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Pertussis: A Multicounty Outbreak

Forty-nine cases of pertussis (whooping cough) have been reported in Virginia during the months of January through November, 1983. This number exceeds the 29 cases reported in 1982 and the 10 cases reported in 1981.

Of these 49 cases, 20% were not laboratory confirmed but were reported by physicians based on the presence of clinical manifestations typical of pertussis. The remaining 80% were laboratory confirmed, mostly by fluorescent antibody testing of nasopharyngeal specimens (FA test); all were associated with a respiratory illness which included cough. Half of these cases (24) were reported from Brunswick County, Dinwiddie County, Mecklenburg County, Sussex County, and the City of Petersburg.

Sixty-nine percent of reported cases exhibited whooping, 38% were hospitalized, 16% had radiologic evidence of pneumonia, and none developed encephalopathy. There was, however, one death (2%).

Sixteen (35%) had received no diphtheria, pertussis, tetanus (DTP) immunizations. As shown in table 1, the proportion of patients who had received three or more doses of DTP vaccine increased with age.

The outbreak began in Brunswick County with the reporting of two cases by two physicians. The cases had onsets in late December, 1982 and early January, 1983 and both had paroxysmal coughing episodes associated with whooping. Following these and subsequent reports from the area, local and state health investigators began tracing contacts of cases and instituting chemoprophylaxis with erythromycin, where indicated. Although not ordinarily recommended as a routine procedure, some contacts identified early in this investigation were screened with the FA test.

A total of 181 cases and contacts were investigated in the localities affected by the outbreak and, of these, 158 (87%) were tested by FA. Fifty-one tests (32%) were positive. A positive FA test was more common among those with symptoms than those without (46/114 vs. 5/44, $p<0.001$ by Chi square). Twenty-four of the 51 FA positive individuals had respiratory symptoms including cough and were considered cases. Of the remaining 27 individuals, 22 had mild respiratory symptoms without cough, and 5 were asymptomatic; all were considered "FA positive contacts". The five asymptomatic persons remained well on follow-up; all, however, were treated with antibiotics. Four of the five were over 10 years of age.

Ten persons who had been found to be FA positive within the preceding two weeks and who had not yet received antibiotics were selected for culturing of nasopharyngeal specimens using Bordet-Gengou media containing methicillin for selective inhibition of normal nasopharyngeal flora. All 10 were also retested by FA. Two were still FA positive and one of these was culture positive; eight had become FA negative and only one of the eight was culture positive.

A second group, consisting of 15 children brought to an immunization clinic and whose parents gave verbal consent to testing, were screened with the FA test; some were also cultured for pertussis. Although all except one of these children had symptoms of an upper respiratory infection (URI), none was suspected to be suffering from pertussis. Twelve (80%) of the children were FA positive; four of these were also cultured and all grew *Bordetella pertussis*. Of the three who were FA negative one was cultured, yielding *B. pertussis*.

Editor's comment: Although the number of FA positive individuals identified in this outbreak was undoubtedly inflated by the intensive contact tracing and FA screening, the

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Table 1. Reported Cases of Pertussis by Age Group and Immunization History.

Age Group (years)	Number (patients)	Proportion who had received 3 or more doses of DTP vaccine
<1	14	0%
1-9	16	44%
10-19	19	83%

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outbreak was not an artifact of these efforts. If the increase in reports of pertussis were due solely to the intense screening and identification of otherwise unrecognized cases, then one would have expected to see a drop in the percentage of tests performed which were positive. As shown in figure 1, this did not occur. The mean percentage (±SD) of tests performed which were positive was 27±7 for the outbreak period (January through April) and 28±15 for the endemic period (October through December of 1982 and May through November of 1983).

The possibility was entertained that this was a "pseudo-outbreak" due to the occurrence of false positive FA tests from cross reaction or nonspecific fluorescence. Indeed, the reason for the discrepancy between the number of positive FA tests (Figure 1) and the number of reported cases of pertussis is that investigators regarded these lab results with skepticism given the lack of typical symptoms of pertussis for many of the patients tested. The pseudo-outbreak theory was rejected for two reasons. Experience has shown that false negative reactions are more often a diagnostic problem than false positive reactions.[1,2] Second, the results of parallel FA tests and cultures indicated that, by and large, a positive FA test was associated with the presence of *B. pertussis*.

There were several unusual aspects to this outbreak. First, many of the

This ulcer was produced by the base of the tongue rubbing against the lower front teeth.

symptomatic individuals who were found to be FA positive thought they merely had "colds". Many did not even experience a cough, and it is unlikely they would have been considered by their physicians to possibly have pertussis had there not been the generalized awareness that a pertussis outbreak was occurring. Second, several individuals found to be FA positive were asymptomatic at the time of screening and remained so. Although one might argue that they would have developed illness had they not been treated with antibiotics, this seems unlikely given the poor clinical response customarily seen with antibiotic therapy of pertussis.[3] Third, although pertussis is widely perceived to be an illness of infants and young children, a large percentage of the patients reported this year were older children and young adults.

The epidemiology of pertussis has changed because of immunization practices. A greater proportion of recent cases are seen in infants too young to have been effectively immunized and adults whose immunity from childhood vaccination has waned. Adult cases are sometimes not easily recognized, possibly because the clinical manifestations are milder; as such, they may be an important reservoir for infection of infants.[4,5]

It is frequently stated that there is no carrier state for pertussis. Linneman endorsed that viewpoint after culturing 1102 individuals, mostly children, who were not suspected to be suffering from pertussis. He recovered *B. pertussis* from only five children; three with mild upper respiratory symptoms and two who were asymptomatic at the time of culture but who later developed cough.[6] Other studies have documented, by FA smear or culture, the presence of *B. pertussis* in nasopharyngeal specimens from asymptomatic contacts of cases, and some have considered these individuals to be carriers.[1,2,7] It is not known, however, how long these "carriers" harbor the organism and whether or not they represent a reservoir for transmission of the organism.

Based on the findings of this outbreak, a revised case definition for pertussis will be developed so as not to exclude FA positive patients with atypical symptoms. Once developed, the number of reported cases for 1983 will be revised.

Recommended control measures during pertussis outbreaks include a) isolation of cases, b) erythromycin treatment (50 mg/kg/day in four divided doses) of cases to shorten the

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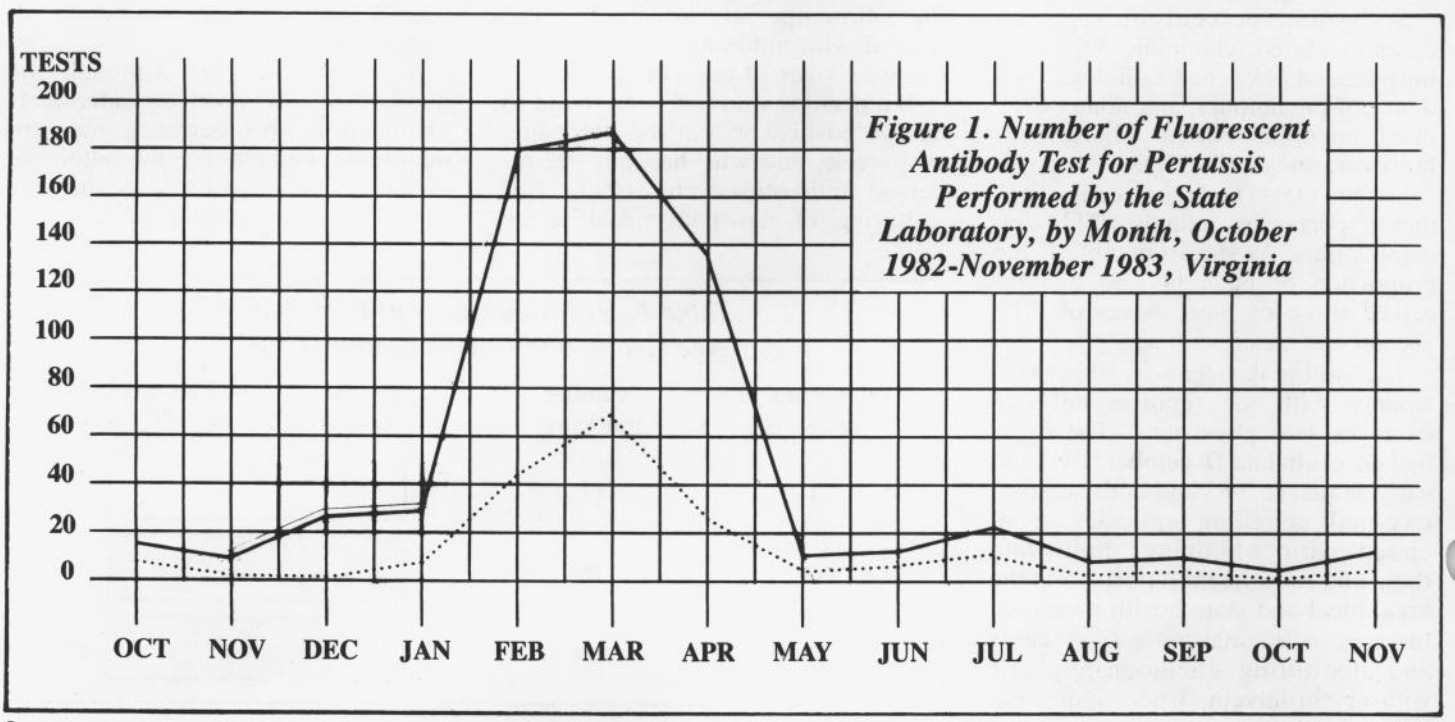

Figure 1. Number of Fluorescent Antibody Test for Pertussis Performed by the State Laboratory, by Month, October 1982-November 1983, Virginia

Typhoid Fever: Still With Us

Eighteen culture-proven cases of typhoid fever were reported in Virginia in 1983, more cases than were reported in any other year since 1962 (Figure 2). Of these cases, 16 were classified as having acute disease and two as being carriers.

Since 1969, when the Division of Epidemiology began collecting case-specific information on all reported cases, the majority (70%) of cases for which a source of infection could be identified were related to travel or residence in another country in which the disease was endemic. Only 19% of the cases resulted from contact with a family member who was a typhoid carrier. In 1983, of 10 cases for which a source was identified 50% were related to foreign travel or residence and 50% to contact with a known typhoid carrier.

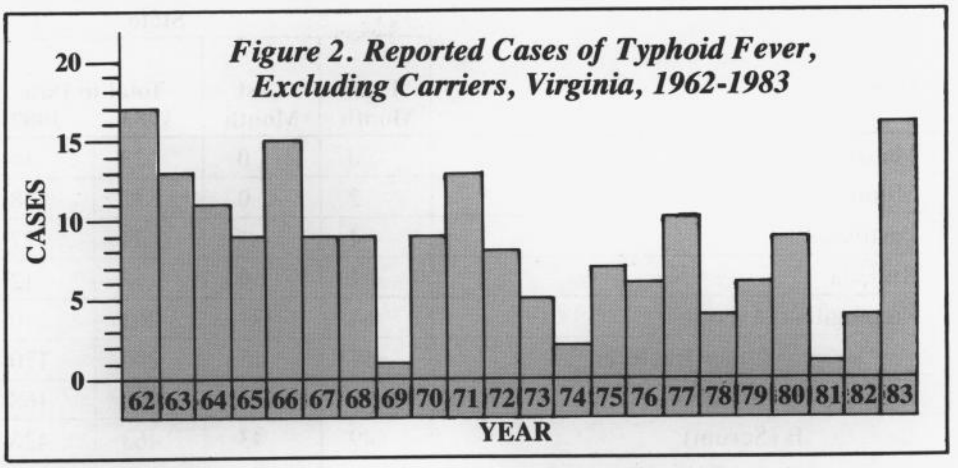

Figure 2. Reported Cases of Typhoid Fever, Excluding Carriers, Virginia, 1962-1983

Two carriers, both elderly women, were identified as the source of infection for five acute cases reported in 1983. One carrier transmitted the disease to a grandchild and the grandchild's friend. The second carrier transmitted the illness to two grandchildren and a great-grandchild. She had previously been identified as the source of infection for a third grandchild and second great-grandchild. All but one of these five cases did not reside with the carrier, but were frequent visitors in the carrier's home.

A cluster of five typhoid cases occurred in the northern Virginia area, but no apparent link between these cases was uncovered following an epidemiologic investigation.

Editor's comment: In Virginia all typhoid fever cases are kept under local health department supervision and restricted from food handling until a series of three stool specimens, collected at least twenty-four hours apart and not earlier than one month after the date of onset, are found to be negative for *S. typhi*.

A typhoid carrier is defined as an individual who continues to excrete *S. typhi* in stool or urine a year of more after onset of the acute illness. The names of carriers are entered on the Typhoid Carrier Registry and may not be released from health department supervision until six consecutive negative stool cultures, collected at least one month apart, have been documented. Currently there are nineteen names on the Virginia Typhoid Carrier Registry (Figure 3), some of which have been there since the 1940's. In recent years the number of carriers has steadily diminished as the number of deaths among elderly carriers has exceeded the number of newly reported carriers.

The determination of *S. typhi* phage patterns is an important tool in epidemiologically relating typhoid fever cases to other cases or to known carriers. Phage typing is routinely completed on all *S. typhi* isolates submitted to the Division of Consolidated Laboratory Services in Richmond.

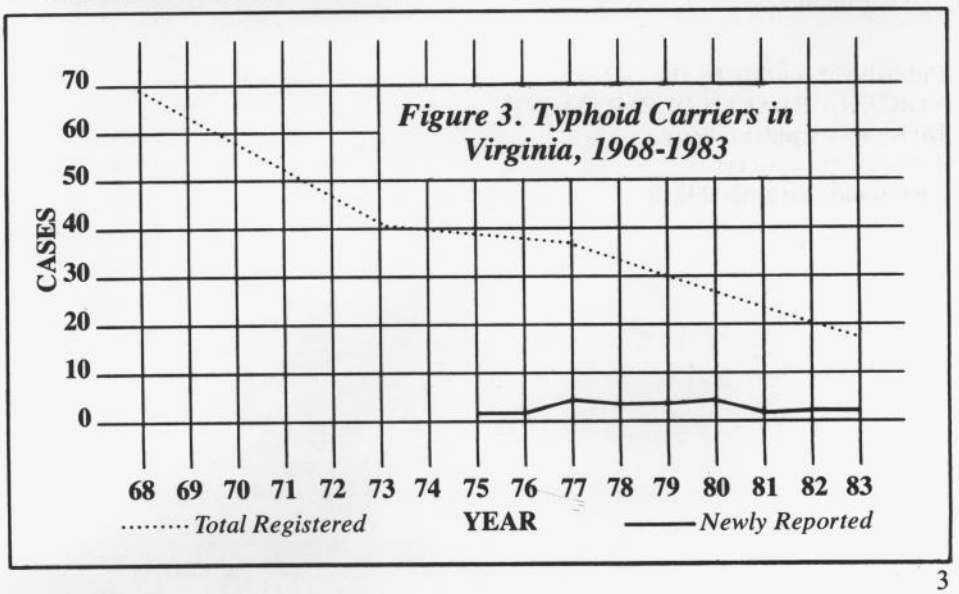

Figure 3. Typhoid Carriers in Virginia, 1968-1983

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duration of communicability, c) a search for unrecognized cases, d) booster immunization of exposed, previously immunized children under three years of age, and e) chemoprophylaxis of childhood contacts with erythromycin, even if previously immunized, since vaccine-induced immunity is not absolute.

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Month: October, 1983

Disease	State					Regions				
	This Month	Last Month	Total to Date 1983	Total to Date 1982	Mean 5 Year To Date	This Month N.W.	This Month N.	This Month S.W.	This Month C.	This Month E.
Measles	0	0	23	14	693	0	0	0	0	0
Mumps	2	0	32	38	99	0	2	1	0	0
Pertussis	4	1	49	27	14	3	0	0	1	0
Rubella	1	0	3	12	102	0	1	0	0	0
Meningitis—Aseptic	64	71	263	210	199	12	16	12	17	7
Other Bacterial	17	15	200	170	147	1	1	7	2	6
Hepatitis A (Infectious)	11	13	112	168	212	0	5	2	2	2
B (Serum)	49	43	463	426	392	0	15	10	8	16
Non-A, Non-B	9	9	70	67	44	4	3	1	0	1
Salmonellosis	185	217	1,265	1,276	1,108	29	41	18	52	45
Shigellosis	32	27	169	131	340	0	5	0	1	25
Campylobacter Infections	66	64	469	335	*181	11	14	6	16	19
Tuberculosis	63	38	427	514	—	—	—	—	—	—
Syphilis (Primary & Secondary)	57	49	493	525	477	1	6	6	20	24
Gonorrhea	2,445	1,970	17,737	17,236	18,767	—	—	—	—	—
Rocky Mountain Spotted Fever	5	13	63	72	93	2	0	1	2	0
Rabies in Animals	44	30	564	545	143	4	40	0	0	0
Meningococcal Infections	9	3	71	61	66	2	3	1	0	3
Influenza	5	3	901	362	2,281	0	0	5	0	0
Toxic Shock Syndrome	0	0	6	6	*7	0	0	0	0	0
Reyes Syndrome	1	0	6	5	12	0	1	0	0	0
Legionellosis	1	1	20	19	16	0	0	0	1	0
Kawasaki's Disease	1	1	35	12	15	0	0	0	0	1
Other:	—	—	—	—	—	—	—	—	—	—

Counties Reporting Animal Rabies: Clarke 1 calf; Madison 1 raccoon; Shenandoah 1 cow; Spotsylvania 1 raccoon; Arlington 7 raccoons; Fairfax 14 raccoons, 1 bat; Loudoun 1 raccoon, 1 bat; Prince William 1 raccoon, 1 bat; Alexandria 14 raccoons.

Occupational Illnesses: Occupational hearing loss 6; Occupational pneumoconiosis 12; Asbestosis 6; Occupational dermatitis 1; Hypersensitivity pneumonitis 3; Mesothelioma 2.

*3 year means

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