

An outbreak of streptococcal infection in a chicken factory

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SUMMARY

A large outbreak of streptococcal skin infection occurred late in the summer of 1978 in a factory which undertakes the slaughter, preparation and packing of chickens. In all, 103 episodes of infection occurred in 82 workers from a total factory establishment of 347. The highest incidence of infection was in the packing department where there was an attack rate of 44 %. The routes of introduction of infection into and spread within the factory remain mostly unknown. Following the identification of cases and carriers and the institution of appropriate treatment and control measures the outbreak quickly declined. The responsible organism in the outbreak was *Streptococcus pyogenes* T-type 3/13/B3264, provisional M-type 'R78/55'. This is the first poultry factory outbreak in England to be reported.

INTRODUCTION

Numerous outbreaks of streptococcal skin sepsis among meat handlers have been reported (Fraser *et al.* 1977, 1979) and a recent survey of abattoirs and other meat-processing factories confirmed that meat handlers are particularly susceptible to this type of infection (Working Group on Streptococcal Infection in Meat Handlers, 1979). However, in that survey no streptococcal infection was found among poultry workers and no outbreaks of streptococcal infection among such workers in England have hitherto been reported (M. T. Parker, personal communication).

The nature of the work in chicken-processing factories, where carcasses on a conveyor line are handled by a succession of workers in wet, greasy conditions, seems suitable for the spread of infection.

THE OUTBREAK

A large outbreak of streptococcal infection occurred late in the summer of 1978 in a factory which undertakes the slaughter, evisceration, packing and freezing of 33 000 chickens per day on a conveyor production line. The first signs of the outbreak were noticed in mid-September by local medical practitioners who reported that several patients with infected hands worked at the factory. A review of the

factory sickness records showed many previous infections, after the first which occurred at the end of June (Fig. 1).

Altogether 103 infections occurred; 82 primary infections with 21 further episodes of infection occurring 10 days or more after the first attack. Table 1 shows the distribution of infections according to occupation. Infections were limited to employees handling chickens at one stage of preparation or another, or in contact with plant. Employees mostly suffered impetigenous or eczematous lesions, paronychia and infected lacerations of the hands. Nineteen workers suffered a second episode of infection 10 or more days after the first, and 2 had a third attack.

Table 1. *Distribution of infections among the workers in the factory*

Occupation	Total no.	No. infected
Packers	149	66 (44)*
Eviscerators	82	14 (17)
Cold store men	24	1 (4)
Cleaners	17	1 (6)
Managers	11	0
Clerks	8	0
Canteen workers	6	0
Nurse	1	0
Quality controllers	6	0
Drivers and maintenance	43	0
Total	347	82 (24)

* Figures in parentheses are percentages.

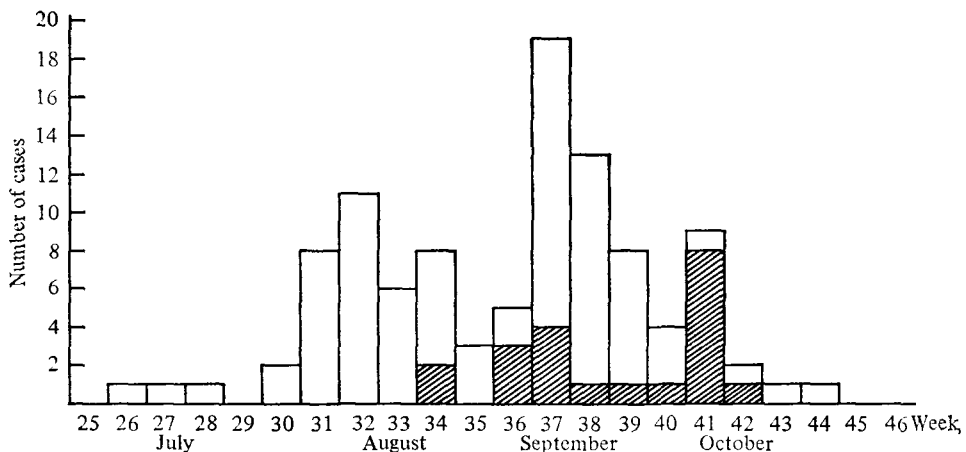


Fig. 1. Weekly number of cases of skin infection in the factory. □, New cases; ▨, reinfection/recrudescence at ≥ 10 days.

Bacteriological studies in the factory

Swabs were taken from the nose and throat of the 272 employees in the affected groups; none of them complained of sore throat. Swabs were also taken from 24 hands and a toe with areas of inflammation and 23 environmental sites. Thirty-six strains of β -haemolytic streptococci of Lancefield's group A, resistant to tetracycline, were cultured from 30 workers, including 17 of 24 (71%) hands swabbed,

the toe, 16 throats and 2 noses. Those harbouring the organism included workers with acute infection, 4 convalescent and 8 symptomless carriers, Group A streptococci were also isolated from a nailbrush in the men's lavatory. Of these strains of group A streptococci 31 were tested in the Streptococcus Reference Laboratory, Colindale; 30 of them, including that from the nailbrush, had the T-typing pattern 3/13/B3264 and opacity-neutralization tests suggested that the strain belonged to a newly recognized provisional M-type, 'R78/55'. The remaining strain, from the throat of a symptomless carrier in the factory, was type T12 M12.

β -Haemolytic streptococci of other groups were cultured from 60 workers (22% of those swabbed); these were mostly group C, with some group B, and a few group G and other groups. They were mostly isolated from the nose, with some from the throat but none from hands. However, group G streptococci were isolated from the sick-room door handle.

Staphylococcus aureus was isolated from 65 of 272 workers swabbed (24%); these were mainly from the nose, but 8 of 24 (33%) of the hands swabbed were positive. No particular phage-type or antibiotic sensitivity pattern predominated, though 81% of the strains were resistant to penicillin. A contemporary study of *Staphylococcus aureus* causing sepsis in out-patients in the Health District showed that 71% of strains were resistant to penicillin.

Spread outside the factory

There was evidence of spread within two families outside the factory. A 60-year-old man with carcinomatosis and no sign of local infection developed group A, T-type 3/13/B3264, M-type 'PT R78/55' streptococcal septicaemia and recovered with treatment. His wife had chronic dermatitis of the hands and worked in the factory but swabs from her yielded no streptococci. In another family the mother, who worked in the factory, had clinical infection of the hand followed by proved streptococcal paronychia of the toe. Her 3-month-old daughter developed streptococcal infection of the ear lobe. Her 6-year-old son was found to carry the organism in the nose and throat, and his strains proved to be T-type 3/13/B3264, M-type 'PT R78/55'.

Infection control

Control procedures included the exclusion of infected cases from work, the wearing of gloves on return and regular cleaning and disinfection of all doorhandles, swing door surfaces, aprons, gloves and knives. Plastic nailbrushes were regularly replaced. Doctors were advised to prescribe penicillins or erythromycin and to avoid tetracyclines, fusidic acid and aminoglycosides for treatment. Early cases had commonly received tetracycline but the infecting organism was resistant to this drug. Following the introduction of these measures the outbreak quickly declined and no further cases were found after October.

DISCUSSION

The infection principally affected workers handling the carcasses on the production line but the modes of spread of infection were not clear. Many workers did not wear gloves and had wet, greasy hands for many hours each day. Lacerations were common, knives were shared and aprons hung up together. Streptococci from infected hands might be protected and transmitted by grease on environmental surfaces. Surface contamination of the carcasses might transmit infection down the production line despite repeated spraying with hyperchlorinated water. This contained 20–25 parts/10⁶ in sprays on the evisceration line and 50–75 parts/10⁶ in the chilling bath before the carcasses reached the packing department. The work of Gilbert & Wieneke reported by Fraser *et al.* (1977) showed that streptococci from meat handlers can multiply many-fold in raw minced meat at room temperature. Tsai *et al.* (1979) reported isolation of streptococci from the surface of a carcass during an abattoir outbreak and experimental inoculation showed survival on meat surfaces at 10 °C for days. We swabbed 23 environmental sites including surfaces, doors and handles commonly touched by the workers but we made no attempt to detect streptococci on the carcasses. The epidemic strain was isolated from a nailbrush shared by employees in the men's lavatory and the use of the brush might have spread the infection. Fraser *et al.* (1977) reported the isolation of streptococci from several environmental sites in an abattoir.

This is the first published report concerning streptococci of the provisional M-type 'R78/55'. The type strain was isolated from the nose of a patient in a detention centre in Cardiff and with the use of opacity factor antiserum other strains of the same type have been found in skin sepsis in geriatric patients and a meat handler in England; an indistinguishable strain from Israel has also been received at the streptococcus Reference Laboratory (W. R. Maxted, personal communication). It was notable in the outbreak that there were no cases of sore throat although the organism was commonly isolated from this site. Mortimer, Pinney & Widdowson (1979) have recently investigated the epidemiologically distinct 'throat types' and 'skin types' of streptococci and reported differences between them; 'skin types' recover better than 'throat types' after oleic acid treatment and this might relate to their ability to multiply from small inocula in poorly nutrient media and to survive on the skin. It remains unexplained why the 'skin types' do not commonly cause sore throat. This outbreak occurred in the autumn and this appears to be typical of other reported outbreaks (Fraser *et al.* 1977); in their report these authors also commented on the presence of *Staphylococcus aureus* in some infected lesions which is a similar finding to our own. The finding of other groups in the respiratory tract but not on the hands suggests that they were not significant in the outbreak. More than one T-type of streptococcus is often found in an outbreak and although 2 types were isolated from the chicken factory workers, type 3/13/B3264 was the only cross-infecting strain. Group A streptococci rarely cause disease in animals and the strain probably came from a human source, though this was not identified.

This outbreak occurred in a modern factory despite good working conditions

and regular cleaning of plant and premises. Facilities for hand washing were good. There are problems in the selection of an adequately bactericidal liquid soap for handwashing in food processing plants as the agent must not taint the food by toxicity, taste or smell. An Irgasan-like soap ('Sumanol') was used in the plant. Lilly & Lowbury (1974) showed that Irgasan was inferior to Hibiscrub in reducing bacterial counts on the hand. In addition Irgasan has less residual activity than hexachlorophane or chlorhexidine, of which no suitable preparations are available for the industry. That the outbreak was well established before being spotted suggests that similar outbreaks in poultry workers could pass unnoticed.

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REFERENCES

- FRASER, C. A. M., BALL, L. C., MAXTED, W. R. & PARKER, M. T. (1979). Streptococcal skin sepsis among meat handlers. In *Pathogenic Streptococci* (ed. M. T. Parker). Chertsey, Surrey. Reedbooks.
- FRASER, C. A. M., BALL, L. C., MORRIS, C. A. & NOAH, N. D. (1977). Serological characterization of group-A streptococci associated with skin sepsis in meat handlers. *Journal of Hygiene* **78**, 283-96.
- LILLY, H. A. & LOWBURY, E. J. L. (1974). Disinfection of the skin with detergent preparations of Irgasan DP300 and other antiseptics. *British Medical Journal* *iv*, 372-4.
- MORTIMER, G., PINNEY, A. M. & WIDDOWSON, J. P. (1979). The growth of 'skin' and 'throat' streptococci in simple peptone media and their survival in oleic acid-peptone water mixtures. In *Pathogenic Streptococci* (ed. M. T. Parker). Chertsey, Surrey. Reedbooks.
- TSAI, T. F., WATSON, W. N., HAYES, P. S., FACKLAM, R. R. & FRASER, D. W. (1979). Mode of spread of group A streptococci in an abattoir outbreak of wound sepsis. In *Pathogenic Streptococci* (ed. M. T. Parker) Chertsey, Surrey. Reedbooks.
- WORKING GROUP ON STREPTOCOCCAL INFECTION IN MEAT HANDLERS (1979). A survey of streptococcal skin sepsis among meat handlers and other workers. In *Pathogenic Streptococci* (ed. M. T. Parker) Chertsey, Surrey. Reedbooks.