EPIDEMIC OF POLIOMYELITIS IN ST. HELENA*

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Towards the end of 1945, the remote community on St. Helena suffered a severe outbreak of poliomyelitis, a disease unknown on the island within the memory of its oldest inhabitants. In 1836, however, Sir Charles Bell mentioned an epidemic fever among the young children on St. Helena, followed in all cases by 'a want of growth in some part of their body or limbs.' This may be the earliest reference to epidemic infantile paralysis in the English literature.¹

The following brief account of the epidemio-

logical features of the recent outbreak is given with the kind permission of Dr. Wilson Rae of the Colonial Medical Service. In October, 1945, I had spent a few hours on the island *en route* from South Africa by transport. When the epidemic was at its height, Dr. Rae, on Professor H. J. Seddon's suggestion, secured my immediate release from naval service and a quick return to St. Helena for a stay of six weeks.

The Island and its Population

St. Helena is situated in the South Atlantic Ocean roughly 16° South and 6° West (see map). It has an area of 47 square miles and is of volcanic formation. The principal feature is a semi-circular ridge of mountains rising to 2,700 ft., part of the weathered rim of a great crater. From

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FIG. 1.—Contour map of St. Helena, showing geographical features and main roads in heavy lines, with the 1,000 and 2,000 ft. contour levels.

this ridge steep valleys stretch in all directions; many contain small streams, and springs of good water are abundant. The island is everywhere mountainous, the sea-face being generally formed by cliffs several hundred feet in height. The only practicable landing place is on the leeward side from an open roadstead at St. James' Bay, where in normal times one Union Castle vessel anchors each month.

Climate, Vegetation and Supplies

The climate is healthy and temperate owing to the constant south-east trade wind. The rainfall reaches 40 in. in the hills, but on the lower slopes it is derived from light drizzles and is of little value.

The coastal zone is mainly rocky and barren except for prickly pears. The middle zone is partly under grass, with some small areas under afforestation. The central zone is largely under flax, which affords the main industry. Agriculture is on a small scale, with less than five acres under irrigation. All grain and flour are imported. The main foodstuffs of local origin are potatoes, bananas, yams, fresh vegetables and plums. During the war there was rationing of meat, rice, fats, sugar and latterly flour. The small fishing industry provides an important source of protein mainly from the albacore or tunny, but catches are variable and distribution is uneven. Half the small supply of cow's milk is consumed by Europeans. Bread, potatoes and fish are the staple articles of diet among the islanders, with sweet tea as a beverage.

The Population

A recent census was 5,000. Of these the British in the garrison numbered less than 200, with a similar number in Government service and commerce. The remainder, here called 'islanders,' are of mixed extraction, mainly from the East Indies, West Africa and Great Britain. In peacetime there is a steady exodus to domestic service and industry in South Africa, while recruiting into the British Army abroad has begun. The proportion of children therefore tends to be high.

The wartime garrison, housed in barracks at the top of Ladder Hill, included about 70 island recruits. Local enlistment ceased in the middle of 1944, and a number of men had returned to civilian work on the island.

Towns, Roads and Housing

The capital, Jamestown, is situated at sea level in the length of a narrow valley, and has 1,500 inhabitants in its crowded houses. Apart from villages in Half-tree Hollow, Longwood, and round the cable station at The Briars, the island

homes are widely scattered. The 60 miles of roads passable to motor traffic are mainly steep and stony. Traffic goes mostly by foot or donkey, and to a small extent by motor vehicle.

The typical island house consists of a row of two to four small rooms, each with an outside door. The walls are of stone with mud plaster and the woodwork suffers badly from the ravages of ants. Overcrowding is common and frequently gross. A Government building scheme is in progress but has not advanced enough to affect the acute shortage of houses. Water is obtained by hand from the nearest water tank or spring. Night-soil is collected in buckets, but the stony ground makes disposal difficult. Conditions in Jamestown, however, are much better with regard to water supply and drainage. The common pests are the house-fly and the rat. Domestic gardens are either absent or small.

Conditions Preceding the Epidemic

The conditions on the island at the time of the epidemic were unusual. Drought was affecting all areas, with failure of the potato and vegetable crops. Low stocks of flour had made strict bread rationing necessary. There was clinical evidence of vitamin B deficiency and little doubt that the average intake of vitamin C was below normal. A small epidemic of anthrax in cattle had subsided, though recently enough for many islanders to use the same word for cases of poliomyelitis.

Two weeks previous to the first case what was regarded as the annual outbreak of influenza had reached a very high peak (see graph). Most of the 385 cases had fever with headache, general aches and pains and a sense of weakness in the limbs; only one was admitted to hospital with this diagnosis. The outbreak had not subsided when the epidemic began, and it is probable that there were some cases of cross diagnosis between 'influenza' and abortive cases of poliomyelitis. Apart from the single case mentioned above, no case labelled influenza attended later with a specific muscular paralysis. This and the interval of three weeks between the peaks of the two infections suggest that the earlier outbreak was not a carrier wave, though it may in some way have prepared the ground for the coming epidemic.

The Course of the Epidemic

On the evening of November 14th, 1945, the first patient, a woman of 25, was taken ill in Jamestown with malaise and vomiting. This continued the next day, but the added fever, headache, backache, irritability and drowsiness were thought to be no more than symptoms of influenza. When seen first by a medical officer on the 16th, signs at the right base and a respiratory

Fig. 2.—Graph to show incidence by weeks of 'Influenza' (X) and of Poliomyelitis (P), abortive cases included.

rate of 40 led to a provisional diagnosis of pneumonia with septicaemia. Typical paralysis of the legs and respiration developed, however, and the correct diagnosis was made before death.

Possible Sources of Infection

To anticipate, there is no doubt that the strain of virus was one to which the islanders were highly susceptible and the European population almost immune. The last ship to call before the onset of the first case was H.M.T. *Reina del Pacifico* bound for Liverpool from Durban and Cape Town with 2,800 persons on board. The passengers were mainly service personnel, together with 350 women and children, for whose medical care I was chiefly responsible. Poliomyelitis was common in South Africa at this time. Apart from a few cases of measles the voyage was uneventful and no fresh invalids were transferred to hospital at Liverpool on October 28th.

The transport lay off Jamestown on October 14th. Several small parties of officers went ashore, myself included, but only one of the other ranks, a corporal who had previously been stationed in St. Helena. He obtained permission to visit his fiancée, the first patient, who developed symptoms 31 days later and died. This young woman continued on friendly terms with members of the garrison after his visit of some two hours.

The transport embarked a mixed contingent of British and St. Helena troops. Among the former was an artillery sergeant who reached his family in Ealing on October 29th. Eleven days later his daughter developed severe poliomyelitis and when admitted to Clayponds Isolation Hospital was the

first patient from the district for over a year. The father could not recall any personal illness like an abortive attack.

It is unlikely that the garrison provided the source of infection. Just before and during the epidemic the garrison was free from cases of obscure pyrexia, and in any case ample opportunity for any transmission of infection had occurred since the last overseas reinforcements three months previously.

It does appear significant that the first case, a fulminating one, was visited by a person less than a week out from South Africa, an endemic area. Though the suggested incubation period of 31 days is remarkably long, it is still less than the 35 days considered to be the upper limit by American workers.² In crowded Jamestown, however, the visit mentioned could not be regarded as an 'only possible exposure.' The Ealing infection was also compatible with the presence of carriers on board the transport.

Spread of the Epidemic (Table 1)

After the first death a few apparently trivial cases of illness were not recognized at first as poliomyelitis. A boy of five with fever and generalized spasm and twitches was thought to be suffering from the common *Ascaris* infection, but developed a temporary facial palsy. A boy of ten had obscure pain in the left axilla, and the lower half of the pectoral muscle was later found paralysed. A labourer, the only case admitted to hospital with a diagnosis of influenza, had paresis of the deltoids which was not recorded for a few days. But on November 29th, 11 days after the

first death, a second patient, gravely ill, was admitted and died on December 1st, a day on which a number of obvious cases reported. The first phase, lasting a fortnight, was now over. The epidemic reached a peak in the next two weeks, and then subsided to spend itself gradually over a period of six weeks. I arrived by H.M.S. *Shiel* from Cape Town on December 23rd and sailed again on February 1st.

TABLE 1.—TO SHOW INCIDENCE OF CASES BY WEEKS

Week ending	Fatal	Paralytic	Abortive	Totals
1945				
Nov. 21	1	3	0	4
" 28	1	6	3	10
Dec. 5	4	22	48	74
" 12	2	14	52	68
" 19	1	7	14	22
" 26	1	6	9	16
1946				
Jan. 2	0	2	6	8
" 9	1	1	2	4
" 16	0	2	3	5
" 23	0	2	2	4
" 30	0	0	1	1
Feb. 6	0	1	0	1
Totals	11	66	140	217

The epidemic list in order of onset showed intervals of nine and 12 days between the first Jamestown case and the first cases in the neighbouring areas of Half-tree Hollow and The Briars. The intervals for first infections in the distant Longwood and Sandy Bay areas were 13 and 17 days. Graphs for the three main districts showed a marked time lag in the Sandy Bay area, from whence came, as expected, the majority of late cases.

Method of Spread

The living traffic between Jamestown and the outlying districts is almost confined to adults and donkeys. There are long stretches of barren road, so that flies and rats are unlikely vectors. The only fresh foodstuffs distributed to the periphery are bread and fish. The latter may be carried exposed for long distances, but the epidemic lacked the explosive character associated with contamination of food. Water supplies are from numerous fresh sources. Milk is brought always into Jamestown. There was, in fact, no evidence to conflict with the opinion that the spread was commonly by contact with adult carriers.

Clinical Features

The symptoms and course of the illness were fairly typical and it is not proposed to make detailed comments. There were two noteworthy signs however.

The colour of the tongue was noticed to be characteristic by Dr. Lee and his colleagues early in the epidemic. Despite the pyrexia the tongue was moist and not furred. Its general colour was a cold bluish-grey, the shade obtained by pouring milk into blackcurrant juice. But round the margins small macules like flea-bites appeared and sometimes became confluent. These findings persisted for some two weeks, and were constant in all cases with paralysis. During the course of the epidemic very few 'positive tongues' were seen in persons with no symptoms of infection. But at Longwood on January 29th, Dr. Duncan examined 49 school children, all of whom were house contacts, and found that 27 had the type of tongue described.

The odour of the faeces was also characteristic. Several patients volunteered that the odour was offensive, like rotting vegetables, or like flax waste. The nursing staff in particular noticed the change from normal as many patients required enemata. The odour was independent of consistency and persisted for several days after the fall in temperature.

Age, Sex and Race (Table 2)

Reference to Table 2 shows the very low incidence in children up to five years. No case was detected under one year, and there was only one case of severe paralysis in the whole of the first five-year period. The brunt of the infection fell on the three next five-year periods, with most deaths in the 15-19 age-group.

TABLE 2.—TO SHOW AGE-INCIDENCE BY FIVE-YEAR PERIODS, AND SEX INCIDENCE

Age-Groups	Fatal	Paralytic	Abortive	Totals
0-4	0	5	16	21
-9	1	19	33	53
-14	2	13	34	49
-19	5	15	31	51
-24	0	8	12	20
-29	2	2	6	10
-34	0	1	4	5
-39	1	3	3	7
-44	0	0	0	0
-49	0	0	1	1
M.	3	38	60	101
F.	8	28	80	116
Totals	11	66	140	217

A striking contrast is afforded with the civilian epidemic in Malta, when 397 cases of paralysis occurred under five years and only 29 above that age.³ Corresponding figures here are 5 and 61.

The only European patient was a girl of ten living at the cable station who had an abortive infection. All others were islanders.

Abortive Cases

Abortive cases were numerous and well defined clinically. The epidemic list totalled 217. This included 11 deaths and 66 cases of paralysis. The remainder, 140, or roughly two-thirds of the total number, were cases with the criteria of infection but no definite paralysis. Many showed general weakness and inability to sit up for two or three days. Those cases admitted to hospital were quite indistinguishable from pre-paralytic cases. Two typical patients had lumbar puncture performed and cell counts of the order of 20 and 70 were found.

By no means all the abortive cases reported, as a number were treated in their homes with island remedies. The current out-patient organization, however, kept down the number of patients so missed. Cases presenting insufficient symptoms to warrant inclusion in the epidemic list were fairly numerous.

The profusion of abortive cases became a serious problem. Thus an expectant mother, thought to have a mild infection, was sent home where she died. On the other hand many patients who proved abortive had to be admitted, especially from outlying districts, and retained in the crowded Civil Hospital till the risk of paralysis was over.

Deaths

Fatal cases numbered 11, i.e. 14.3 per cent. of the total paralytic cases. The average time of death from the onset was 4.3 days, with limits of one and eight days.

Paralytic Cases

These totalled 66. With fatal cases included, the attack rate for paralysis was the high one of 15.4 per 1,000. By January 31st, 28 cases remained paralysed and requiring orthopaedic attention. The distribution of paralysis was a common one, with arms affected rather more than trunk muscles, and paralysis in the legs exceeding the total of other regions. Unilateral facial paralysis was observed in five cases, but was either transient or partial.

An estimate of the final extent of paralysis is as follows, counting severe paralysis of one limb or of the trunk muscles as a unit:—

Three to four units—two cases; two to three units—six cases; one to two units—five cases; less than one unit—15 cases.

Incubation Periods

A few cases of value from this aspect occurred early in the epidemic.

(a) Short and (?) only possible exposure. The long period of 31 days for the first case has already been discussed.

(b) Maximum exposure. The Ealing case developed after 11 days. A patient and a clerk in the Civil Hospital developed severe infections 12 and 18 days respectively after the admission of the first case.

(c) Minimum exposure. The second fatal case developed after the whole family had been isolated for four days.

Methods of Control

As soon as succeeding cases of obvious poliomyelitis were diagnosed, the disease was made notifiable, hospital treatment was made free, and measures restricting congregations of people were adopted. The schools being already closed from 'influenza,' church services and cinemas were discontinued, and gatherings of more than four persons, whether in shops, public houses or vehicles, were forbidden. The garrison was confined to barracks, a measure which many of the soldiers had already adopted. A review of the restrictions suggests that in view of the probable high susceptibility of the islanders, the stern warning of the first fatal case would have justified immediate action. All restrictions were lifted on January 26th, by which time the epidemic had subsided. Certificates of fitness were required of all children returning to school, and this gave an opportunity to detect unreported cases of paralysis.

Summary

The St. Helena epidemic of poliomyelitis affected a virgin island population. It commenced in Jamestown in November, 1945, and after some delay spread to the outlying districts. There was some evidence that the virus was introduced from South Africa, an endemic area. The incubation period of the first case may have been 31 days. The highest incidence occurred in the three age-groups between five and 19. Abortive cases numbered two-thirds of the total and, when included, gave an all-over rate of recorded infection of 4.4 per cent. Seventy-seven cases were paralysed, giving an attack rate of 15.4 per 1,000*. Eleven fatal cases gave a death-rate of 14.3 per cent. of all paralytic cases.

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* NOTE.—This figure has been corrected to agree with the population given in a recent census.