Cincinnati's Poliomyelitis Immunization and Surveillance Program in 1961

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FOR the second successive year a community-wide oral poliomyelitis vaccination program was carried out in 1961 in Cincinnati, Ohio. Surveillance for poliomyelitis cases during the summer months indicated that no indigenous cases had occurred in the city for the second summer in a row.

In the spring of 1960, about 73 percent of the preschool children and 79 percent of the school children in Cincinnati received type 1 oral poliomyelitis vaccine. Types 3 and 2 were given to the same groups later in the year, so that more than 70 percent of the school and preschool children received protection by this means against all three types of poliovirus (*1*). In addition, a large but unknown segment of the population had received the Salk vaccine. The effectiveness of the vaccination program was studied by Sabin (*2*), who found that in the summer of 1960 no poliomyelitis cases had occurred in Cincinnati residents. He and his colleagues investigated all cases of illness in the city that had any resemblance to the disease. Of the 57 cases reported for study, only 1 was confirmed as being caused by a poliovirus. This case was not indigenous to Cincinnati, the patient having arrived there only a few days before onset of illness.

This paper reports on the maintenance of herd immunity in 1961 and on the continued surveillance for poliomyelitis cases during the summer months of that year.

Immunization Program in 1961

In 1961, as in the previous year, oral poliomyelitis vaccine was administered both in the clinics of the health department and in the offices of practicing physicians. The oral vaccine was supplied by Dr. Albert B. Sabin and came from the same stock as the vaccine used in 1960. Between March 16 and March 28, type 1 vaccine was given to children of preschool age who had not received it in 1960 and to those born since January 1960 and over the age of 3 months (table 1). Babies 3 months of age or younger were not given the oral vaccine. The number of doses amounted to 18,845 for Cincinnati and the towns of Norwood and St. Bernard that are within the Cincinnati city boundaries. Vaccine from types 3 and 2 viruses were fed later to those who had had the first dose. Defaulters were sent postcards and 627 defaulters came to a later immunization clinic. Of the children who received type 1 vaccine, 77.7 percent returned for both their second and third doses (table 2).

Particular attention was given to infants born in 1960 who were between the ages of 3 months and 15 months in March 1961. In 1960, there had been 11,245 babies born in Cincinnati to city residents, with an additional 9,439 born to nonresidents. Assuming that migration into and migration out of Cincinnati of babies to be about equal, these birth figures closely represent the total population between the ages of 3 months and 15 months in March 1961. Vaccine was given to 7,161, or 63.6 percent, of the resident babies. Also immunized were 2,583 non-

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resident babies. Throughout the year, Salk vaccine was given to a number of school children who immigrated to Cincinnati, and private physicians also used a small amount of that vaccine. In this way the immunity of the children in the city was maintained close to the level achieved in 1960.

Surveillance

All hospitals in Cincinnati likely to admit possible cases of poliomyelitis were requested to inform the city health department of all patients with poliomyelitis-like illnesses. Litsey was assigned full time to investigation of such cases for the period June through August; during September and October, he investigated only those illnesses that seemed likely to be poliomyelitis after discussion with the physician reporting the illness. All cases of aseptic meningitis were tested for enteroviruses.

In each instance, a case history was taken, and specimens were collected for laboratory studies. All virus isolations and serologic tests were performed by the Ohio Department of Health laboratories in Columbus. In each instance, an attempt was made to isolate enteroviruses from feces collected on the first day of admission to the hospital. Serologic tests for mumps virus, arbor viruses, and leptospires were performed on paired acute-convalescent serums whenever the clinical condition indicated. Sometimes tests were not required since an alternate diagnosis would become obvious before there had been time to send the specimens for testing to the State laboratory. Specimens were stored in a freezer both in Cincinnati and Columbus but were shipped to Columbus without freezing during the half-day journey.

Table 1. Age distribution [1] of children [2] given type 1 oral poliovirus vaccine, by source of vaccination, Cincinnati, 1961

Age group	Total vaccinated	Source of vaccination	
		Clinics	Private physicians
All ages	18, 865	5, 578	13, 287
4–14 months	7, 161	1, 779	5, 382
15 months–5 years	9, 964	3, 135	6, 829
6 years and over	1, 740	664	1, 076

[1] Calculated from a sample of 2,000 records.
[2] City residents only.

Table 2. Percent of children given type 1 oral poliovirus vaccine who returned from vaccination with type 3 and type 2,[1] Cincinnati, 1961

Source of vaccination	Percent of children receiving—			
	Type 1	Type 3	Type 2	All 3 types
Total vaccinated	100	88. 35	78. 85	77. 7
Clinics	100	82. 3	93. 5	79. 0
Private physicians	100	94. 4	88. 2	87. 6

[1] Based on a random sample of 1,000 clinic records and 1,000 records from private physicians.

Laboratory Techniques

Fecal specimens were suspended in complete Hanks' balanced salt solution in approximately a 20 percent concentration and centrifuged at 2,000 rpm (900 g) for 30 minutes in the cold. The resulting supernatant was recentrifuged at 7,000 rpm (4000 g) for 30 minutes. This supernatant was mixed with streptomycin, penicillin, and mycostatin for 1 hour prior to inoculation to achieve a final concentration of 5 mg., 2,000 units, and 200 units per milliliter respectively. Monkey kidney and HeLa cell culture tubes were inoculated with 0.1 and 0.2 ml. quantities of the fecal extract and incubated for 1 week at 35° C. Tubes which showed evidence of cytopathogenicity were passed to new cell cultures, and those which showed cytopathogenicity were considered to contain viral agents. Identification of the agent was made by performing neutralization tests with group and type specific immune monkey serums, in monkey kidney or HeLa cell culture tubes. All stools and tissue culture fluids containing virus were held at −60° C. during intervals between tests.

Viral complement fixation tests were made by a modified Kolmer procedure with antigens obtained from commercial sources. Leptospiral titers were determined by agglutination tests with formalin-killed antigens of *Leptospira*

Table 3. Final diagnoses and virus isolations in 56 cases of poliomyelitis-like illnesses, Cincinnati, summer 1961

Diagnosis	Number of cases	Virus isolations
Poliomyelitis	[1] 1	Type 3.
Aseptic meningitis	42	
	(6)	Coxsackie B5.
	(4)	ECHO 9.
	(2)	ECHO 14.
	(1)	Adenovirus.
	(29)	None.
Mumps	2	
Guillain-Barré syndrome	2	
Bacterial meningitis	2	
Meningo-encephalitis	2	
Encephalitis	3	
Undetermined	2	

[1] Patient was in a Cincinnati hospital but was not a city resident.

icterohaemorrhagiae, *Leptospira canicola*, and *Leptospira pomona* prepared at the Ohio Department of Health laboratory.

Findings

A total of 56 possible poliomyelitis cases were reported, almost the same total as in 1960 when 57 such cases were reported and were studied by Sabin and co-workers. The diagnosis of poliomyelitis was confirmed in one instance by isolation of type 3 poliovirus from the feces. The patient had been admitted to a Cincinnati hospital from the city of Hamilton, Butler County, and was therefore not a resident of Cincinnati.

A second case was diagnosed clinically as poliomyelitis by the reporting physician, but this was not supported by the laboratory findings. Paralysis of a leg was transitory, no virus was isolated, and the serologic findings did not support the diagnosis. The patient had had a course of injections with Salk vaccine the previous year, and both acute and convalescent serums had the same low titer antibodies. Even if the diagnosis had been confirmed, the case was not indigenous to Cincinnati since the patient resided about 30 miles away in another county.

The final diagnoses of the 56 reported cases are given in table 3. An interesting point is the large number of cases of aseptic meningitis reported and the enteroviruses recovered from them. The two cases of mumps encephalitis had significant rising titers of antibodies in paired serums. One possible case of leptospirosis produced an illness consistent with that diagnosis and a significant antibody titer against *Leptospira* on the 7th day of illness, but a second specimen collected 3 months later had no antibodies against *Leptospira*, and thus the case was diagnosed as aseptic meningitis.

Discussion

Cincinnati was the first city in the United States with a population of at least a half million to undertake a communitywide poliomyelitis vaccination program using Sabin oral vaccine. The experience in 1961 showed, first, that it is possible to continue this program even after the novelty of the first immunization has worn

Table 4. Month of occurrence of aseptic meningitis cases and virus isolations in such cases, surveillance of poliomyelitis-like illnesses, Cincinnati, June–November 1961

Month	Number of cases	Virus isolations				
		Coxsackie B5	ECHO 9	ECHO 14	Adeno-virus	Total
June	0	0	0	0	0	0
July	1	0	0	0	0	0
August	14	1	1	0	1	3
September	19	4	2	0	0	6
October	8	1	1	2	0	4
November	0	0	0	0	0	0
Total	42	6	4	2	1	13

off and, second, that the vaccine is apparently successful in eliminating the disease. The incidence of the disease in the country as a whole was at a low level during 1961, but a city the size of Cincinnati could have been expected to have at least 5 or 10 cases without this special program of oral vaccination. There were 281 cases reported for the whole State in 1961. The virus was obviously active in the populations adjoining the city, as shown by the isolation of type 3 virus from the patient from Butler County, which is within 20 miles of Cincinnati.

The reporting of 42 cases of aseptic meningitis shows that this disease is more common than previously expected. The association of certain enteroviruses with aseptic meningitis has of course been well established, although the mere presence of a virus in the feces of patients does not necessarily prove a causal relationship. In 1960 Sabin found that a substantial number of healthy children in Cincinnati carried enteroviruses, with a carrier rate of about 4 percent in April 1960 rising to about 20 percent in August and September 1960. The carrier rates found by Sabin in 1960 correlate well with the chronology of aseptic meningitis cases and associated enterovirus infections found in the 1961 poliomyelitis surveillance program (table 4).

Summary

For the second year, the herd immunity of Cincinnati against poliomyelitis virus was maintained by use of the Sabin oral vaccine in 1961. For the second summer, no case indigenous to the city was discovered. In the investigation of 56 cases of poliomyelitis-like illnesses, 42 cases of aseptic meningitis were studied. Enteroviruses were recovered from the feces of 12 of the patients and an unidentified adenovirus was isolated from 1 patient.

REFERENCES

(*1*) Porter, E. R., and Wehr, R. E.: Oral poliomyelitis vaccine program in Cincinnati. Pub. Health Rep. 76: 369–374, May 1961.

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Oral Poliomyelitis Immunization Program in Florida

A two-dose oral poliomyelitis immunization program using a trivalent Sabin vaccine is underway in Tampa, Fla. Sponsors of the communitywide campaign are the Hillsborough County Health Department, the Hillsborough County Medical Association, and the Florida State Board of Health. The objective of the program is saturation of the entire population of 250,000 under 40 years of age, with special emphasis on preschool children in low-income families.

During the first 7-day feeding period in February, 178,000 received the vaccine. Eight weeks later the second dose was offered and 196,000 were fed. Among those below the age of 5 years, 55 percent were fed during the first period and 62 percent during the second.

Serum samples are being collected from 1,500 preschool children to determine antibody conversion after vaccination. Other scientific studies include extensive surveillance for associated neurological illness (none has been observed), collection of sewage and rectal swabs to measure community enterovirus excretion patterns, and research in behavior patterns to determine factors related to community and individual acceptance of the oral vaccine.—Dr. John S. Neill, *director, Hillsborough County Health Department, Tampa, Fla.*