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ARCADIO RODANICHE AND ENID C. DE RODANICHE

*The Santo Tomas Hospital and the Gorgas Memorial Laboratory, Panama, R. P.*

# AN EPIDEMIC OF ACUTE ANTERIOR POLIOMYELITIS IN PANAMA IN 1950-1951

ARCADIO RODANICHE AND ENID C. DE RODANICHE

*The Santo Tomas Hospital and the Gorgas Memorial Laboratory, Panama, R. P.*

In recent years attention has been focused on the occurrence of epidemics of acute anterior poliomyelitis in tropical countries where the disease previously was known to exist only in sporadic form or had escaped recognition entirely. Data concerning poliomyelitis as observed in the tropics has been ably reviewed by Rhodes (1948), Van Rooyen and Rhodes (1948) and Hammon (1949). Such epidemics have been characterized by a tendency to affect primarily infants, a type of incidence usually considered as indicative of a high degree of immunity in the older age groups due to repeated exposure to the etiologic agent, in spite of the low recorded incidence of the clinical disease. In the present report we wish to describe briefly an epidemic of acute anterior poliomyelitis which began in Panama, R.P. in August of 1950 and conformed to the pattern noted above. Three strains of the virus were isolated from suitable patients and studied.

Accurate statistical data concerning the prevalence of infantile paralysis in the Republic of Panama are not available. A total of 44 cases were reported to the Department of Health from 1943 to 1949, the accuracy of the diagnosis of many of which may be questioned. Annual distribution of cases varied between 2 and 6 with the exception of 1947 when 20 cases were reported. Hernandez (1948) noted the occurrence of an outbreak of some 20 additional cases in the Province of Chiriqui in the last months of 1946 and the beginning of 1947. It is thus obvious that 1947 was a year of increased prevalence. In the Canal Zone, Stevenson (1951) reported a total of 143 cases of local origin treated between 1903 and 1950. These figures indicate that clinical poliomyelitis has been present at a low endemic level in Panama for many years. However, the number of cases had never been sufficiently large to attract the attention of the medical profession in general or of the public. Many competent physicians and most of the lay population were unaware of the previous existence of the disease in the Republic and regarded its occurrence in 1950-1951 as entirely without precedent.

An effort was made to hospitalize all cases occurring in the Republic of Panama in the largest public hospital, Santo Tomas. From August 1950 to April 1951 a total of 133 patients with poliomyelitis were hospitalized in Panama. There were 9 deaths. During this epidemic period, Dr. G. M. Stevenson informs in a personal communication that 9 Panama residents were hospitalized in the Canal Zone, with one death. These figures give a total morbidity of 142 for the Republic or 18 per 100,000 and a mortality of 7 per cent. For the District of Panama where the great majority of the cases occurred, the morbidity rate was 51 per 100,000. We shall confine the remainder of our discussion to the 133 cases hospitalized in the Republic, for which we have more complete data.

The epidemic began in the poor and overcrowded district of Chorrillo in

the City of Panama, the first patient being a one year old infant, Arias, who died August 5, 1950, 12 hours after admission to the hospital and 3 days after the onset of illness with fever and catarrhal symptoms. Clinical, pathological and laboratory data all supported a diagnosis of acute anterior poliomyelitis and a strain of the virus was isolated from the spinal cord, thus providing the first incontrovertibly established diagnosis for the Republic. The second clinical case appeared in the same neighborhood in September. The number of cases then increased rapidly to reach a peak in January of 1951. In Panama the winter or rainy season extends from May to December and the summer or dry season from January until April. Thus, the epidemic began near the middle of the rainy season and reached a peak near the beginning of the dry season. A distribution of the cases according to the month of admission is presented below:

<i>Month</i>	<i>Year</i>	<i>No. cases</i>
August	1950	1
September	1950	1
October	1950	16
November	1950	27
December	1950	37
January	1951	40
February	1951	6
March	1951	3
April	1951	2

Age distribution showed greatest prevalence in children less than two years old, among whom 74 cases or 56 per cent of the total number were registered. Eighty-one per cent of all cases occurred in children less than 5 years old. The sex incidence was similar to that usually observed, there being a slight preponderance of males in a proportion of 69 or 51.9 per cent to 64 or 48.1 per cent. Data as to age distribution are presented below:

<i>Age</i>	<i>No. cases</i>	<i>Percentages</i>
1-11 months	20	15.0
12-23 months	54	40.6
2-5 years	33	24.9
6-10 years	13	9.8
11-15 years	6	4.5
19-39 years	7	5.3

The greater part of the cases, 91, were from the City of Panama and its suburbs. An additional 29 cases occurred in the Interior of the Republic within a radius of some 50 miles of the City, and the remaining 13 in the more distant provinces. Four of the cases occurring in the Interior had visited or resided in the City of Panama 7 to 12 days before developing symptoms.

Multiple family cases were observed in two instances. In one moderate-income urban family two sisters, aged 6 and 12 years respectively, both developed the paralytic form of the disease, the elder three weeks after the younger. In another almost destitute family living under extremely unsanitary conditions on the outskirts of the city three sisters aged 18 months, 32 months and 10 years

respectively were admitted to the hospital between the 24th and 27th of November, indicating a common source of contagion. The 10 year old girl showed the nonparalytic form of the disease, the other 2 the paralytic. The youngest sister is of especial interest as the only patient in this series who suffered a relapse, with flaccid paralysis of the legs on both hospitalizations. The relapse occurred 11 days after her dismissal as completely recovered on December 27. An attempt was made to isolate virus from her feces, collected on January 15, 1951. One *M. mulatta* was inoculated intraperitoneally and intranasally and six each of 2 day old white Swiss mice intraperitoneally without success.

In this series of 133 cases, 29 were classified as nonparalytic and 104 as paralytic, with 9 deaths all of bulbo-spinal type. Of the 95 nonfatal paralytic cases the following clinical classification was made:

<i>Type of paralysis</i>	<i>No. cases</i>
Quadriplegia and paralysis of the diaphragm.....	4
Quadriplegia.....	8
Paraplegia.....	57
Left inferior monoplegia.....	8
Right inferior monoplegia.....	6
Paraplegia and superior monoplegia.....	6
Right hemiplegia.....	2
Right superior monoplegia.....	1
Paralysis of the facial nerve.....	3

There were 24 patients with moderate to severe neuromuscular sequelae at the time of writing. Four of these show an apparently irreversible flaccid paraplegia, eight can walk with the aid of orthopedic appliances and 12 can use their impaired limb unaided. The prodromal symptoms followed more or less the classic pattern with fever and muscle pain present in all cases. Other symptoms observed in the order of their frequency were vomiting, catarrhal symptoms, diarrhea and headache.

With the exception of one case which was first seen in the late paralytic period, spinal fluid was obtained from all patients. Findings were typical of those usually observed. White cell counts varied from 15 to 1100, usually with a preponderance of lymphocytes. The average white cell count for all fluids examined was 60.

#### ISOLATION OF THE VIRUS

During the epidemic we isolated three strains of the virus of poliomyelitis, one from spinal cord and two from feces, all similar in animal pathogenicity. The first strain was obtained by the combined intracerebral, intraperitoneal and intranasal inoculation of one *Macaca mulatta* with a 10 per cent suspension of sections taken from various levels of the spinal cord of the first case, Arias, who died August 5, 1950, 12 hours after admission to the hospital. Six days after inoculation the animal developed fever followed in 3 days by the appearance of flaccid paralysis of the right leg which rapidly spread to involve also the left. At this time the animal was sacrificed. This strain has been maintained for a

total of 6 monkey passages. It proved infective for the Panama whiteface monkey, *Cebus capucinus imitator*, and two subspecies of the howler monkey, *Alouatta palliata palliata* and *A. palliata aequatorialis*, after two or more passages in the rhesus monkey. Experimental work on the susceptibility of the whiteface and howler monkeys has been reported elsewhere by one of the authors (Rodaniche, 1952). Suspensions of the original human cord and of monkey cord after each serial passage were injected intracerebrally into 6 infant and 6 adult white mice, 2 guinea pigs, 1 rabbit and 1 hamster with consistently negative results. Cotton rats became available after five monkey passages had been effected and two groups of 12 each were inoculated with fifth and sixth monkey passage virus respectively, also with negative results.

The other two strains were obtained from the feces of two patients with the paralytic form of the disease, Gordon, a 3 year old male and Diaz, a 2 year old male child, both admitted in October 1950. The feces were obtained 20 and 13 days respectively after the onset of symptoms. One *Macaca mulatta* was inoculated intraperitoneally with 10 cc. of an ether-treated 10 per cent fecal emulsion of each patient prepared according to the technique described by Paul (1948) and intranasally over a period of 5 days with 1 cc. in each nostril of the non-etherized fecal suspension. Prophylactic treatment against possible bacterial infection with sulfathiazole and penicillin was administered. Both animals developed febrile temperatures, tremors, muscular spasticity and extensive flaccid paralyzes involving all four limbs within 11 days of the first injection. Attempts to pass these two strains to mice, guinea pigs, rabbits and hamsters gave negative results. The Gordon strain was given one further passage in the rhesus monkey. The Diaz strain was not passaged further. Sections of the spinal cords of affected monkeys showed the characteristic pathological picture with focal and perivascular infiltration with round cells, chromatolysis and necrosis of neurons and neuronophagia, most prominent in the anterior horns.

The epidemic here described was caused by a monkey-pathogenic strain of virus. If we employ the system of nomenclature recommended by the Committee on Nomenclature of the National Foundation for Infantile Paralysis (1948), the strains isolated here may be designated Arias-Panama-1950-M<sub>6</sub>, Gordon-Panama-1950-M<sub>2</sub> and Diaz-Panama-1950-M<sub>1</sub>. The Arias strain was sent to a laboratory in the United States for immunological typing. Results are still pending.

Attempts to isolate a Coxsackie virus from feces of 8 paralytic and 2 non-paralytic patients by the inoculation of 3-4 day old white Swiss mice gave negative results.

#### DISCUSSION

The epidemic of acute anterior poliomyelitis here described is of interest as it represents the first large outbreak in the history of the Republic, although a markedly increased incidence was observed in 1947. It began in the City of Panama where the great majority of the total number of cases were registered. We have no explanation to offer for this sudden change in the epidemiology of

the disease here. Sanitary conditions in the city are fairly good and have been more or less unchanging during the last 20 years except that during the war there was a great influx of people with resultant overcrowding which has continued up to the present time. As Panama is a crossroads of the world it is quite possible that an imported strain was responsible for the outbreak. However, as most of the adult population must be presumed immune since it escaped the clinical disease, such a strain would have to be antigenically similar to the local one or ones, though of increased virulence. As virus has not been isolated in Panama previously we have no basis for antigenic comparison of the present strain. We agree with Rhodes (1948) that "there is urgent need for further epidemiological and laboratory investigation in tropical countries" concerning poliomyelitis.

#### SUMMARY

The largest outbreak of acute anterior poliomyelitis which has occurred in the Republic of Panama is described. Infants less than 2 years old constituted a majority of the cases. Three strains of virus were isolated, one from cord and two from feces. All showed strict monkey pathogenicity.

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