in practice.

The use of BCDMH (1-bromo-3-chloro-5, 5-dimethylhydantoin, etc.) in the UK and North America in the last 20 years has (to my knowledge) produced a very large numbers of rashes, mostly transient, some serious (especially after re-exposure) and a few situations not without humour. The occurrence of contact dermatitis has been widely denied by small pool chemical retailers.

Mechanism and action of BCDMH

There are several different compounds collectively referred to as BCDMH, the difference being the numbers of chlorine and bromine atoms which are attached to the parent molecule, i.e., Dimethylhydantoin (DMH). For all practical purposes all these compounds act similarly and in particular, they are all associated with the same problems, such as rashes, green water coloration and expense.

One end product of the BCDMH disinfection process is sodium bromide. BCDMH in solution dissociates into hypobromous acid and hypochlorous acid, the latter is the more powerful oxidizing agent and rapidly combines with sodium bromide to produce more hypobromous acid thus BCDMH pools are in fact brominated.

BCDMH rashes

In 1983 Rycroft and I briefly summarized the salient features of BCDMH rashes. Nineteen brominated pools had been visited, 65 patients with rashes were seen and some were fully investigated. In one particular pool it was estimated that at least 5% of users of the pool had experienced itching after swimming and most had then developed rashes. It was noted that the incidence of BCDMH rashes increased broadly with increases in the level of total bromine residue and these pools also tended to have the lowest bacterial counts. It was noted that older age groups were affected much more commonly than children. This paper was subsequently supported by several letters in the British Medical Journal and personal correspondence from USA and UK. These preliminary conclusions have been confirmed very many times over since 1983. I have dealt directly or indirectly with more than 2,000 bromine rashes and my estimate is that the incidence of this rash in BCDMH pools operated according to recommended guidelines is of the order of 0.2% in the under-20 year olds rising to around 20% in the over-70 year olds.

Typical features of a BCDMH associated rash are:

1. An intensely itchy rash, starting within 12 hours of exposure
2. The development of a widespread dermatitis of varying distribution which occasionally is bullous and associated with fever and malaise.
3. Re-exposure, especially shortly after the occurrence of an itchy rash can be especially hazardous, producing the most severe reactions.
4. The differentiation from pseudomonas folliculitis is obvious in well developed cases, but even in the others, diagnosis is not difficult because pseudomonas folliculitis takes more than 12 and usually around 24 hours to develop and itching is absent or slight. Re-exposure of, say, one lower leg readily produces a BCDMH rash in 10 minutes.

In 1990 a letter was published in all free and paid-for newspapers in Somerset, asking those subjects who believed they had rashes that were attributable to exposure to any pool to contact me. Forty-five respondents who had had rashes which were more than trivial, in the previous three years were sent questionnaires which were analyzed by a statistician, in order to get some approximate idea of the incidence of rashes in relation to chlorinated and BCDMH pools. In summary, there were two rashes in chlorinated pools having 1.7 million bathers and 43 rashes in BCDMH pools having 31,000 annual bathers. A minor factor in the increased incidence of rashes in BCDMR pools was that these pools were in clubs or hotels therefore having an older clientele, but it was considered that this only accounted for a small part of the large difference in these relative incidences. All of the brominated pools were run according to the recommended guidelines and there was an absence of pseudomonas.

The above figures have been broadly confirmed by other surveys, all retrospective, apart from the obvious and immediate rashes produced by the planned re-exposure of previous rash sufferers, in order to confirm the diagnoses.

It has always seemed likely that the rash was an irritant contact dermatitis and I have seen three subjects who exhibited exacerbations of psoriasis caused by BCDMII pool exposure which was thought to be due to the Koebner phenomenon; one of these subjects had not suffered
from psoriasis previously and her rash was widespread and severe, also being subsequently readily provoked on re-exposure.

Commercial promotion of BCDMH

Since 1983 many pool operators have told me that their pool chemical retailers have replied to their questions about the use of BCDMH with the following key points:

1. BCDMH pools are less irritant (including the production of irritant rashes) to bathers, etc. than chlorinated pools.
2. One gets troublesome chlorine gas in chlorinated pools and not in BCDMH pools.
3. The reported rashes with BCDMH are due to infection (i.e., pseudomonas folliculitis) following the use of too little BCDMH, therefore increase BCDMH use if there are complaints of rashes.

There is little doubt that all the above points are entirely wrong, the latter dangerously so because the incidence of BCDMH related dermatitis rises with increases in the amount of BCDMH in a pool and there is a well-known re-exposure exacerbation, also.

Regulatory mechanisms for pool chemicals

Pool operators and occupational physicians might not unreasonably hope that there is an effective method for regulating the use of pool chemicals in the United Kingdom and also that COSHH data sheets will help them. The Department of Environment do run a voluntary scheme for the approval of pool chemicals relying mainly on manufacturers' data which is kept confidential; this scheme has approved the use of BCDMH. The approval was originally subject to certain conditions, such as the necessity to monitor rashes and residual DMH levels; I am not aware that any attempt was ever made to fulfil these conditions, of which the regulatory authority must have been well aware. None of the BCDMH COSHH data sheets which I have seen have mentioned rashes.

Hydrotherapy pools and BCDMH

Loughney and Harrison refer to some helpful papers and publications but not the publication which was specially produced because of the frequency of hydrotherapy associated pool problems viz. Hygiene for Hydrotherapy Pools. This is now produced by the Public Health Laboratory Service, Colindale and has been widely publicized, including in Physiotherapy. The exposure of physiotherapists (i.e., hydrotherapists) and possibly immuno-compromised patients to hydrotherapy pool water, makes the need for the maintenance of optimum water conditions clear. In spite of this many hydrotherapy pool operators are unaware of Hygiene for Hydrotherapy Pools and they obtain their advice from a local domestic pool company.

BCDMH rash anecdotal evidence

The Pool Water Treatment Advisory Group (sponsored by the English Sports Council) is a multi-disciplinary group giving advice on any aspect of pool water and they have produced what is one of the main authoritative publications in the English language viz. The Treatment and Quality of Pool Water which describes the occurrence and diagnosis of BCDMH rashes. It is the consensus view of the Members of this Group (who do not have a financial interest in BCDMH) that rashes are a substantial problem. This view could be described as the 'conventional view of the UK professional pool industry'. BCDMH is now used almost exclusively only in the non-professional pool market such as domestic pools, hydrotherapy pools and those in camp sites, caravan parks, small hotels and whirlpools (spas, Jacuzzis and the like).

The references attached to the paper of Loughney and Harrison and the considerable weight of evidence outlined in this letter have been referred to by the Department of Environment Regulatory Authority as merely anecdotal; it is reasonable to assume that this judgement has enabled approval to be continued. Anecdotal or not there are numerous other anecdotes about BCDMH rashes.

Before the first Ryder Cup golf match was played at the Belfry there was consternation because of increasing numbers of itchy rashes following members exposure to the swimming pool and/or the Jacuzzi. The USA team had made reservations for these facilities and serious adverse publicity was feared. The rashes ceased when BCDMH was abandoned.

Within an hour of my describing BCDMH rashes to Geoff Watts on the BBC programme Medicine Now, a patient telephoned me from a hospital dermatology ward to say that she had been admitted with an itchy, blistering rash and malaise, cause unknown. On holiday she had swum on three successive days in a BCDMH pool and thought her increasing itchiness due to sunburn. She vividly illustrated the key point that re-exposure, after recent irritation, can be especially hazardous and in my opinion this is one the main reasons why warnings should be given in all data relevant to BCDMH including COSRH.

In the Somerset survey referred to earlier, one man had been away for a week to a company conference in a hotel and had been using their BCDMH pool, his intensely itchy rash subsequently being diagnosed by his family doctor as scabies. This diagnosis then caused his wife to accuse him of marital infidelity; she was guessing intimate bodily contact. Unfortunately, before the true diagnosis was made, he admitted that her accusation was true.

In 1981 an American stockbrokers circular explored the commercial possibilities of BCDMH in the swimming pool market and commented 'however, its commercial use has been stymied by the skin toxicity problems of bromine'.
Comment

The paper by Loughney and Harrison coincides with a survey of hydrotherapists’ rashes by the Chartered Society of Physiotherapists. Hopefully Loughney and Harrison’s paper will reactivated the awareness of the need for adequate information about BCDMH rashes to be available to fringe pool operators. One could but hope and speculate that the obviously flawed UK regulatory mechanism for pool chemicals would have reacted differently if it had been necessary for BCDMH to be used in mainstream professional pools. Forty years of dealing with pool based problems has made me very doubtful whether ‘an evidence based approach, combined with an appropriate COSHH assessment’ by most of my occupational physician colleagues would have yielded the necessary advice to hydrotherapy pool operators before problems occurred.

Dr P. T. Penny
Occupational Physician

REFERENCES


AUTHOR’S REPLY

Thank you for the additional supportive evidence for the problems experienced by users of BCDMH. I too am hopeful that this report will increase awareness of the problems associated with inadequate information provision. I am perhaps a little more optimistic regarding the development of an evidence-based approach to occupational medicine.

With growing access to reference and research databases, up-to-date information is available to all practitioners. The development of a culture of evidence before action can only lead to better and safer practice in the future. The key evidence in this case was Dr Penny’s own original report1 in the Br Med J accessed via CD ROM Medline search.

Dr Elizabeth Loughney

REFERENCES


LATEX GLOVES

Dear Sir,

I feel I have to respond to an item in your February 1999 issue. In item 4 of the ‘Insight: Questions’ you state under (c) that an important aspect of a skin care policy includes the provision of appropriate gloves.

Whilst these can and will often be an element in any policy to prevent occupational skin disease, the sequencing of the series of questions could give rise to the impression that the provision of gloves is, in itself, an acceptable means of controlling exposure and more important than engineering controls.

May I draw your attention to both the COSHH and PPE regulations. These state clearly that engineering controls must be preferred to the provision of gloves.

Where gloves are provided this may only be done after all other practical measures to control exposure have been taken and then only in conjunction with these measures.

The reasons for this are simple. In the first instance the protection afforded by gloves depends upon the correct selection and use. Determining how well a glove performs and its useful life is not simple as the enclosed article illustrates. Indeed, our pilot study which tested glove performance under actual working conditions demonstrated clearly that conditions of use will have a significant effect of the useful life of a glove. In one case a glove with a stated permeation breakthrough time of >70 minutes with a particular solvent showed breakthrough after only five minutes!

Gloves are also always fail-to-danger, i.e., a glove failing will result in exposure. Given the damage to the skin’s barrier caused by the occlusion this may result in greater damage to health than might have occurred had the glove not been worn in the first place.

Chris Packham

May I comment on your editorial in Occupational Medicine volume 48 number 7. In this you state as a principle that ‘... workers should not have their health damaged simply by attempting to earn a livelihood’. I do not believe that this is any longer an adequate guiding principle for occupational medicine.

Furthermore, the reliance upon legislation as a medium for ensuring that employers achieve an adequate standard in worker health protection is also, in my view, too limited.

In practice, management has many demands upon their time and financial resources. They will devote these to those actions which they see as being most ad-