

ECHO TYPE 6 VIRUS OUTBREAK IN N. IRELAND

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DURING 1968 there was an outbreak of ECHO type 6 virus infection which was unusual in its extent and the fact that the epidemic developed in N. Ireland before other parts of the United Kingdom.

MATERIALS AND METHODS

Faeces, CSF, a throat swab and acute and convalescent blood samples were obtained from aseptic meningitis cases, while faeces were obtained from gastro-enteritis and other cases.

Primary rhesus monkey kidney cell cultures were used for virus isolation and isolated viruses were typed with ECHO virus diagnostic serum pools supplied by the Standards Laboratory, Central Public Health Laboratory, London, and also with an ECHO type 6 neutralizing antiserum.

Acute and convalescent sera from 51 aseptic meningitis cases from whom virus was not isolated and who were negative when screened serologically in the complement fixation test against mumps, measles, herpes simplex, lymphocytic choriomeningitis and louping ill viral antigens were tested for ECHO type 6 virus neutralizing antibody. Sera were inactivated at 56°C. for 30 minutes then serial dilutions were mixed with 100 TCD₅₀ of ECHO type 6 virus which was isolated from a patient in the current outbreak. The virus-serum mixtures were left for 2 hours at 37°C. before inoculation.

RESULTS

The number of patients from whom ECHO type 6 virus was isolated or a rising titre of ECHO type 6 antibody was found and the month of their illness are shown in Table 1.

It will be seen that the outbreak began in February and that 81 out of 95 cases (85 per cent.) occurred between May and September with a peak incidence during July. Before this outbreak the last time ECHO type 6 virus was isolated from a

TABLE I

Illness	Month												Total
	J	F	M	A	M	J	J	A	S	O	N	D	
Aseptic meningitis	—	1	1	3	12	10	25	12	8	3	2	1	78
Gastro-enteritis	—	—	—	—	1	1	4	4	2	—	—	—	12
Respiratory	—	—	3	—	—	—	—	—	—	—	—	—	3
Pyrexia & myalgia	—	—	—	—	—	—	1	1	—	—	—	—	2
Total	—	1	4	3	13	11	30	17	10	3	2	1	95

N. Ireland patient was in November 1965 and after the outbreak the first isolation made was in July 1969. The predominant illness was aseptic meningitis which was associated with 82 per cent of all ECHO type 6 virus infections.

There were 172 proven cases of aseptic meningitis in N. Ireland during 1968 as shown by examination of the CSF and this included 4 deaths. Seventy-eight cases (45 per cent) were associated with ECHO type 6 virus infections and a virological diagnosis was made in 143 patients (83 per cent). In the aseptic meningitis group ECHO type 6 virus was isolated from the faeces of 58 patients, and from the throat of 20 patients but from the CSF of only 3 patients. Of the 51 aseptic meningitis cases from whom virus was not isolated and who were investigated serologically for ECHO type 6 neutralizing antibody ten patients had a four fold or greater rise in antibody which indicated recent infection. A further 26 patients had stationary titres of ECHO type 6 neutralizing antibody in their acute and convalescent sera which indicated infection with this virus at some time in the past. In this group of 26 patients, ten were adults and 8 were children over the age of ten years. In the aseptic meningitis group are included an 8 months old girl who had an ECHO type 6 virus infection associated with "salaam" attacks and ECHO type 6 virus was also isolated from the brain of a 9 year old girl who died after a very short illness. Outside N. Ireland a 15 year old boy in Co. Galway was investigated. He had been fully immunized against poliomyelitis but had developed extensive paralysis of both arms and legs and this was associated with an ECHO type 6 virus infection.

During 1968 in N. Ireland there were several outbreaks of gastro-enteritis in infants including outbreaks in hospitals. Faecal samples were obtained from 443 affected children and viruses were isolated from 99 (22 per cent). ECHO type 6 virus was only isolated from 12 cases (2.7 per cent). A 13 day old boy with enteritis and jaundice died. At post-mortem there were haemorrhages in his lungs and intestine and ECHO type 6 virus was isolated from his kidney. Another 3 months old boy had a rash in addition to his gastro-enteritis.

Three adult males had respiratory symptoms associated with ECHO type 6 virus infections. One had pharyngitis, joint pains and a rash, another had pneumonia and a third patient had a syndrome like Bornholm disease. Two other patients had an influenza-like illness. A boy of 4 years had pyrexia and limb pains and a female of 21 years had severe abdominal pain and pyrexia.

The age and sex of the patients who had ECHO type 6 virus infections are shown in Table 2.

TABLE II

Illness	Age in years						Male	Female	Total
	<1	1-4	5-9	10-14	15-19	20+			
Aseptic meningitis	2	13	28	14	10	11	44	34	78
Gastro-enteritis	11	1	—	—	—	—	9	3	12
Respiratory	—	—	—	—	1	2	3	—	3
Pyrexia & myalgia	—	1	—	—	—	1	1	1	2
Total	13	15	28	14	11	14	57	38	95

The majority of ECHO type 6 virus infections were in males and over half the cases were in children under the age of 10 years. It will be seen that the majority of aseptic meningitis cases were in males and the 5-9 year old age group was affected most. The youngest patient in the aseptic meningitis group was 2 months old and the oldest was 55 years. In the gastro-enteritis group the youngest patient was 13 days old and the oldest was 20 months.

Although the first three patients in the N. Ireland outbreak came from Banbridge, Co. Down, there was no subsequent localization to this area, The geographical distribution of the patients was as follows:

<i>County</i>	<i>No. of patients</i>	<i>Clinical attack rate/ 100,000 population</i>
Belfast Borough	57	14.3
Antrim	12	3.8
Down	13	4.5
Armagh	6	4.8
Tyrone	7	5.1

It will be seen that 82 patients (86 per cent) out of the 95 came from the eastern half of the Province (Belfast, Co. Antrim and Co. Down) while Belfast County Borough had the highest clinical attack rate of 14.3/100,000. The ECHO type 6 virus clinical attack rate/100,000 population was 6.4 in N. Ireland as a whole but only 1.2 in the rest of the United Kingdom.

The distribution of cases within towns and households was of interest. There were 6 families in which 2 children in each family had aseptic meningitis associated with ECHO type 6 virus infection. Five of the families lived in Belfast and one in Stewartstown, Co. Tyrone. In each family the two children became ill within a few days of each other. A further 11 children and 3 adults had ECHO type 6 aseptic meningitis who lived in 3 widely separate streets in Belfast and one street in Ballynahinch, Carrickfergus and Newtownabbey respectively. The patients in each street became ill at approximately the same time.

WEATHER DURING 1968

In Northern Ireland from June to October inclusive the cumulative daily maximum temperature was above average and there was above average sunshine in June, July and August. Rainfall during July and August was only 41 per cent and 73 per cent of average respectively.

In S.E. England on the other hand, the daily maximum temperature was below average from April until July inclusive while from August to November inclusive the temperature was above average. Sunshine from May to December was below average while rainfall in April, May, June and September was above average with about average values in July and August.

The mean of monthly values taken over a 30 year period for temperature, sunshine and rainfall is the average referred to above.

DISCUSSION

The ECHO viruses (enteric cytopathogenic human orphan viruses) comprise a sub-group of the human enteroviruses. They are obligatory human commensals whose survival depends on successful implantation in susceptible cells of the

alimentary tract. Man is the only known natural host. The epidemiology is like poliomyelitis where the virus may be recovered from the pharynx for about a week and in the faeces for longer intervals. Spread is by direct person to person oral transfer of human excrement or occasionally by the respiratory route. Family infections are therefore common with young children being the main source of infection. ECHO virus infections are worldwide and in temperate climate epidemics occur during the warm months.

In the United Kingdom a total of 731 ECHO type 6 virus infections was reported during 1968 (Private communication Public Health Laboratory Service). An excess of cases was first detected in N. Ireland where infections with the virus began to increase from mid-May and reached a peak incidence in mid-July (see Table 1). In London and the S.E. of England the increase began about 2 months later and the peak of the epidemic was in early October (Private communication Public Health Laboratory Service). The clinical attack rate was 5 times higher in N. Ireland than in the rest of the United Kingdom if one assumes that comparable laboratory facilities existed everywhere. It is interesting that Belfast County Borough had a clinical attack rate about 3 times higher than Counties Antrim, Down, Armagh and Tyrone and this may reflect the effect of greater crowding in an urban area. Although there were small foci of illness involving 6 families and a further 6 streets there was little evidence of spread of infection with high clinical attack rates in local communities in N. Ireland. Infection in each street could have occurred amongst children at play or at school.

In N. Ireland as in the rest of the United Kingdom, meningitis or encephalitis was the main clinical feature in both children and adults while gastro-enteritis, influenza-like and respiratory infections were less commonly associated. Meningitis or encephalitis accounted for 82 per cent of all cases in Northern Ireland while in the United Kingdom as a whole it accounted for 60 per cent of all cases (Private communication Public Health Laboratory Service).

It should be remembered that the 95 patients investigated during this outbreak were in hospital and although aseptic meningitis was the commonest illness seen, it may be that in the community at large, mild symptoms or asymptomatic infections were more common, since enteroviruses are known to cause a high percentage of subclinical infections.

The gastro-enteritis survey in N. Ireland suggested, in view of the variety of viruses isolated and the low isolation rate, that excretion of virus only reflected the overall virus infections in the community. It was noteworthy that the ECHO type 6 gastro-enteritis cases were the only cases which were clustered in time and there was a close correlation of these cases with the peak of ECHO type 6 aseptic meningitis cases (see Table I). It is difficult to know if the isolated viruses caused gastro-enteritis in some cases since other surveys have shown that the isolation rates in healthy children are not significantly different.

Rashes indistinguishable from exanthem subitum, rubella, measles, glandular fever, meningococcaemia or scarlet fever may occur during infection with several ECHO viruses but in this outbreak only two patients were observed to have a rash.

Since the majority of cases were in children under the age of 10 years it suggests that the older age groups may have had previous experience with ECHO type 6

virus and this was supported by finding stationary titres of antibody in 18 patients (44 per cent) over the age of ten years, but in only 8 patients (19 per cent) under the age of ten years.

From the meteorological data it is obvious that N. Ireland had a warmer, sunnier and drier summer than usual while the S.E. of England had cooler, less sunny and wetter weather. The warm weather in N. Ireland began in June which was about two months earlier than the S.E. of England where a four month colder spell ended in July. It is interesting that there was a two month interval between the onset of above average warm weather in N. Ireland and in the S.E. of England which may be of significance since there was an approximate two month gap between the peaks of the ECHO type 6 epidemic in N. Ireland during July and in the S.E. of England during early October.

The abnormally warm, sunny and dry weather in N. Ireland may also have been associated with the higher ECHO type 6 clinical attack rate in the area. There was widespread water shortage in N. Ireland during this period and alternative emergency sources of supply such as Lough Neagh had to be used.

SUMMARY

During 1968 there was a widespread outbreak of ECHO type 6 virus infection which developed in N. Ireland before other parts of the United Kingdom. The clinical attack rate was five times higher in N. Ireland than the rest of the United Kingdom. Ninety-five patients in hospital were diagnosed and two died. Eighty-two per cent of patients had aseptic meningitis and the majority of patients were children.

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