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Epidemiology of parainfluenza virus type 3 in England and Wales over a ten-year period

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SUMMARY

We have analysed data on respiratory syncytial (RS) and parainfluenza type 3 (PF3) viruses reported to the Communicable Disease Surveillance Centre, London, over the period 1978–87. These confirm the annual winter epidemic of RS virus and show that, in England and Wales, PF3 is a summer infection with regular yearly epidemics.

Human parainfluenza virus type 3 is a major cause of lower respiratory tract disease, particularly in infants, second in incidence only to respiratory syncytial (RS) virus (Gardner *et al.* 1971; Martin *et al.* 1978). The virus is found throughout the world and appears to infect children predominantly during the first 2 years of life, usually presenting as croup or bronchiolitis. After 2 years of age, the risk of infection with parainfluenza type 3 is much reduced (Glazen *et al.* 1984*a*). Epidemiological studies of parainfluenza virus type 3 have generally concluded that the virus is endemic with infections detected throughout the year irrespective of geographical location (Glezen, Loda & Denny, 1984*b*). In contrast to these data, there have been reports that the virus may be epidemic but the number of cases was low in both studies making assessment difficult (Martin *et al.* 1978; Glezen *et al.* 1984*a*). The most recent study, from Texas, USA, suggested that the pattern of infection with parainfluenza virus type 3 had changed from an endemic pattern to an epidemic one with the peak of infection occurring in the late winter/early spring (Glezen *et al.* 1984*a*).

Recognition of a seasonal pattern of infection would give an insight into the likely aetiology of acute lower respiratory tract infections during each year. To investigate the epidemiology of parainfluenza virus type 3, we undertook an analysis of the cases in England and Wales reported to the Communicable Disease Surveillance Centre, Colindale over a 10-year period from 1978 to 1987 inclusive. Each case was identified by one or more of the following; a rise or single high titre in circulating antibody levels by complement fixation test, direct detection of virus antigen by antibody in a nasopharyngeal aspirate, or direct virus isolation followed by identification.

Table 1. *Relative annual incidence of parainfluenza virus type 3 and respiratory syncytial virus in 4-weekly periods over a 10-year-period from 1978 to 1987 inclusive*

Weekly period	1978		1979		1980		1981		1982	
	Paraflu3	Rsv	Paraflu3	Rsv	Paraflu3	Rsv	Paraflu3	Rsv	Paraflu3	Rsv
1–4	3·57	23·93	2·37	4·64	5·04	22·85	4·67	19·14	2·92	8·89
5–8	1·59	34·69	1·66	8·41	2·91	24·74	5·65	34·05	2·53	16·49
9–12	4·96	18·37	0·95	20·52	1·55	20·73	3·19	15·89	2·33	17·76
13–16	8·93	11·13	2·13	21·27	3·10	10·62	4·91	13·02	4·67	8·65
17–20	18·25	3·99	3·55	13·73	6·59	3·11	5·90	3·13	4·09	2·51
21–24	24·60	0·65	2·61	6·46	6·59	0·83	16·95	0·72	14·20	0·84
25–28	16·27	0·74	8·29	6·46	17·05	1·00	22·85	0·65	26·65	0·30
29–32	8·73	0·09	15·88	3·10	21·71	0·50	14·99	0·07	27·24	0·49
33–36	4·56	—	21·33	1·88	9·88	0·11	7·62	0·07	7·59	0·32
37–40	3·17	0·37	8·29	0·54	6·01	0·28	1·97	0·20	3·11	0·70
41–44	1·59	0·65	12·56	1·21	5·23	1·11	4·42	1·04	2·14	3·64
45–48	2·58	0·74	14·69	0·87	6·40	2·39	4·91	3·58	1·17	13·90
49–52	1·19	4·64	5·69	10·90	7·95	11·73	1·97	8·46	1·36	25·52
Total cases	504	1078	422	1486	516	1799	407	1536	514	3711

Weekly period	1983		1984		1985		1986		1987	
	Paraflu3	Rsv	Paraflu3	Rsv	Paraflu3	Rsv	Paraflu3	Rsv	Paraflu3	Rsv
1–4	4·32	47·27	0·55	35·48	2·67	13·75	1·33	35·50	2·59	30·21
5–8	2·97	15·10	0·28	24·03	3·74	18·53	1·33	15·77	2·59	21·62
9–12	2·16	7·63	0·83	16·20	3·74	15·88	0·89	5·44	4·53	17·65
13–16	9·46	3·66	0·83	9·18	6·06	8·24	2·22	2·57	7·34	6·78
17–20	9·46	1·46	4·99	2·39	8·20	3·74	4·43	1·06	21·38	2·02
21–24	25·68	0·75	6·37	0·73	16·76	1·47	8·20	0·35	18·14	0·79
25–28	19·19	0·35	24·10	0·04	21·75	0·94	26·16	0·42	20·30	0·34
29–32	13·51	0·25	26·04	0·04	17·47	0·48	31·04	0·35	13·60	0·29
33–36	5·95	0·40	8·59	0·12	8·02	0·40	10·64	0·12	4·10	0·14
37–40	2·43	0·15	8·59	0·15	2·50	0·46	6·43	0·45	1·73	0·34
41–44	1·89	0·80	6·37	0·46	4·99	2·19	1·55	0·59	1·51	1·04
45–48	1·62	4·06	7·48	2·35	3·21	8·98	2·00	5·41	1·29	4·58
49–52	1·35	18·11	4·99	8·83	0·89	24·96	3·77	31·97	0·86	14·17
Total cases	370	1993	361	2593	561	5025	451	4248	463	5828

The figures are expressed as the percentage of total annual cases. The total number of reported cases for both viruses for each year is also given.

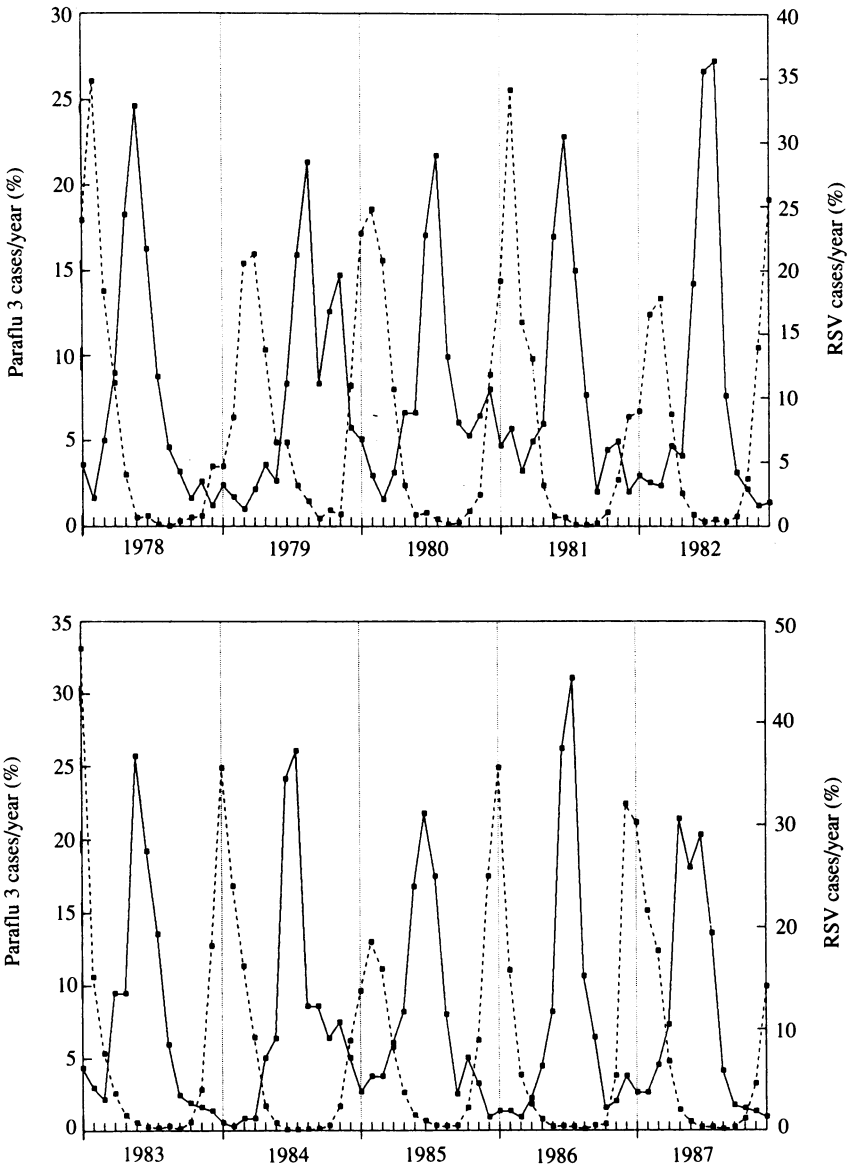

Fig. 1. Relative annual incidence of parainfluenza virus type 3 (–□–) and respiratory syncytial virus (--□--) in 4-weekly periods over a 10-year period. The figures are expressed as the percentage of total annual cases.

The figures for the incidence of parainfluenza virus type 3 in England and Wales are presented in Table 1. The figures are expressed as the percentage of the yearly total occurring in each 4-week period. The total number of cases in each year is also given. For comparison the figures for RS virus infections over the same period are shown in the same way.

The total number of cases for each year for these two viruses indicate their relative occurrence in clinically significant situations. While the number of RS virus infections for each year in the 10-year period varies by up to fivefold, the number

of parainfluenza virus type 3 infections is relatively constant. The fluctuation in RS virus incidence results in parainfluenza virus type 3 representing from approximately 10 to 40% of the number of patients presenting with either of these two viruses as the causative agent of lower respiratory tract infection.

The figures for RS virus infections by 4-week periods confirm the well-recognized epidemic periodicity of this virus (Chanock *et al.* 1984). These data are more clearly presented in graph form in Fig. 1. The peak of RS virus reports occurs in the winter period, generally in the first 8-week period of each calendar year. An exception to this pattern was observed in 1979 when the peak incidence occurred in weeks 9–16. The reason for this change in pattern is unknown; however, this year was also unusual in its incidence of parainfluenza virus type 3 as described below. In the summer and early autumn the number of RS virus infections is consistently very low.

The figures for the incidence of parainfluenza virus type 3 in 4-weekly periods (Table 1 and Fig. 1) indicate that this virus also occurred as a yearly epidemic during each year of the 10-year study. Unlike RS virus, parainfluenza virus type 3 has a peak occurrence in the summer months, generally occurring in weeks 21–32 of each year. The major exception to this pattern occurred in 1979 when two peaks of incidence, one in the summer and a second in late autumn/early winter were seen. The reasons for the unusual patterns of incidence in this year are unknown. However, the delayed onset of RS virus infections in this year may indicate that some external factors peculiar to that year had some general effect on agents of respiratory diseases.

The difference in the season of peak incidence of parainfluenza virus type 3 observed in England and Wales (summer months) and that proposed for Texas (late winter/early spring, Glezen *et al.* 1984*a*) may be due to environmental or geographical factor(s), although the number of cases studied in Texas was low and the true periodicity of virus infection in this area needs to be clarified further.

As can be seen in Fig. 1, although parainfluenza virus type 3 is clearly an epidemic virus in England and Wales, many cases of infection are found in the periods between the epidemic peaks. This is in marked contrast to the situation with RS virus which is only rarely detected between epidemics. If analysis similar to that described here is performed on data from a limited area, and necessarily from fewer cases each year, the epidemic pattern of infection is obscured (data not shown). The relatively high incidence of parainfluenza virus type 3 in the interepidemic periods is the probable reason for the conclusion that this virus is endemic rather than epidemic. Because many laboratories screen for these two viruses independently (for example, by immunofluorescence) the possibility of an epidemic of one virus masking the presence of the other seems unlikely.

In conclusion, we have shown that parainfluenza virus type 3 infection in England and Wales occurs in annual epidemics with a peak in the summer months, and that this pattern has occurred uninterrupted over the 10 years from 1978 to 1987. The high relative occurrence of parainfluenza virus type 3 during the summer months when RS virus is least active indicates that parainfluenza virus type 3 is the major likely viral cause of lower respiratory infection in children at this time.

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