PHARAOH'S ANTS AS PATHOGEN VECTORS IN HOSPITALS
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Summary
Long-standing infestations of Pharaoh's ants (Monomorium pharaonis L) in nine hospitals were sampled to determine whether these ants carry organisms of medical interest, in particular Salmonella spp., Pseudomonas aeruginosa, Staphylococcus spp., Streptococcus spp., and Clostridium spp. Examples of all these bacteria were isolated. A cross-infection of Bordetella bronchiseptica in the isolation ward of a school of veterinary medicine is given as an example of the capacity of Pharaoh's ants to transmit disease.

INTRODUCTION
Infestations of Pharaoh's ants (Monomorium pharaonis L) have been a problem in hospitals for many years. Little attention has been paid to their capacity for carrying pathogens, although Wheeler,1 in 1914, expressed an interest in this problem. To understand their possibilities as transmitters of pathogenic agents, it is essential to know something of their mode of life.

These ants are a tropical species and rely on artificial heating for survival. They live in nest colonies containing queens, males, workers, and pre-adult stages. One nest may contain several thousand workers, and in suitable conditions there can be a number of nests in a small area. The workers are 2 mm. in length, and of a translucent brown-orange colour. When collecting food and water they keep to a definite track, rarely deviating from it. Nests are found in a variety of situations, behind tiles, in light fittings, in fuse boxes, indeed in any concealed part of a building. Nests are not unknown in operating-theatres, where they are usually found around autoclaving units. Nests have also been found in heated food-trolleys, and considerable trouble is caused when automatic drink-vending machines become infested. Small nests are sometimes found between the folds of sheets and towels coming from laundries; indeed laundry may be the chief way that ants are spread between hospitals. Pharaoh's ants are omnivorous but prefer raw and cooked meats and sweet items such as trifle and swiss-roll. The numbers of ants to be supported, and the need for very high levels of humidity within the nesting colonies,4 make it necessary for some worker ants to forage almost continuously.

Common black ant (Lasius niger) (a) and Pharaoh's ant (M. pharaonis) (b) (x 10).

During these expeditions contamination of food occurs, since many hundreds of workers regularly visit moist situations, including bedpans, toilets, sluices, drains, and sinks.

Patients who develop suppurating lesions are likely to suffer attack by ants that apparently feed on the discharge inside dressings. Workers are able to locate such patients very quickly and also those with a fever or profuse sweating. In intensive-care units the problem can be acute if the ants establish nests in the structure, since workers get into drip-tubes and resuscitation equipment. In baby-units worker ants have bitten the infants around the eye-lids,3 in central sterile supply department (C.S.S.D.) stores foraging workers regularly get inside sterile packs. Nearly all the hospitals I visited had found ants in these packs.

MATERIALS AND METHODS
Ants were collected from wards, casualty and intensive-care units, kitchens, and toilets over a period of nine months. They were caught with sterile forceps and were placed in sterile bottles containing quarter-strength Ringer's solution; afterwards only selective media were used and pathogenic bacteria were isolated. While this method was discarded because the results were poor, when night collecting was involved, culturing was carried out the following morning. At first all bacterial growth was studied; afterwards only selective media were used and pathogenic bacteria were isolated.
bacteria identified. The following media, incubated at 37 °C, were used: MacConkey agar, desoxycholate citrate bismuth sulphite agar, Baird Parker agar, proteose peptone lactose sucrose, cystine lactose electrolyte-deficient agar, agar, King’s medium ‘A’, 5% blood agar, reinforced clostridial medium, selenite broth, 7.5% saline tryptone soya broth.

the accompanying table, nine hospitals were surveyed.

morning the patient complained of considerable irrita-

going leg surgery late one afternoon. The following

Isolation of a Pseudomonad

A patient was returned from theatre after under-

going leg surgery late one afternoon. The following morning the patient complained of considerable irritation, and, on investigation, nurses found the bed heavily infested with ants. The bed was immediately stripped and samples of ants were taken. A pseudomonad was isolated from the cultures obtained. Ps. aeruginosa was later isolated from ants found in the kitchen of the ward in question and from drain-swabs. There had been a history of pseudomonas contamination in the ward and the drains of the hospital concerned. Three other hospitals had ants carrying Ps. aeruginosa in their main kitchen areas, and Ps. fluorescens was obtained from an intensive-care unit, a ward, and 2 kitchens.

Spread of Bordetella bronchiseptica within a Veterinary Isolation Unit

This appears to be the first record of cross-infection that may be attributed to a heavy infestation of Pharaoh’s ants. Experimental piglets were housed in specially designed isolation cubicles in an infective-disease block. Experiments 4 dealing with enzootic pneumonia and pneumonia associated with Bordetella bronchiseptica had been in progress for some time with no recorded instance of cross-infection of control animals 5 until an infestation by Pharaoh’s ants occurred. During this period cross-infection of Bordetella bronchiseptica occurred in control piglets, and the unit had to be temporarily closed down. The Ministry of Agriculture, Fisheries and Food treated the whole building with dieldrin lacquer, which eliminated the Pharaoh’s ants. Ant reinfestation or bacterial cross-infection have not occurred in the 10 years since the incident. Infected piglets, at the time of cross-infection, produced considerable amounts of nasal mucus, and Pharaoh’s ants are attracted to this type of material. The ants gained access to both infected and control areas despite the operation of the positive-pressure air system. This system, while guarding against airborne droplet infection, does not deter insect invaders.

DISCUSSION

The occurrence of S. dublin and Staph. aureus is of particular interest, since many foods visited by ants provide ideal sites for bacterial multiplication—e.g., meat dishes of all types, trifles, custards, and milk. Ants also become trapped in certain foods and can be overlooked owing to their small size and inconspicuous colouring. In some hospital kitchens food had only to be placed on working tops for a short period before it was covered in foraging workers.

Initial experiments showed that S. marcescens was recoverable from the nest colony for a period of almost 3 weeks after infection. B. globigii was recoverable for a far longer period. Normal nest conditions of 80+ % relative humidity and temperature 27-38 °C suit bacterial growth. The ants’ habit of regurgitating food in the form of pellets to be stored and later fed to pre-adult stages also provides fresh nutrients for bacterial growth. Ants from a nest colony containing viable pathogenic bacteria could contaminate food, over which they wander while collecting fresh supplies. Ant trails can run for a considerable distance from the nest to a supply of food. On one occasion a run of 72 ft. was recorded; it is not known how far the run extended inside the wall cavity. Carriage of Pseudomonas spp. occurs fairly often owing to the ants’ habit of visiting drains and sluices for moisture. Ps. aeruginosa was isolated from ants in a ward area, where there was a history of Ps. aeruginosa both in the ward and in the drains of the hospital. The risks of rendering sterile packs non-sterile are obvious when ants invade C.S.S.D. stores. Theats and intensive-care units are also at risk. I wonder whether any of the baby-units forced to close down owing to infection have ever had Pharaoh’s ant infestations during these periods.

The veterinary case of cross-infection illustrates this ant’s ability to enter highly sophisticated isolation units apparently carrying pathogenic organisms. All the hospitals included in the survey had ants carrying pathogenic bacteria.

CONCLUSIONS

Pharaoh’s ant infestations can no longer be regarded as only a slight inconvenience. The feeding habits of these ants lend themselves to the carrying of pathogenic agents, and the ability to carry such agents has been demonstrated.

Initial experiments have shown that bacteria can remain viable within the nest colony and could reinfect workers and so produce a reservoir of infection. These ants are not particularly difficult to eliminate if correct insecticides and formulations are used and specialist advice is obtained; but the procedure is costly and adequate funds must be made available to combat this pest.

I thank Mr. D. Goode, Royal Army Medical College, London, for his assistance; the microbiology departments at Brooklands
Avenue, and the Veterinary Investigation Centre of the Ministry of Agriculture, Fisheries and Food, Cambridge, and the Public Health Laboratories at Collindale, Cambridge, and Norwich for specialist identification; and the staffs of the hospitals for their cooperation. The illustration is Crown copyright.

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REFERENCES
5. Whittlestone, P. Personal communication.

ON BEING A GOOD PROFESSOR

DEAR JAMES,

Congratulations on your translation from a post-graduate to an undergraduate chair. I am most flattered that you should ask for my advice: it is true that I made a somewhat similar transfer a while back, though at a lower level, but I cannot pretend to having been any more successful than I deserve. However, you may find interesting these reflections on medical schools in general and the role of heads of departments in particular. I will state them dogmatically, in the hope that you may extract some grains of wheat from the folly.

Don't worry too much about curricula. The balance between subjects reflects chiefly the shifting balance of power between departments, and the order is largely a matter of fashion. Nevertheless, curricula ought to be changed at shortish intervals—every ten years at the longest, otherwise everyone gets into a rut. Moreover, the joint effort benefits everyone. Put your fastest-talking lecturer on the job rather than yourself.

Even major gaps in the curriculum matter less than one would think. If there were no department of physiology (not that I'm recommending the omission) every other department would be found teaching the parts of physiology relevant to its own subjects—one often has to do so. It is not altogether a paradox to say that the most successful teachers of every subject are those in other departments: students take most seriously those parts of each subject that seem to be taken seriously by the non-specialists.

What matters most in every school is having the right teachers and the right students. Getting the right students depends chiefly on the educational system and on the image of the medical profession, but a lively admissions committee can do something, and the image of the school itself presented by its staff to its own students (who ought to be its best propagandists) matters also—but it should not be too blatantly euphoric. Good teachers need to be learned, professionally competent, capable of at least some investigation, and good communicators. We actively teach our potential staff members the first two, and there are usually ample opportunities to learn investigatory techniques. But who teaches communication? There are courses for junior teachers in some universities, but not many, and they are very variable in quality. How many heads of departments even know whether their junior staff can teach, let alone do anything to improve them? (Rehearing papers is one tactful if oblique method—if a man cannot give a short paper properly, how can he be trusted with a lecture?) Every large department should be attempting at least one piece of research into educational technology, however elementary, if only to prove that such technology exists.

Do not worry too much about the relative value of lectures, tutorials, clinics, practical classes, conferences, films, programmed learning, projects, &c. Use as many of them as you conveniently can, for there is no one best method of spreading the light, but not so many as to become itsy-bitsy. Be ruled neither by tradition nor by novelty. A lecture is neither good nor bad save as it is a good or bad lecture, and the same applies to the latest on-line computer teaching-program.

Medical students mostly know well enough where they are going; the malaise that has afflicted so many other faculties they regard with sympathetic tolerance but do not share. By the time they have reached you, they have learnt how to learn, and are connoisseurs of good teaching. They are happy enough to be entertained by the way, but they are rarely far out for long in their assessment of what is or is not worth their serious attention.

Remember that it is a poor class that does not contain at least one future professor; allowing for the inexorable loss of grey cells with the years, the top two or three are probably already cleverer than you are, even though not yet as wise. Students like their professors to be a little larger than life, welcome a few amiable eccentricities, and expect a reasonable degree of dogmatism (we are paid, like the lawyers, for our opinions, not for our doubts); but even if you had a Nobel prize you would find it fatal to assume to yourself the least touch of godhead. Above all, you must be and be seen to be deeply concerned about your students and their progress. It is true that to the head of a major medical-school department these days his undergraduates are but one among a dozen major responsibilities. Nevertheless, this is the one which ultimately the university pays you for, and your students will not love you unless you appear to be doing your best for them. Your success will be measured by the number who apply for jobs with you. If you possibly can, take a tutorial group—not casually, but the same group once a week for a year. They will teach you a great deal.

No one can do properly all the things that are cumulatively expected of the head of a big clinical department nowadays. If the load becomes intolerable, decant some of it on your senior lecturers. Don't just let things fall to them by default. Say firmly, "You will run the undergraduate course for the next year"—or the D.N.A. unscrambling project, or the cytology lab., or the holiday rota, or what have you—and leave them to it. I suspect that most professors (not all) would do more good in total if they renounced all personal research after the age of 50. In the largest and busiest department a second chair is an immense advantage.

There are two main factions in every medical school, the full-time academics and the part-time clinicians. They differ in many things, but most fundamentally in that the academics are the innovators, and the part-timers the inertia. Do not waste time regretting this: it is a valuable dialectic. The rare non-academic clinician who retains into his years of seniority an eagerness for progress is, however, immensely to be cherished; and, on the other hand, the professor who calcifies prematurely and sits down to defy the march of time can do untold harm. "Stay young or die" should be the motto of all heads of departments.

It is surprising how many live up to it: I am sure you will continue to do so in your new post.

Good luck to you, in any case.

PETER DAVEY.