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An outbreak of psittacosis in a boys' boarding school

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SUMMARY

In 1980, an outbreak of a mild illness involving twenty pupils and four adults in a boys' boarding school was identified serologically as psittacosis. Intensive epidemiological investigations did not uncover the source. It is suggested either that sources of chlamydia other than avian exist, which may produce a milder illness than the avian type, or that human-to-human spread of a mild form of chlamydiosis occurs.

INTRODUCTION

Psittacosis is a disease caused by *Chlamydia psittaci* and may be acquired from psittacine birds (Meyer, 1942) or poultry (Andrews, Major & Palmer, 1981). Infection is presumed to be by aerosol inhalation. Human-to-human transmission is thought to be unusual, although it quite clearly occurred in the severe outbreak in Louisiana (Olson, 1944); it may also occur in hospitals (Pether, 1981). Infection may be sub-clinical, take the form of a minor respiratory illness or pneumonia or progress to a fulminant form resulting in death (Fraser & Hatch, 1965; Schaffner *et al.* 1967; Byrom, Walls & Meyer, 1979). We report an outbreak of psittacosis in a boarding school, the source of which could not be found.

MATERIALS AND METHODS

The outbreak

In June 1980 a general practitioner reported that there was an outbreak of a minor illness in a private school for which he was the medical officer. The school was situated in the centre of a town in the West of England. In April 1980 there were 299 male borders and 19 day boys, and also seven day girls in the sixth form. The ages of the pupils ranged from 13 to 18 years. There were 32 members of staff, most of whom lived in the school buildings.

The illness was characterized by a sore throat usually progressing to a bad 'cold'. Headache and fever were frequent; some patients had had catarrh, abdominal pain, vomiting or diarrhoea. Half the cases gave a history of cough. The illness was mild and bed rest was usually unnecessary. The initial finding of raised complement-fixing antibodies to *Chlamydia psittaci* led to a detailed epidemiological inquiry. During June and July 1980 20 boys, two teachers and one kitchen-worker were diagnosed as having had psittacosis. In addition, one of the investigators also contracted the infection.

Epidemiological investigation

A case was defined as a patient with a lower respiratory tract infection or a boy with an acute non-specific febrile illness associated with a fourfold rise in antibody titre, or a CF titre of 128 or more, or fluorescent antibody titre of 64 or more. The ill boys were investigated epidemiologically by an administered questionnaire. Fourteen boys who had been ill at about the same time, but did not have serological or clinical evidence of chlamydiosis, were also questioned. Questions included details of clinical features, visits to a local pet shop, contact with birds or other animals and movements within the school. The games the boys played, the subjects that they studied and any contact with a dovecote which was situated in the school grounds were also noted. The school was inspected on three occasions, especially areas which boys from all houses would have frequented, for live or dead animals or birds.

Microbiological studies

Sera were tested for antibody to respiratory viruses, chlamydia and *Mycoplasma pneumoniae*. Complement-fixation tests for chlamydia were performed by standard techniques (Bradstreet & Taylor, 1962) with an antigen prepared from a strain causing ovine enzootic abortion. Fluorescence tests were performed using the same antigen (Richmond & Caul, 1975).

Serological study of control populations

Antibody levels were determined in 85 sera collected for a survey on influenza from pupils in a similar West Country school. To investigate the background antibody level in the local community the levels of complement-fixing antibody to the common psittacosis antigen were also determined in 124 serum samples from a blood donor session at one local town and 104 donor samples from another town.

Table 1. *Antibody levels of the 24 cases of psittacosis*

Case				Serology					
No.	Age	Status	Onset	Date	CFT*	IF*	Date	CFT*	IF*
1	15	Pupil	15 May	1 July	160	128			
2	16	Pupil	28 May	10 June	< 20	8	9 July	40	32
3	16	Pupil	30 May	10 June	80	256	1 July	160	512
4	18	Pupil	31 May	24 June	160	256	1 July	160	256
5	16	Pupil	1 June	10 June	80	64	1 July	160	64
6	17	Pupil	7 June	12 June	< 20	8	9 July	80	256
7	16	Pupil	7 June	9 June	160	256			
8	17	Pupil	11 June	16 June	< 20	8	9 July	80	256
9	16	Pupil	11 June	1 July	> 160	128			
10	15	Pupil	14 June	1 July	160	128			
11	14	Pupil	15 June	17 June	< 20	8	1 July	> 160	64
12	15	Pupil	15 June	2 July	> 160	512			
13	15	Pupil	16 June	1 July	160	512			
14	25	Master	17 June	2 July	160	64			
15	14	Pupil	23 June	7 July	80	128			
16	15	Pupil	25 June	7 July	320	1024			
17	14	Pupil	28 June	2 July	80	256			
18	15	Pupil	3 July	7 July	40	128			
19	16	Pupil	5 July	9 July	80	96			
20	17	Pupil	5 July	9 July	40	64			
21	52	Master	5 July	10 July	160	128			
22	21	Kitchen	7 July	10 July	40	16	22 July	40	ND
23	15	Pupil	19 July	21 July	160	256	30 July	80	256
24	46	Investigator	15 July	Sept.	160	256			

* Antibody test by complement-fixation test (CFT) and immunofluorescence (IF).
ND, not done.

RESULTS

Epidemiology

From 15 May 1980 when the first boy became ill cases continued to occur until a total of 20 boys, two masters and possibly a kitchen-worker had been affected (Table 1). There were small clusters of cases around mid-June and early July (Fig. 1), but there was no evidence of a common source. Distribution of ill pupils by form and house (Tables 2 and 3) appeared to be random. There was no school activity that brought more than a few of the cases in contact with avian or other wildlife. A search was made within the school boundaries for an avian source. A number of birds were discovered (Table 4), but only one of these (no. 4 in the table) could have infected so many boys throughout the school. This was a budgerigar owned by a healthy kitchenworker. The bird had been recently bought from the local pet shop and was in a cage in the kitchen by a window that opened on to a covered and enclosed passage frequented by many pupils. Eighteen of the 20 ill boys either used this corridor or visited the room in which the bird was caged, compared with 11 of the 14 boys ill from other causes ($P = 0{\cdot}3$; this is not significant). Although a veterinarian did not consider that the bird was healthy no evidence of chlamydiosis was found at post mortem. The owner of the bird did not have antibodies against chlamydia. Down duvets were used only by cases 3 and 16.

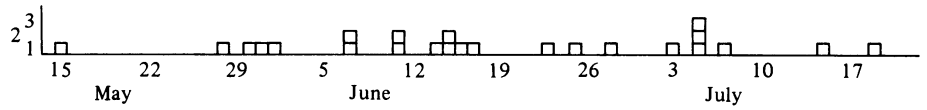

Fig. 1. *Date of onset of cases.*

Table 2. *Distribution of ill pupils by form*

	Number of boarders	Number of cases
Upper Modern Sixth	21	2
Upper Science Sixth	13	0
Lower Modern Sixth	27	1
Lower Science Sixth	20	1
Remove	5	0
5A	16	3
5B	19	1
5C	17	0
5D	17	1
4A	20	0
4B	17	4
4C	15	0
4D	12	2
3A	21	2
3B	21	0
3C	19	2
3D	19	1
	299	20

Table 3. *Distribution of pupils by house*

	Total	Number ill
Old House	56	4
New House	58	4
Priory	64	3
Lyon	62	3
Blackford	59	6
	299	20

N.B. One affected teacher was resident in Old House (not included above). The other teacher resided outside the school.

There was a pet shop in the town on the street opposite the main part of the school. The shop stocked a variety of birds. All the birds were deemed to be healthy by the local Veterinary Officer. Only two of the cases and also two of the boys ill from other causes had been in the pet shop. Extensive searches were made throughout the school, particularly in the communal areas used by all the children, for an avian or animal source, but none was found.

Towards the end of the outbreak in mid-July, one of the investigators developed malaise, fever and a cough, two weeks after his last visit to the school.The illness was diagnosed as psittacosis (CF titre 160, IF titre 256); his only contact with any

Table 4. *Birds connected with the school*

	Owner	Contact with cases	Comment
1 Cockatiel	Housemaster looking after it for a pupil	No	Inspected by V.O.; appeared well
2 Parrot	Bursar	No	Fifteen years old. Appeared well (V.O.)
3 Tumbler Pigeon	Adopted by a boarder 22 June 1980	One House only	Owner and bird well. Bird serologically negative (V.O.)
4 Budgerigar	Purchased March 1980 by kitchen-worker	Yes; lived in kitchen (see text)	Owner well. Detailed examination by MAFF proved negative
5 Ducks	Wild, on the river	No	
6 Two crows	Shot for an art exhibition on 23 June	No	

V.O., Veterinary Officer.

Table 5. *Complement-fixing antibody to* C. psittaci *common antigen from blood donors in two towns near the school*

	Number tested	Reciprocals of antibody titres								
		< 2	2–4	8	16	32	64	128	256	> 512
Town A	124	73	25	10	6	4	4	2	0	0
Town B	104	67	15	7	3	2	1	3	0	6
Total	228	140	40	17	9	6	5	5	0	6

N.B. Dilutions of sera were selected to demonstrate low levels of antibody.

of the cases had been to shake hands and talk with some of the infected pupils. A cup of coffee and two biscuits had been consumed and the pet shop visited once.

Only case 4 was admitted to hospital. The illness in the two masters and the investigator was more severe and prolonged than in the boys.

After case 23 returned home two members of his family developed a clinical illness that resembled chlamydiosis, with antibody demonstrated by the fluorescent technique at a dilution of > 1 in 64 in both.

Microbiology

The criteria for a diagnosis of psittacosis was satisfied in 20 pupils, two masters and one of the investigators. A member of the kitchen staff was included as a case because she had a clinically similar illness, although serological results showed a CF titre of 40 and an IF titre of 16 (case 22, Table 1).

The 85 sera from pupils at the control school showed a low level of antibody titres to *C. psittaci*, with one pupil with a titre of 40, three of 20 and five of 10; the remainder had no detectable antibody. Sera from blood donors at two local towns showed that antibody to *C. psittaci* at levels of 128 or more occurred in 11 (4·8%) of the local population although there was some small differences between

towns, with most of the low titres from the second town (Table 5). Six donors had antibodies at a dilution of 1 in 512 or more, which was confirmed on re-testing in one of them; none had been ill recently.

DISCUSSION

This outbreak of a mild form of potentially serious disease occurred in a closed community in a predominantly rural county which appeared to have a high background level in adults of complement-fixing antibody to *C. psittaci*. The epidemic curve was consistent with case-to-case spread or a continuing single-source outbreak with low exposure or low infectivity rates.

Fraser *et al.* (1964) described endemic chlamydial infection, both sub-clinical and symptomatic, amongst naval recruits in Portsmouth. Outside such institutions this would remain unnoticed. In spite of intensive investigation no avian source was found in our outbreak and both the beginning and the end of the outbreak could be identified; it was possibly halted by the end of term. It would be very difficult to identify a human carrier (Meyer & Eddie, 1951) but it seems possible that chlamydia were spread from person to person. It has been thought that case-to-case spread is unusual, but in a recent paper Nagington (1984) reviewing 150 illnesses attributable to chlamydial infection, discovered a presumptive avian source for only 17 %; he supports the concept that case-to-case transmission is an important mode of spread, although there was no epidemiological evidence for this in the outbreak described.

The question arises as to the origin of both the background antibody level in the indigenous population and the origin of what possibly occurs more commonly than expected: small outbreaks of chlamydial infection amongst humans. None of the six blood donors who had a titre of 512 or more appeared to be ill, nor did they give a history of illness in the recent past. The high background level of antibody in well people may lead to confusion in the diagnosis of acute psittacosis, especially if (Nagington, 1984) some of the antibody to *C. psittaci* is due to anamnestic responses in patients who are suffering from other infections.

The antigen provided both for the complement fixation and fluorescence tests is the group antigen extracted from the organism that produces enzootic abortion of ewes. The presence of antibody merely provides evidence of past infection with chlamydia, but it does not identify the particular organism responsible for the infection. There are inevitably difficulties arising in the interpretation of low levels of antibody to group antigen. Some of these have been the response to infection with *C. trachomatis* infection. Immunofluorescence tests may be useful in this respect (Dr Shirley Richmond, personal communication.). If *C. psittaci* strains responsible for outbreaks similar to the one reported in this paper can be isolated and characterized they may provide a more specific test for psittacosis. It is possible that animal strains of chlamydia may be adapting to humans (Terzin & Mišković, 1965). A case of psittacosis acquired from sheep has recently been reported (Beer, Bradford & Hart, 1982), but there was no evidence that the ill schoolchildren had had contact with sheep.

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