ANNUAL SUMMARY 1973
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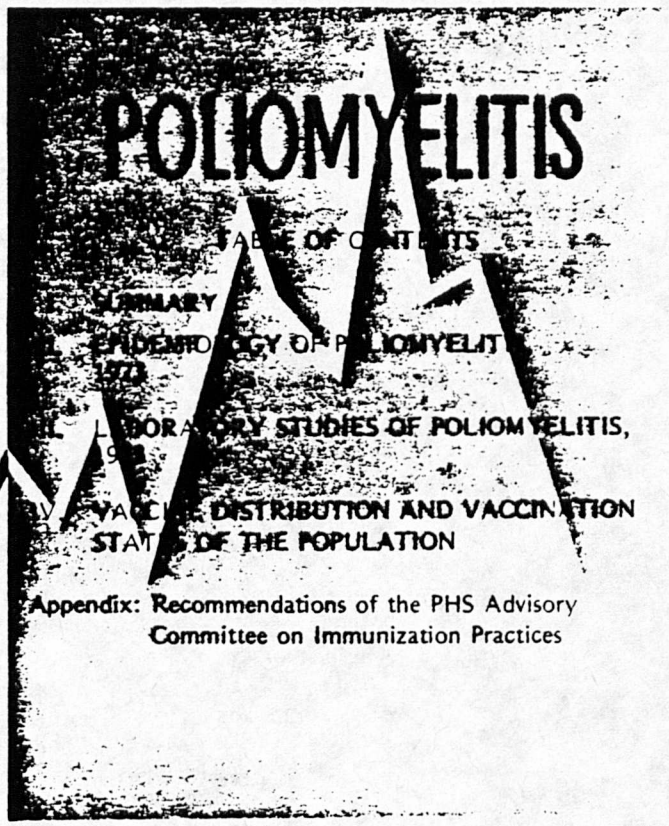
CENTER FOR DISEASE CONTROL

NEUROTROPIC DISEASES

SURVEILLANCE



U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE

PREFACE

Summarized in this report is information received from state health departments, university investigators, virology laboratories, and other pertinent sources, domestic and foreign. Much of the information is preliminary. It is intended primarily for the use of those with responsibility for disease control activities. Anyone desiring to quote this report should contact the original investigator for confirmation and interpretation.

Contributions to this report are most welcome. Please address:

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I. SUMMARY

Fourteen cases of paralytic poliomyelitis with 3 known deaths were reported in the United States in 1973. This is the lowest annual total reported to the Center for Disease Control (CDC) since poliomyelitis surveillance began in 1955. The cases were scattered among 9 states. Virginia, Maryland, and California with 2 cases each were the only states to report more than 1 case. Most (86%) of the cases were in persons under 18 years of age and 64% were in preschool-age children. The 3 types of poliovirus were implicated in varying combinations with similar frequencies. Nine of the 14 cases (64%) were vaccine-associated (5 "recipient vaccine-associated" and 4 "contact vaccine-associated"), representing the highest percentage of vaccine-associated cases yet reported.

The National Immunization Survey showed a continued decline in proportion of preschool-age children who received at least 3 doses of polio vaccine. In 1973, 60.4% of preschool children were reported as having received 3 or more doses of trivalent oral polio vaccine (TOPV). The percent with no immunization for polio continued to increase, reaching its highest level since 1965.

II. EPIDEMIOLOGY OF POLIOMYELITIS, 1973

This 19th Annual Report of Poliomyelitis Surveillance summarizes selected epidemiologic and laboratory characteristics of poliomyelitis cases reported for 1973. These data are based on official reports from the states to the Bureau of Epidemiology, CDC.

A. Total Cases Associated with Paralytic Poliomyelitis, 1973

In 1973, the "best available paralytic poliomyelitis case count" was 14 cases. This designation, used since 1958 as representation of paralytic illness of poliovirus etiology, includes clinically and epidemiologically compatible cases known to have residual paralysis at 60 days, plus those cases reported initially as paralytic poliomyelitis for which no 60-day report on residual paralysis was available. Limiting the summary count to those cases with proven residual paralysis permits exclusion of cases with more transient weakness possibly due to ECHO, Coxsackie, or other viruses, although not proven as such. All 14 paralytic cases in 1973 had pathologic and/or virologic evidence supporting the diagnosis of poliomyelitis.

B. Characteristics of the Cases

The 14 cases reported in 1973 are the lowest annual total reported to CDC since 1955, when surveillance began (Figure 1). In 1973, cases occurred throughout the year instead of with the classic summer-fall peak (Figure 2). Cases were scattered: Virginia, Maryland, and California each reported 2 cases; Maine, Pennsylvania, Alabama, Iowa, Vermont, Florida, Washington, and Hawaii each reported 1 case.

Severity of residual paralysis in the cases does not vary significantly from the trend of the past 4 years (Table 1). Comparisons of age distributions from 1962 through 1973 are presented in Table 2. In 1973, only 2 (14%) cases were in adults and 9 (64%) were in preschool-age children.

One case was temporally related to travel outside the United States. A 56-year-old man from California had the onset of symptoms soon after returning from Mexico. The case was associated with a wild type 1 stool isolate.

C. "Type Specific Etiology" of Poliovirus Associated with 1973 Paralytic Cases

The basis for establishing a type-specific etiology for the 1973 paralytic cases is summarized in Table 3. Of the 14 cases, 6 were confirmed by both viral isolation and a diagnostic (4-fold) rise or fall in serotype-specific antibody titer. Although the presence of an enterovirus in the alimentary tract does not constitute proof of an etiologic role, compatible illness and absence of evidence of another

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etiology has been accepted by the respective states as adequate documentation of etiology and is included in this summary as the probable agent. Therefore, 6 cases were designated by specific etiology on the basis of viral isolation alone. In 2 instances, diagnosis of paralytic poliomyelitis was based on clinical aspects alone. Both patients had had contact with recently vaccinated infants and had become ill with clinical poliomyelitis less than 60 days after contact (see below under vaccine-associated disease).

Fig. 1 BEST AVAILABLE PARALYTIC POLIOMYELITIS CASE COUNT, BY YEAR, UNITED STATES, 1958-1973

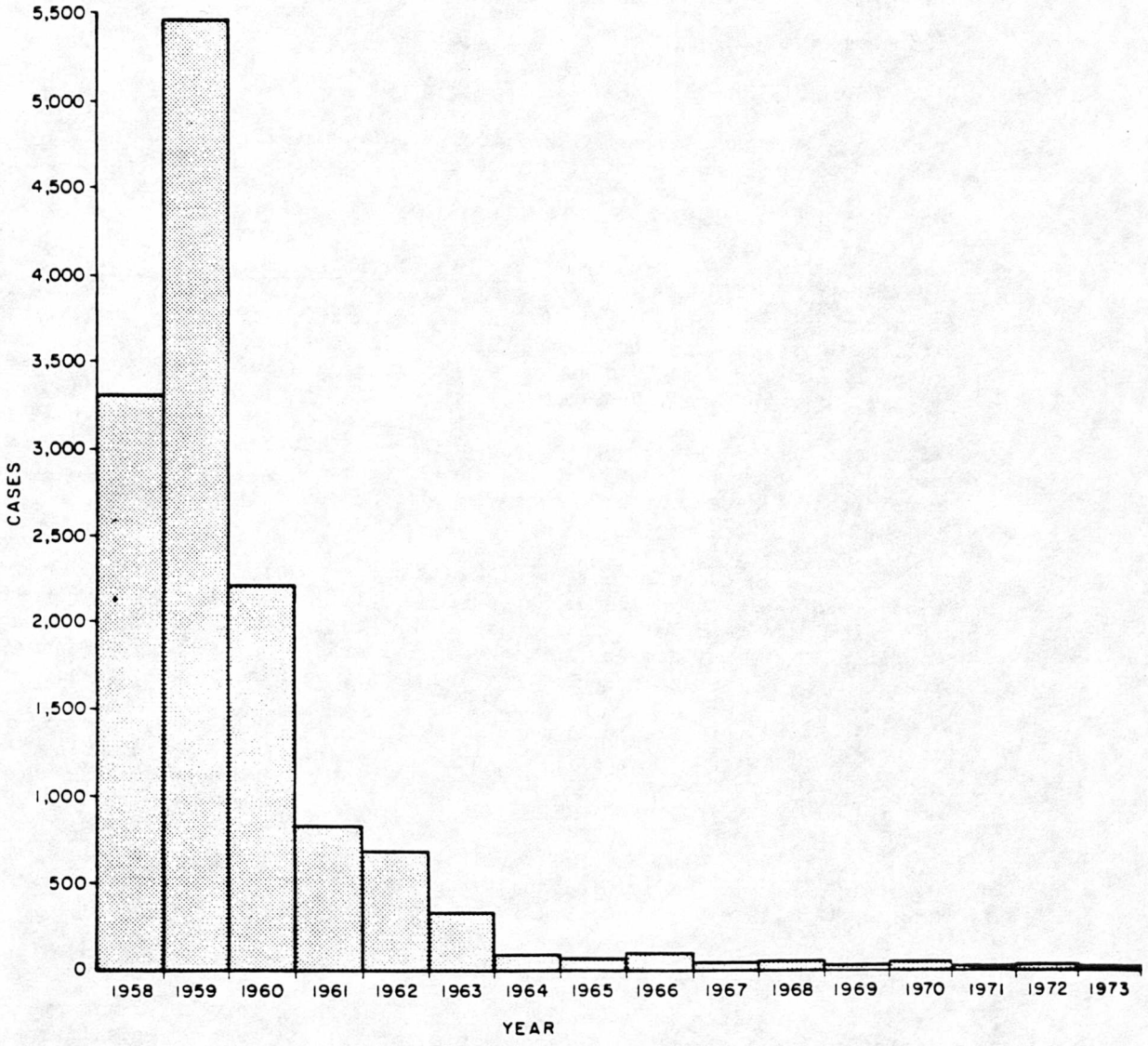

Fig 2 PARALYTIC POLIOMYELITIS CASES, BY MONTH OF ONSET, UNITED STATES, 1962-1973

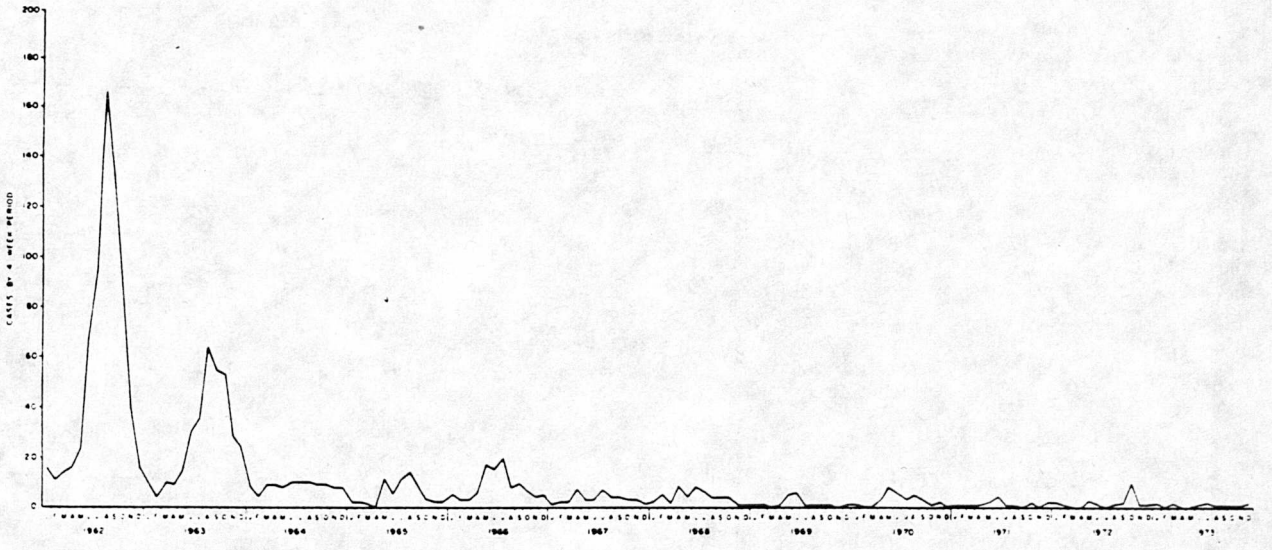

Table 1

Paralytic Poliomyelitis
By Status of Residual Paralysis at 60 Days*
1968-1973

60-Day Status	1968		1969		1970		1971		1972		1973	
	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%	Cases	%
Deceased	5	10	0	0	2	6	2	12	3	14	3	21
Paralysis												
Severe	8	17	4	22	1	3	3	12	5	23	5	36
Significant	18	38	11	58	21	66	9	53	9	41	4	29
Minor	10	21	3	15	3	10	3	12	5	23	0	0
Unknown	7	14	1	5	6	15	2	12	0	0	2	14
Total	48	100	19	100	33	100	19	101	22	100	14	100

* In 1971, status of residual paralysis is based on 1- to 11-month follow-up reports

Table 2

Paralytic Poliomyelitis Cases By Age Group, 1962-1973

	1962		1963		1964		1965		1966		1967		1968		1969		1970		1971		1972		1973	
Age	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
0-4	338	49	165	49	38	42	31	51	79	77	25	61	31	65	9	46	30	91	8	42	5	23	9	64
5-9	139	20	60	18	16	17	10	16	10	10	2	5	3	6	2	11	2	6	0	-	1	5	1	7
10-14	70	10	38	11	7	8	7	11	3	3	0	-	4	9	1	5	0	-	0	-	3	14	0	-
15-19	26	4	15	4	8	9	2	3	1	1	1	2	1	2	4	22	0	-	2	11	8	36	2	14
20-29	52	8	24	7	7	4	4	7	3	3	4	10	4	8	0	-	0	-	3	16	1	5	0	-
30-39	36	5	18	5	7	8	3	5	5	5	7	17	2	4	2	11	0	-	5	26	3	14	1	7
40+	22	3	8	2	11	12	4	7	1	1	2	5	3	6	1	5	1	3	1	5	1	5	1	7
Unknown	8	1	8	2	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Total	691		336		91		61		102		41		48		19		33		17		22		14	

Table 3

Paralytic Poliomyelitis
By Designation of "Etiologic" Poliovirus Type, 1973

	Polio-Virus Type 1	Polio-Virus Type 2	Polio-Virus Type 3	Multiple Isolates	Unknown	Total
Virus isolation and diagnostic titer change	1	1	0	4	0	6
Titer change as only laboratory confirmation	0	0	0	0	0	0
Virus isolation as only laboratory support	0	3	1	2	0	6
Diagnosis made on clinical and epidemiologic basis only--no evaluation of etiology possible	0	0	0	0	2	2
Total	1	4	1	6	2	14

Comparison of "etiologic" poliovirus for 1966-1973 (Table 4) shows that only 6 of the 14 (43%) could be classified by a single etiologic type. Six of the 14 (43%) had multiple viruses isolated and serologic titer changes. Multiple types of isolates and serologic change are a result of vaccine-associated cases.

Table 4

Paralytic Poliomyelitis Cases
By "Etiologic" Poliovirus Type, 1966-1973

Year	Type 1		Type 2		Type 3		Multiple		Unknown		Total Cases
	No.	%	No.	%	No.	%	No.	%	No.	%	
1966	60	59	13	13	6	6	0	0	23	22	102
1967	18	44	8	19	7	18	0	0	8	19	41
1968	27	56	7	15	4	8	0	0	10	21	48
1969	6	32	5	26	4	21	0	0	4	21	19
1970	28	85	4	12	1	3	0	0	0	0	33
1971	5	26	6	32	6	32	0	0	2	11	19
1972	14	64	0	0	3	14	4	18	1	5	22
1973	1	7	4	29	1	7	6	43	2	14	14

Tabulation of the 14 paralytic cases by age group and "etiologic" virus type (Table 5) shows that the 6 cases with known etiology are scattered throughout the age groups. Five of the 6 patients with multiple isolates were in the 0-4 age group, which correlates with those being recipient cases of vaccine-associated polio with multiple isolates or serologic changes.

Table 5

Paralytic Poliomyelitis Cases
By Age Group and "Etiologic" Poliovirus Type, 1973

Age Group	Poliovirus Type					
	1	2	3	Multiple	Unknown	Total
0-4	0	4	0	5	0	9
5-19	0	0	0	1	2	3
20-29	0	0	0	0	0	0
30-39	0	0	1	0	0	1
40+	1	0	0	0	0	1
Total	1	4	1	6	2	14

D. Viruses Associated with 1973 Paralytic Poliomyelitis Cases

In 1973, specimens were submitted for virus isolation in 13 of the 14 cases of paralytic poliomyelitis, and poliovirus was isolated from 11 of the 13 (Table 6). Although the percentage of successful isolations decreased to 61% from 68% in 1972, the significance of this figure is not known, since it could reflect increased numbers of samples tested or increased reporting of negative results.

Table 6

Paralytic Poliomyelitis
By Number of Specimens Submitted
And Results of Virus Isolation Attempts by Year, 1961-1973

Year	Best Available Paralytic Case Count	Cases with Specimens Submitted for Isolation		Cases with Poliovirus Isolated		% of Specimens Submitted in Which Isolation Successful
		No.	% of Total	No.	% of Total	
1961	829	481	58.0	382	46.1	79
1962	691	472	68.3	408	59.0	86
1963	336	242	72.0	197	58.6	81
1964	91	77	84.6	51	56.0	66
1965	61	50	81.9	38	62.3	76
1966	103	82	79.6	74	71.8	90
1967	40	31	77.5	29	72.5	93
1968	48	39	81.2	35	72.9	90
1969	19	16	84.2	14	73.7	88
1970	33	33	100	31	93.9	94
1971	19	17	89.5	14	73.7	82
1972	22	20	90.9	15	68.2	68
1973	14	13	92.9	11	78.6	61

For 1973, 9 stool specimens submitted from 10 cases were positive for poliovirus. Three cases had positive throat cultures, and poliovirus was isolated from the brain and spinal cord in 1 fatal case. Comparison of the frequency of isolation of each poliovirus type with the annual percentage of paralytic cases is shown in Table 7 for the years 1961-1973. In 1973, type 2 poliovirus was most frequently isolated.

Table 7

Paralytic Poliomyelitis Cases by Type of Poliovirus Isolated
And Percentage of Total Cases by Year, 1961-1973

Year	Number of Isolates				Percentage		
	Poliovirus Type				Poliovirus Type		
	1	2	3	Unknown	1	2	3
1961	231	6	145	0	60.5	1.6	37.9
1962	300	8	100	0	73.5	2.0	24.5
1963	160	6	31	0	81.2	3.0	15.7
1964	21	6	24	0	41.1	11.8	47.0
1965	19	8	11	1	50.0	21.1	28.9
1966	55	13	6	1	74.3	17.6	8.1
1967	16	6	7	0	55.2	20.7	24.1
1968	25	7	3	0	71.4	20.0	8.6
1969	5	5	4	0	34.6	34.6	30.8
1970	26	4	1	0	83.9	12.9	3.2
1971	5	4	5	0	35.7	28.6	35.7
1972	11[1,2]	1[1]	6[1,2]	0	61.1	5.5	33.3
1973	5	9	4	0	27.8	50.0	22.2

1 Includes 1 case with isolates of all 3 types
2 Includes 1 case with isolates of types 1 and 3

E. Association of Immunization with Paralytic Poliomyelitis

1. Paralytic Poliomyelitis in Recent Vaccine Recipients

In July 1964, the Surgeon General's Special Advisory Committee reviewed all cases of paralytic disease consistent with poliomyelitis that had occurred within 30 days after receipt of any oral poliovirus vaccine (OPV). At that time, 57 cases were judged to be compatible with vaccine association by virtue of meeting the following criteria:

a. Onset of illness between 4 and 30 days after being fed the specific vaccine, plus onset of paralysis not sooner than 6 days after the feeding.

b. Significant residual lower motor neuron paralysis.

c. Laboratory data not inconsistent with respect to multiplication of the vaccine virus fed.

d. No evidence of other motor neuron disease, definite sensory loss, or progression (or recurrence) of paralytic disease 1 month or more after onset.

Cases reported since 1964 have not been formally reviewed by an advisory committee. However, the Viral Diseases Division continues to use the above criteria to determine whether a case is consistent with vaccine association, recognizing that such association does not necessarily imply a causal relationship. Cases fulfilling the above criteria are termed "recipient vaccine-associated cases."

In 1973, 5 recipient vaccine-associated cases were reported to CDC (Table 8). All received trivalent oral polio vaccine (TOPV). The interval from receipt of vaccine to onset of illness varied from 7 to 21 days. Of the 5 cases, 3 had received no immunizations against polio, 1 had received 2 injections of inactivated poliovirus vaccine (IPV), and 1 had received 1 dose of TOPV in the same year. All 5 were 6 years of age or younger; 3 were female and 2 were male. The residual in the cases was either significant (2 cases), or severe (3 cases). Laboratory findings on the cases are included in Table 8.

Table 8

Paralytic Disease in Vaccine Recipients, 1973

State	Age	Sex	Prior Immun	Type Vacc Admin	Interval Admin to Onset	Patient's Isolation Type	Antigenic & RCT* Char**	4-fold Titer Rise	Residual Paralysis
Hawaii	8 mo	M	0	TOPV	10 days	2 3	wild -/- vacc +/+-	yes yes	significant
Md	4 mo	M	0	TOPV	21 days	2	wild -/-	yes	significant
Maine	3 yr	F	0	TOPV	21 days	1 2	intermed -/- intermed +-/-	yes yes	severe
Md	6 yr	F	2 IPV	TOPV	11 days	3	vacc +/+-	yes (Types 1,2)	severe
Ala	8 mo	F	1 TOPV	TOPV	7 days	1 2	vacc -/- wild -/-	none	severe

* Replication capacity at temperatures of 39.2°C and 39.9°C
** Laboratory testing done by CDC

Three additional patients received TOPV several months before onset of illness. In all, underlying immune deficiencies were subsequently noted. The first patient was an 8-month-old from Washington. After immunization in April and July 1973, it was determined that he had hypogammaglobulinemia. Onset of illness and paralysis began on October 30, 1973. A combined humoral and cellular immunodeficiency was demonstrated through laboratory testing. All 3 polio types were isolated repeatedly with a nonvaccine type 2 isolate being obtained as late as April 1974. The second patient was a 10-month-old female from Virginia who had been immunized with TOPV in May, June, and August 1973. She was later diagnosed as having cartilage-hair hypoplasia, with a combined immunodeficiency involving both B cell and T cell lymphocytic lines. In November, a clinical illness compatible with poliomyelitis began. Type 2 poliovirus (not vaccine-like) was isolated from the brain and spinal cord obtained at autopsy. Histopathologic findings were consistent with the diagnosis of vaccine-related polioencephalomyelitis. The third patient had Swiss-type immunodeficiency. This 9-month-old female had received TOPV at 3 months of age and died when 10 months old. Pathologic changes of polio were found histologically at autopsy.

The classification of these last 3 cases is difficult, since they had underlying immunodeficiency disorders. Poliovirus can be excreted for a longer time in cases with immune deficiencies. It is difficult to judge the probability of reversion of the vaccine virus to a wild type in the compromised host. No known environmental

sources of poliovirus were apparent in the cases. It is possible that all 3 cases were recipient vaccine-associated diseases with a prolonged interval of onset secondary to an underlying immunological defect. However, a wild virus etiology cannot be excluded.

2. Paralytic Poliomyelitis in Contacts of Recent Recipients of Vaccine

In addition to the group noted above, cases of paralytic illness have also occurred in persons with a history of close physical contact with recent OPV recipients. The working definition of these contact vaccine-associated cases is that 1) onset of illness occurred between 4 and 60 days after polio vaccine was fed to a recipient in contact with the case, 2) contact occurred within 30 days prior to the onset of illness, and 3) criteria b, c, and d in the definition of a "recipient vaccine-association" case apply.

In 1973, 4 contact vaccine-associated cases were reported (Table 9). Two patients were males. Three of the 4 were adults; the other was a 17-month-old boy. Three of the 4 were unvaccinated; 1 had received 1 dose of IPV. A vaccine-type virus was found in the 2 specimens submitted for laboratory testing. The interval from receipt of vaccine by the contact to onset of illness in the patient varied from 36 to 53 days.

Table 9

Paralytic Disease in Close Contacts of Vaccine Recipients, 1973

State	Age	Sex	Prior Immun	Contact Relationship	Contact Vacc Admin	Interval Admin to Onset	Pt's Isol Type	Antigenic & RCT Char	4-fold Titer Rise	Residual Paralysis
Va	36 yr	M	1 IPV	son	TOPV	36 days	3	Vacc +/+	yes	severe
Pa	17 mo	M	0	neighbor	TOPV	40 days	1 2	Inter +-/- wild -/-	yes no	significant
Iowa	18 yr	F	0	son	TOPV	46 days	none		no	significant
Cal	18 yr	F	0	cousin	TOPV	53 days	none		no	severe

Nine of the 14 cases (64%) of poliomyelitis in 1973 were vaccine-associated. None had been adequately vaccinated previously. These findings are consistent with the hypothesis that the increasing percentage of vaccine-associated paralytic poliomyelitis is a result of an increasing ability to find these cases as well as a marked drop in wild type paralytic poliomyelitis. Recipient cases continue to be found almost solely in younger age groups since adults are not receiving routine immunization. Contact cases continue to occur in unimmunized adults as well as in children.

With fewer cases of paralytic poliomyelitis and more sophisticated laboratory methods of determining immunodeficiency diseases, more cases of polio are being found in children with immunodeficiencies diagnosed after immunization. Patients with suspected or known immunodeficiency disorders should not be given live polio vaccine.

The experience of recipients and their contacts with respect to contracting vaccine-associated paralytic disease can be expressed in terms of cases per million doses of vaccine distributed (Table 10). These statistics provide a useful basis for comparing trends. Such rates are not so useful for describing the risks to recipients and their contacts, because there are no satisfactory estimates of the number of doses actually received or the number of susceptible people who contact vaccine recipients. These rates are given for 1961-1964 and 1965-1973, because after 1964 there was a general curtailing of routine immunization for adults, as recommended by the Public Health Service Advisory Committee on Immunization Practices (ACIP), and a shift in emphasis from mass immunization campaigns and community-wide programs to routine immunization of infants. TOPV then became the most widely used oral poliovirus vaccine. There is a continuation of the trend for the past 2 years of a lower incidence of recipient than contact-associated disease.

Table 10

Rates of Vaccine-Associated Paralytic Polio
For Known Recipients and Contacts, United States, 1961-1973

Vaccine	Period	Est. Doses Distributed in Millions	Recipient Cases	Recipient Rate/Million*	Contact Cases	Contact Rate/Million*
MOPV-1	1961-64	109 (1)	16	0.147	0	0
	1965-73	8.76	1	0.114	2	0.228
MOPV-2	1961-64	104 (1)	2	0.019	0	0
	1965-73	6.96	0	0	2	0.287
MOPV-3	1961-64	105 (1)	39	0.371	3	0.029
	1965-73	7.46	6	0.804	0	0
ALL MOPV	1961-64	318 (1)	57	0.179	3	0.009
	1965-73	23.2	7	0.302	4	0.172
TOPV	1961-64	28.2	5	0.177	0	0
	1965-73	207	13	0.063	40	0.193
ALL OPV	1961-64	346	62	0.179	3	0.009
	1965-73	230	20	0.087	46 (2)	0.200

* Doses of Vaccine

(1) Sources of distribution data: State Health Departments and PHS Regional Offices before June 1962 and CDC subsequently

(2) Includes 2 cases for which type of vaccine administered to recipient is unknown during 1972 when TOPV was the only vaccine of significant distribution

3. Vaccine Failures

A "vaccine failure" is defined as paralytic disease attributed to poliovirus infection occurring in a person who has previously received "adequate immunization." The ACIP defines an "adequate" series as 4 or more doses of IPV, 3 doses of MOPV plus 1 of TOPV, or 3 doses of TOPV at appropriate intervals (see Appendix). None of the patients in 1973 can be considered vaccine failures. Five of the 14 patients with reported paralytic polio in 1973 had received a dose of OPV prior to the dose associated with onset of illness (Table 11). In 3 of these, an immunodeficiency disease was determined as previously noted. A fourth received 1 dose of TOPV in September and then received a second dose in December, 1 week before onset of her illness. The fifth had an onset of illness 41 days after receipt of TOPV. Tests of immune response in these last 2 patients were not reported.

III. LABORATORY STUDIES OF POLIOMYELITIS, 1973

Laboratory techniques have been employed to differentiate "vaccine-like" from "not vaccine-like" strains of virus isolates. One of these tests, the modified Wecker intratypic serodifferentiation test, is based on certain antigenic characteristics of the virus strain. Another test, the "temperature marker" ("T" marker), is based on comparison of viral replication at different temperatures. In general, strains of poliovirus types 1 and 2 that are antigenically "vaccine-like" are usually associated with negative "T" markers, while this association is seen less frequently with poliovirus type 3. These tests usually establish with high probability the origin of the

virus isolated. However, because certain wild type 3 viruses are antigenically "vaccine-like," and because of the known antigenic and "T" marker changes which can occur, especially with vaccine type 1 virus, these tests do not definitely establish the origin of the virus isolated. Furthermore, these tests do not in any way indicate the neurovirulence of the isolated virus.

Table 11

Paralytic Poliomyelitis by Immunization Status of Persons With History of at Least 1 Immunization, 1973

State	Age	Sex	Prior OPV Doses	Prior OPV Type	Year of Last OPV Dose	Prior IPV Doses	Year of Last IPV Dose	Virus Type Implicated	Residual Disability
Va	36 yr	M	0			1	1961	3	severe
Md	6 yr	F	0			2	1967	multiple	severe
Ala	8 mo	F	1	TOPV	1973	0		multiple	severe
Wash*	8 mo	F	2	TOPV	1973	0		multiple	unknown
Va*	10 mo	F	3	TOPV	1973	0		2	death
Vt	9 mo	M	1	TOPV	1973	0		2	death
Fla	10 mo	F	2	TOPV	1973	0		2	unknown

* Patients with documented immunodeficiency diseases

IV. VACCINE DISTRIBUTION AND VACCINATION STATUS OF THE POPULATION

A. Vaccine Distribution

Two kinds of information indicative of the vaccination status of the population are available. One is the number of doses of polio vaccine distributed in the United States. These data, as summarized for 1962-1973 in Table 12, present the number of doses distributed (not administered) and reflect certain trends in immunization practices.

B. Vaccination Status

After 1963, the distribution of IPV steadily declined to the 1968 level of 2.7 million doses. Little or no IPV has been available for use in the United States since 1968. With the introduction of TOPV in 1963, use of MOPV diminished to the 1971 level of less than 1/3 million doses each of the 3 types. In effect, TOPV is the only poliovirus vaccine used in the United States. The number of doses continues to decline, reflecting a shift in emphasis from mass immunization campaigns and community-wide programs to routine immunization of infants and fewer vaccinations in the target population.

C. The 1973 Immunization Survey

A second approach to estimating immunization levels of the population involves a sample survey of the history of types and number of doses of vaccine received.* While this questionnaire method is not as accurate as serologic surveillance, it has proved useful in assessing the proportion of the population that can be expected to exhibit immunity to poliovirus infection. The 1973 Immunization Questionnaire did not include questions on IPV history. Therefore, Table 13 indicates data for the years 1965-1972 including both OPV and IPV immunization history, but for 1973 those data apply only to OPV.

*Communicable Disease Center: United States Immunization Survey-1973. Atlanta, CDC, October 1974

Table 12

Poliomyelitis Vaccines, Net Doses (Millions) Distributed, By Year, United States, 1962-1973

Poliomyelitis Vaccine	1962*	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Inactivated (IPV)	15.3	19.0	8.8	7.5	5.5	4.0	2.7	***	***	***	***	***
Live, Oral (OPV)												
Monovalent (MOPV)												
Type 1	33.1	38.7	24.9	4.7	1.4	1.3	0.5	0.4	.3	.2	***	***
Type 2	37.0	34.2	29.8	3.4	1.3	0.9	0.5	0.4	.2	.1	***	***
Type 3	13.7	54.2	28.4	3.7	1.4	1.0	0.6	0.4	.3	.2	***	***
Trivalent (TOPV)	--	4.2**	24.0	17.4	24.0	18.0	23.9	22.5	25.8	25.5	24.7	24.9
Total	99.1	150.3	115.9	36.7	33.6	25.2	28.2	23.7	26.6	25.9	24.7	24.9

* July-December (surveillance program began in July 1962)
** Production began in mid-1962
*** Not shown since fewer than 3 distributors reported

Table 13

Poliomyelitis Vaccine Immunization Status by Age Group (Under 15 Years) United States, 1965-1973*

	Percentage with ≥ 3 Doses of OPV			Percentage with No OPV Immunization		
	Age Group			Age Group		
Year	1-4	5-9	10-14	1-4	5-9	10-14
1965	73.9	89.9	92.1	9.9	3.0	2.1
1966	70.2	88.2	90.0	11.3	2.9	2.3
1967	70.9	88.3	89.7	11.7	3.1	2.2
1968	68.3	84.9	87.8	10.5	3.3	2.2
1969	67.7	83.6	85.7	10.2	3.2	2.3
1970	65.9	82.3	85.3	10.8	3.6	2.3
1971	67.3	81.2	83.9	8.6	3.3	2.6
1972	62.9	78.9	81.8	10.7	3.9	3.2
1973	60.4	71.4	69.3	14.0	9.5	10.9

* Data for 1965-1972 based on percentage of both OPV and IPV or neither OPV nor IPV

All age groups show a continued decline in immunization levels. Since 1973 data omit those with IPV immunization, the age groups of 5-9 and 10-14 years would be expected to have a higher percentage of adequate and partial immunization than is reflected by the statistics in Table 13. The percentage with no or incomplete OPV immunization documents the trend of decreasing immunization in all age groups.

The immunization history by economic status and age group under 10 for the United States central cities with a population greater than 350,000 is shown in Table 14. In the poverty areas of central cities, 61.7% of the 1-4 year age group received fewer than 3 doses of OPV, and after reaching school age, 36.3% received fewer than 3 doses of OPV. The decrease in immunity levels from 1972 data again is partially a reflection of the omission of IPV immunization history. However, in comparison, the poverty areas have a much lower rate of adequately immunized persons and a higher percentage with no OPV immunization than the non-poverty areas. These figures illustrate a continued need for an active immunization effort and a need for concentration on poverty areas.

Table 14

Poliovirus Vaccine Immunization History by Economic Status and Age Group (Under 10) For U.S. Central Cities With Population Greater than 250,000, 1973*

	Age Group	Population (Thousands)	Percentage** "Inadequately" Immunized	Percentage with No IPV or OPV Immunization
Poverty Areas	1-4	909	61.7	23.3
	5-9	1258	36.3	11.6
Non-Poverty Areas	1-4	2520	36.2	12.7
	5-9	3076	27.8	10.1

* Source - Communicable Disease Center: United States Immunization Survey-1972. Atlanta, CDC, September 1973

** <3 doses of OPV or <3 doses of IPV in acceptable primary series

JUNE 1972

RECOMMENDATION OF THE PUBLIC HEALTH SERVICE ADVISORY COMMITTEE ON IMMUNIZATION PRACTICES

POLIOMYELITIS VACCINE

INTRODUCTION

Widespread use of poliovirus vaccines since 1955 has resulted in the virtual elimination of paralytic poliomyelitis in the United States. To ensure continued freedom from the disease, it is necessary to pursue regular immunization of all children from early infancy.

Paralytic poliomyelitis declined from 18,308 cases in 1954 to 32 cases in 1970 and 19 cases in 1971. A national survey in 1971 showed that 77 percent of individuals 1-19 years old had received at least 3 doses of oral poliovirus vaccine*(OPV), inactivated poliovirus vaccine**(IPV), or both.

Nevertheless, low immunization rates still prevail in certain disadvantaged urban and rural groups, particularly for infants and young children born since the mass immunization campaigns conducted between 1958 and 1962. Most of the cases of paralytic poliomyelitis in recent years occurred in these populations.

With widespread use of poliovirus vaccine, laboratory surveillance of enteroviruses indicates that circulation of wild polioviruses has diminished markedly. It can be assumed that inapparent infections with wild strains will no longer contribute significantly to maintaining immunity; therefore, it is essential not only to continue active immunization programs for infants and children but also to make special efforts to raise the low immunization rates existing in certain other segments of the population.

POLIOVIRUS VACCINES

Between 1955, when IPV was introduced, and 1962, when live, attenuated vaccines became widely used, more than 400 million doses of IPV were distributed in the United States. Primary immunization with IPV plus regular booster doses provided a high degree of protection against paralytic disease.

OPV has almost completely replaced IPV in this country because it is easier to administer and produces an immune response like that induced by natural poliovirus infection.

Monovalent OPV types 1, 2, and 3 were widely used in the United States beginning in 1961, but they have generally been supplanted by trivalent OPV because of greater simplicity in scheduling and recordkeeping.

A primary series of 3 adequately spaced doses of trivalent OPV will produce an immune response to the 3 poliovirus types in well over 90 percent of recipients.

Very rarely, paralysis has occurred in recipients of OPV or in their close contacts within 2 months of its administration. During 1963-70, about 147 million doses of trivalent OPV were distributed in the United States. In the same 8-year period, 9 cases of "vaccine-associated" paralysis in recipients (0.06/million doses distributed) and 21 in contacts of recipients (0.14/million doses distributed) were reported.

In 1972, OPV produced in the WI-38 strain of human diploid cells was licensed in the United States. This vaccine is considered to be equivalent in safety and effectiveness to vaccine produced in primary rhesus monkey kidney cell culture.

VACCINE USAGE

Trivalent OPV—Primary Immunization

Infants: The 3-dose immunization series should be started at 6-12 weeks of age, commonly with the first dose of DTP. The second dose should be given not less than 6 and preferably 8 weeks later. The third dose is an integral part of primary immunization and should be administered 8-12 months after the second dose.

Children and adolescents: For unimmunized children and adolescents through high school age, the primary series is 3 doses. The first 2 should be given 6-8 weeks apart, and the third, 8-12 months after the second. If circumstances do not permit the optimal interval between the second and third doses, the third may be given as early as 6 weeks after the second.

Adults: Routine poliomyelitis immunization for adults residing in the continental United States is not necessary because of the extreme unlikelihood of exposure. However, an unimmunized adult at increased risk through contact with a known case or travel to areas where polio is epidemic or occurs regularly should receive trivalent OPV as indicated for children and adolescents. Persons employed in hospitals, medical laboratories, and sanitation facilities might also be at increased risk, especially if poliomyelitis is occurring in the area.

Pregnancy is not an indication for vaccine administration, nor is it a contraindication when protection is required.

Monovalent OPV—Primary Immunization

An alternative primary immunization is 1 dose of each of the 3 types of **monovalent** OPV given at 6-8 week intervals. A dose of **trivalent** OPV should be given

*Official names: (1) Poliovirus Vaccine, Live, Oral, Type 1, (2) Poliovirus Vaccine, Live, Oral, Type 2, (3) Poliovirus Vaccine, Live, Oral, Type 3, (4) Poliovirus Vaccine, Live, Oral, Trivalent.

**Official name: Poliomyelitis Vaccine.

8–12 months after the third dose of monovalent OPV to ensure adequate responses to all poliovirus types.

OPV–Booster Doses

Entering school: On entering kindergarten or first grade, all children who have completed the primary series of OPV should be given a single dose of trivalent OPV; others should complete the primary series.

There is no indication for routine booster doses of OPV beyond that given at the time of entering school.

Increased risk: A single dose of trivalent OPV can be administered to anyone who has completed the full primary series because of travel or occupational hazard as described above. The need for such an additional dose has not been established, but if there is uncertainty about the adequacy of existing protection, a single dose of trivalent OPV should be given.

Contraindications

Altered immune states: Infection with live, attenuated polioviruses might be potentiated by severe underlying diseases, such as leukemia, lymphoma, or generalized malignancy, or by lowered resistance, such as from therapy with steroids, alkylating drugs, antimetabolites, or radiation; therefore, vaccination of such patients should be avoided.

EPIDEMIC CONTROL

For operational purposes in the United States, an "epidemic" of poliomyelitis is defined as 2 or more cases caused by the same poliovirus type and occurring within a 4-week period in a circumscribed population, such as that of a city, county, or a metropolitan area. An epidemic can be controlled with either trivalent OPV, or, after identification of the responsible type of poliovirus, homotypic monovalent OPV. Within the epidemic area, all persons over 6 weeks of age who have not been completely immunized or whose immunization status is unknown should promptly receive OPV.

SIMULTANEOUS ADMINISTRATION OF LIVE VIRUS VACCINES

There are obvious practical advantages to administering 2 or more live virus vaccines simultaneously. Data from specific investigations are not yet sufficient to develop comprehensive recommendations on simultaneous use, but a summary of current experience, attitudes, and practices provides useful guidance.

It has been generally recommended that live virus vaccines be given at least 1 month apart whenever possible–the rationale for this being that more frequent and severe adverse reactions as well as diminished antibody responses otherwise might result. Field observations indicate, however, that with simultaneous administration of certain live virus vaccines, results of this type have been minimal or absent.

If the theoretically desirable 1-month interval is not feasible, as with the threat of concurrent exposures or disruption of immunization programs, the vaccines should preferably be given on the same day–at different sites for parenteral products. An interval of about 2 days to 2 weeks should be avoided because interference between the vaccine viruses is most likely then.

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STATE EPIDEMIOLOGISTS

Key to all disease surveillance activities are those in each State who serve the function as State Epidemiologists. Responsible for the collection, interpretation and transmission of data and epidemiologic information from their individual States, the State Epidemiologists perform a most vital role. Their major contributions to the evolution of this report are gratefully acknowledged.

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