CONTROL OF "SWIMMING POOL" EAR IN BRITISH HONDURAS

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SUMMARY: A significant loss of man power was caused in British Honduras by an outbreak of otitis externa. This reduced to tolerable proportions following changes in the method of chlorination and pH regulation of the swimming pool water.

The system whereby Infantry Company Groups serve for short periods without their families in British Honduras provided an opportunity to assess the effect of preventive measures against otitis externa. In this instance two Company Groups from the same regiment and of similar composition serving successive six month periods in British Honduras could be compared, their activities both on and off duty being remarkably similar.

The first company group (B Coy) arrived in August 1969, and four weeks later the new Company Commander expressed anxiety because 18 (10 per cent) of his company had contracted otitis externa which restricted their activities. As a result these cases were questioned again in an attempt to trace the source of the infection.

Practically every case reported use of the camp swimming pool sometime during the twenty-four hours prior to the onset of symptoms. In some cases the symptoms of pain or irritation being noted about four hours after swimming. Then during the next twelve hours a serous discharge developed which became purulent in about twenty-four hours. As no other common activity was discovered it was decided to direct control measures towards the swimming pool.

Initially swimming by infected persons was absolutely prohibited and this was enforced by Regimental Police Patrols. A fall in the number of new cases occurred but this was short lived (Fig. 1 B Coy), and eight weeks from their arrival 33 (20 per cent) of the company had been infected. As the mean duration of the illness was 10.5 days, there was a significant loss of man power.

Obviously more vigorous measures were required, and two investigations were instigated at this time.

The chlorination of the pool was reviewed and "Breakpoint Chlorination" introduced. This is a process evolved from the observation that when chlorine is added to water containing organic matter a reaction takes place and chloramines are formed; addition of more chlorine causes these to break down producing hydrochloric acid. Hence it is not until both these reactions are saturated (the breakpoint) that there is a direct relationship between the amount of chlorine added and the free residual chlorine in the water. The breakdown of chloramines at high chlorine levels also reduces the irritant effect providing that the pH is maintained high. Imperial Chemical Industries Ltd, who supply the liquid chlorine for this pool, recommended a chlorine residue of 2.0 parts per million (p.p.m.) of which not less than 1.5 p.p.m. was free residual chlorine with a pH of 7.4. Initially it was impossible to maintain this due to the large size of the pool (110,000 gallons) slow turnover rate (forty-eight hours) and high ultra-violet irradiation. A satisfactory level at eight a.m. was found to have fallen to zero by twelve noon. The problem was eventually overcome by employing a fitter continuously at the

Fig. 1. Total number of new cases of otitis externa presenting each week from 18 August 1969 to 15 July 1970, and comparison between A Company and B Company. W—Commencement of enforced prohibition of use by infected persons. X—Change of method of chlorination. Y—Period of use of pool early morning before chlorination. Z—Pool closed for cleaning. (Graphics by University of Manchester, Department of Medical Illustration.)

pool to manually adjust the rate of chlorine addition throughout the day. Use of the pool was restricted to times when the chlorine and pH levels were known to be acceptable.

In a short time the average incidence of ear infection fell from 4.13 to 0.8 cases per week (Fig. 1). At the same time the help of the Professor of Pathology at the Royal Army Medical College was sought, and arrangements were made to culture material from the infected ears, *Pseudomonas aeruginosa* was found on most occasions (5 in 7 tests). The reason for resorting to London for this procedure was simply that local pathology services are limited.

In January 1970 another change of company (A Coy) took place. At this time it was thought that a comparison of the incidence of otitis externa in the two companies might possibly indicate whether the alteration in the method of chlorination or development of resistance by the soldiers had been the major factor in reducing the incidence of infections. The second company did not suffer as had the first. A company had 19 cases in 28 weeks while B Company had 46 cases in 23 weeks.

Another interesting factor was that 7 (37 per cent) of A Coy's cases occurred about three weeks after arrival. Inquiry revealed that during this period the fitter normally in charge of the pool was on leave, and his relief had allowed platoon swimming to take place early in the morning at a time when chlorination and pH control were unsatisfactory. Of the 7 cases 6 belonged to the platoons which did this training.

This practice was discontinued and the rate of infection fell.

The pool was cleaned in February 1970 and since then there have been 10 cases of otitis externa, a rate of 0.45 cases per week. In none of these has *Pseudomonas*

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aeruginosa been isolated, and also several of them gave a history suggesting that infection was contracted outside camp.

Although these coincidences do not prove that the swimming pool was causally involved, the relationship shown in the chart suggests it and the following unrelated incident may indicate a similar conclusion. In April 1970 the local medical authorities were approached because a large number of tourists at a Hotel were complaining of ear ache which seemed to have developed after use of the hotel swimming pool. A method of chlorination and pH control like that now used in camp was introduced and resulted in a similar reduction in the number of infections. The mechanism by which infection could have occurred is still obscure. Direct invasion by organisms in the pool water might be responsible but a more attractive possibility, because of the rapidity of onset, is that physico-chemical irritation by the water might have rendered the external ear more susceptible to invasion by the organism later, in which case the organism need not necessarily have been in the water. However it is remarkable that if this was so, no complaints of conjunctival or other mucosal irritation had been made during this period.

The methods used are certainly not new and are well known, but this experience shows it is unwise to take them for granted and that attention to details is essential for their maximal efficiency.

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