Epidemiology of a Small Pertussis Outbreak in Kent County, Michigan

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THE FINAL TEST of any specific immunization program is its effect in the community on the morbidity and mortality of the particular disease. It is therefore of special significance to observe the status of whooping cough in Kent County, Mich., including the city of Grand Rapids, a community where field trials of pertussis vaccine were conducted over a period of years (*1*, *2*), and where immunization has been maintained at a relatively high level for a long time (*3*). In addition, there has been continuous use of culture methods in the diagnosis of whooping cough for more than 30 years. In 1960, Kent County including Grand Rapids had a population of approximately 363,000, while for the city alone the figure was slightly less than 200,000.

Data on the trend of whooping cough mortality in the United States, Michigan, and Grand Rapids are given in table 1. Mortality rates had decreased markedly before the use of pertussis vaccine was sufficiently widespread to account for the decline in incidence. The decrease has been more rapid since 1940.

Some observations on a shift in age group of those experiencing the disease are also of interest. As early as 1955 Ipsen and Bowen (*4*) noted that in Massachusetts the attack rate of pertussis began falling around 1943 among children under 10, while it had not yet changed among those in the 10–14 age group. These authors suggested that the use of pertussis vaccine had only recently been sufficiently widespread to influence the attack rate. A shift to an older age group was observed more recently in Grand Rapids by Kendrick (*5*) and Eldering (*2*).

During the spring of 1962 there was an increase in the incidence of whooping cough in Kent County as indicated by the laboratory reports of *Bordetella pertussis* (see chart). Information accompanying the laboratory specimens showed that many of the attacks were occurring among high school pupils. There was thus an opportunity to obtain information on the family epidemiology of whooping cough in this community, and plans for an investigation were made in consultation with Dr. Grace Eldering, chief, Western Michigan Section Laboratory, Michigan Department of Health.

Methods and Definitions

Population for study. The families of all persons in Kent County reported by the laboratory as having *B. pertussis* found on culture during the first 9 months of 1962 comprised the study population. Data on the 89 families for whom the specified information was complete are the basis for this report.

Cultures for B. pertussis. Most of the specimens for examination for *B. pertussis* were taken at the State laboratory on referral of the patient by his physician or local health officials. Exudate from the nasopharynx was collected by means of a pernasal swab as described by Bradford and associates (*6*). The swabs were examined by the culture method of Kendrick and co-workers (*7*). The fluorescent antibody staining procedure reported by Kendrick and

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associates (*8*) was applied to slide preparations made directly from the swabs or from young cultures.

Collection of data. All families were interviewed in their homes to obtain identifying information (name, address, phone number, and birth date), number and dates of vaccinations, vaccinator, place of vaccination, school attended, severity of attack, and name of attending physician. Birth dates were verified for nearly 80 percent of the children of the study group by checking vital records at the Michigan Department of Health. Physician, public clinic, school health clinic, and family records were consulted for corroborative evidence of immunization.

Results

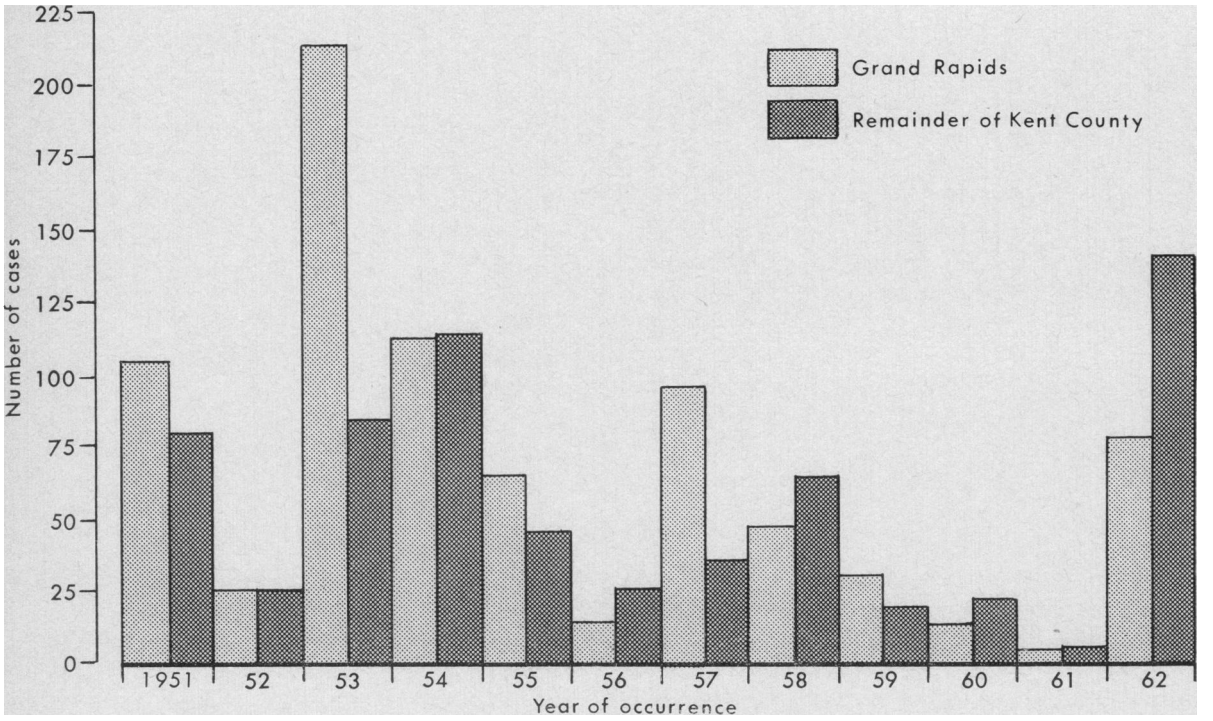
Analysis of study group. Comparison of the population of the study group with that of Kent County revealed marked differences in family size and in age distribution. There were no 2-member families in the study, compared with 32 percent of all Kent County families (table 2). Also, a larger proportion of study families had 6 or more members—41 percent compared with 15 percent for the general population. There was no significant difference in the numbers of families with three, four, or five members.

Table 1. Pertussis deaths in the United States, Michigan, and Grand Rapids, 1932–61

Five-year interval	United States	Michigan	Grand Rapids
1932–36	24, 718	732	10
1937–41	19, 496	474	5
1942–46	10, 775	286	4
1947–51	5, 896	143	0
1952–56	1, 778	50	0
1957–61	834	15	0

Age differences were most marked for the 20 and over age group (table 3); 39 percent of the study population and 59 percent of the Kent County population were 20 or over ($P=<0.001$). There was also a difference in the 10–19 age groups, with 30 percent in the study compared with 17 percent for the general

Reported cases [1] of pertussis, Grand Rapids and Kent County, 1951–62



[1] Reported to the Michigan Department of Health.

Table 2. Size of study families compared with family size in Kent County, Mich.

Number of members	Study families		Kent County families [1]	
	Number	Percent	Number	Percent
2	0	0	28, 901	32
3	13	15	17, 540	20
4	22	25	17, 403	19
5	17	19	13, 015	14
6	13	14	7, 179	8
7 or more	24	27	6, 152	7
Total	89	100	90, 190	100

[1] 1960 census tract data.

Table 3. Age distribution of study group compared with Kent County population

Age group (years)	Study population		Kent County population [1]	
	Number	Percent	Number	Percent
Under 1	21	4	9, 315	2
1–4	55	12	36, 807	10
5–9	71	15	42, 141	12
10–19	141	30	60, 343	17
20 and over	186	39	214, 581	59
Total	474	100	363, 187	100

[1] 1960 census tract data.

population. For other age groups the two populations appeared to be similar.

Pertussis incidence. Among the 474 persons comprising the 89 study families were 195 who contracted whooping cough during the study period. These included 33 parents, 1 grandparent, and 161 children. The overall crude attack rate was 41 percent (table 4). Among the 195 persons with pertussis were 55 who had only a mild paroxysmal cough, without whooping or vomiting. Thirty-one of these had received three or more doses of pertussis vaccine. The remainder of the cases were diagnosed as clinical whooping cough. An attempt at a more precise evaluation of the severity of the disease gave inconclusive results.

In the study group 156 persons (2 vaccinated and 154 unvaccinated, 75 males and 81 females), had a history of previous pertussis and were excluded in calculating attack rates. Also excluded were three children, one male and two females, who received hyperimmune serum after exposure during this study, and remained well. However, 29 persons for whom no records were found were included as vaccinated on the basis of parents' statements.

Eight of the 156 persons excluded because of previous pertussis attack experienced pertussis this time (1 vaccinated and 7 unvaccinated). The overall pertussis attack rate, adjusted for the foregoing exclusions, was 46 percent for the vaccinated (table 5).

All unvaccinated susceptibles in the study acquired pertussis. Specific attack rates for the vaccinated by age group suggested greater exposure over age 10 years. Pertussis attack rates for the sexes did not differ appreciably: the crude rates were 40 percent (91 of 228) for males and 42 percent (104 of 246) for females;

Table 4. Study population by age and number and percent attacked

Age group (years)	Number of persons	Attacks	
		Number	Percent
Under 1	21	15	71
1–4	55	29	53
5–9	71	28	39
10–19	141	84	52
20 and over	186	39	21
All ages	474	195	41

Table 5. All vaccinated [1] persons by age group and number and percent attacked

Age group (years)	Number of persons	Attacks	
		Number	Percent
Under 1	5	1	20
1–4	38	13	34
5–9	60	18	30
10–19	124	73	51
20 and over	12	6	50
All ages	239	111	46

[1] Stated to have had 3 or more doses of pertussis-containing vaccine. Excludes 2 persons who had had pertussis previously (1 well 20-year-old and 1 17-year-old ill with pertussis).

after removal of those considered to be nonsusceptible, the rates were 58 percent (89 of 152) for males and 60 percent (98 of 163) for females.

An interesting finding relates to the number of parents experiencing disease; 28 of 178 parents and 2 grandparents, 34 of whom had no history of the disease, had whooping cough. Six of 146 parents who had a history of pertussis experienced a second attack. Two children were likewise having their second attack. Unfortunately the first attack in each instance had not been confirmed by culture.

No vaccinated ill child under 1 year of age had a family index case; four children in the 1–4 year age group had index cases. No accurate evaluation was possible among school-age children. Most of the ill parents were considered to be secondary cases.

Table 6. Study population by vaccination and clinical status and results of culture for Bordetella pertussis

Vaccination and clinical status	Positive	Negative	Not cultured	Total
Vaccinated [1]	71	34	136	241
Ill	69	17	26	112
Healthy	2	17	110	129
Unvaccinated [2]	43	12	178	233
Ill	43	7	33	83
Healthy	0	5	145	150
Total	114	46	314	474

[1] Stated to have had 3 or more doses of pertussis-containing vaccine.
[2] Stated to have had 0, 1, or 2 doses of pertussis-containing vaccine.

Table 7. Interval between last pertussis vaccine injection and exposure of vaccinated [1] persons, related to number and percent attacked

Interval (years)	Persons with vaccination record [2]	Attacks	
		Number	Percent
0–3	85	18	21
4–7	61	29	47
8–11	43	28	65
12 or more	21	20	95
Total	210	95	45

[1] Excludes 29 persons who had no record of vaccination for pertussis.
[2] Family or health department record of receipt of pertussis vaccine.

Table 8. Vaccinated [1] paired siblings, by interval since last vaccine injection and outcome of exposure to pertussis

Years since last injection		Sign of difference in intervals
Ill sibling	Healthy sibling	
4	2	+
2	1	+
4	1	+
4	1	+
6	4	+, −
2	1	+, +
6 [2]	[2] 3	+
6	2	+
3	1	+
6	4	+

[1] Record of vaccination.
[2] Twins.

Vaccine type and schedule of administration. Pertussis vaccine alone or in combination with diphtheria toxoid had been used for primary immunization of the few older children. The majority, however, received a triple vaccine (DTP), except for eight persons who received a quadruple vaccine containing polioviruses. Triple vaccine was used for all booster injections. Ninety percent (190 of 210) of persons with vaccination records received their primary course of immunization between 3 and 9 months of age. This course usually consisted of three doses of vaccine at monthly intervals. Seventy-four percent (115 of 155 children) received their fourth dose between ages 2½ and 5½ years, and 70 percent (32 of 46) their fifth dose between 7½ and 10½ years.

Culture results. Thirty-three percent (160 of 474) of the study members submitted nasopharyngeal specimens for culture, and 85 percent of the specimens cultured were from ill persons (table 6). For those who were ill there was no difference between the proportions of vaccinated and unvaccinated submitting cultures.

The interval between onset of symptoms and taking of cultures appeared to be important. The average interval for the positive cultures

was 14 days compared with 25 days for the 24 ill persons with negative results.

B. pertussis was recovered on culture from two vaccinated children without symptoms. Of 277 other well persons, 22 had at least one negative culture and no specimens were obtained from the rest.

Attack rate related to interval since last vaccine injection. Pertussis attack rates among 210 vaccinated persons were tabulated according to the interval since the last injection of pertussis vaccine (table 7). Of the 85 who had received their last vaccine within 4 years of exposure, 18, or 21 percent, had whooping cough. For the interval 4 to 7 years, the rate was 47 percent, for the 8- to 11-year interval, 65 percent, and 12 years or more, 95 percent. Results of the sign test performed on the difference of attack rates for two consecutive intervals were not significant ($P=0.125$, $N=3$), and no greater significance was observed by halving the intervals. However, interval differences within families, paired for ill and healthy vaccinated siblings, were significant for 118 such pairs, using the sign test ($r=7$, $N=116$, $P=0.001$), and results comparing intervals for vaccinated siblings paired by age group and the amount of vaccine received were also highly significant: $r=1$, $N=11$, $P=0.003$ (table 8).

Discussion

The direct relationship of increased pertussis incidence in vaccinated persons to increased interval since the last injection of pertussis-containing vaccine was the most significant study finding.

The protective effect of the vaccine used was evident in that all the unvaccinated susceptibles acquired pertussis during the duration of the study. However, the gradual loss of protection for vaccinated persons was apparent in all age groups and independent of the number of injections of vaccine received or the age at which the primary course of vaccination was initiated.

This finding should warrant a closer look at current immunization schedules.

Summary

The 89 families in which at least 1 member harbored *Bordetella pertussis* formed the group studied in a 1962 pertussis outbreak in Kent County, Mich. Approximately one-half of the 474 family members had been previously vaccinated with 3 or more injections of pertussis vaccine. All susceptible unvaccinated persons acquired pertussis during the study, as did 46 percent of vaccinated family members. *B. pertussis* was isolated from 2 healthy as well as 69 ill vaccinated persons. The increased incidence of pertussis in vaccinated persons was directly related to the interval since the last injection of pertussis vaccine.

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APPOINTMENT OF ASSOCIATESHIPS FOR 1967 AT THE NATIONAL INSTITUTES OF HEALTH

Approximately 120 clinical, research, and staff associate appointments are currently being offered to aspiring physicians and dentists by the National Institutes of Health, Public Health Service. Applications for the associateships must be filed by May 14, 1965. Appointees will enter on duty July 1, 1967.

The appointments include commissions in the Public Health Service that customarily satisfy military obligations; appointees are nominated for Selective Service deferment under the Public Health Service Commissioned Officers Residency Deferment Program. Applicants usually file for appointments during their senior year in medical or dental school.

The purpose of the three similar, though operatively different, associateships is to offer work assignments coupled with selected educational experiences designed to advance both the work in progress and individual competence.

Each associate participates in a research program under the preceptor who directs the research. This is the vital part of his training experience. The levels of responsibility and latitude offered to an associate depend on his training and experience as well as his interests and initiative.

Separate didactic exercises are designed to complement the clinical and research associateships, but associates in all three categories may attend all the exercises that can accommodate them, if their schedules permit. In addition, accredited postgraduate instruction is available in evening courses offered by the Foundation for Advanced Education in the Sciences, Inc.

All associateships are given for 2 years except in the National Institute of Allergy and Infectious Diseases, where clinical associates are appointed for 3-year periods. For certain programs, appointments may be extended an additional year. Unless he seeks transfer to another area of the Public Health Service, an associate may expect to be inactivated as an officer when his associateship appointment has been completed.

The *clinical associate* participates in both clinical and laboratory research. Institute programs differ in the amount of time devoted to laboratory and clinical responsibilities. However, it is a fair estimate that one-half to two-thirds of the associate's time will be devoted to laboratory research; the remainder will be devoted to clinical care of the patients.

Ward activities are supervised by competent clinical investigators and include a wide variety of rounds, conferences, and instructive exercises. Proximity to the patient of collaborating scientists from so many biological disciplines creates an unusual opportunity for clinical investigation. Most clinical associates are not in formal residence training programs even though they may be performing the same functions of residents in other hospitals. Some associates appointed to programs in dermatology, neurology, and psychiatry are recommended by their chiefs for a limited amount of residency credit, and associates in internal medicine who remain at the National Institutes of Health for a third year may receive credit for the extra year by application to the American Board of Internal Medicine.

The *research associate* devotes most of his time to laboratory research in the biomedical sciences. He has no clinical responsibilities. His preceptor is responsible for training him in research methodology and design, and for guiding him in the research undertakings that will enable him to gain breadth and perspective, encounter a variety of laboratory problems, and learn many different approaches rather than become a specialist in one or two refined techniques. He is helped with interpretation of

results. In addition, he participates in a series of formal tutorial seminars and informal discussion groups designed for prospective independent investigators.

The *staff associate* generally has already defined his career goal by the time he is appointed. His training at the National Institutes of Health answers a specific need in an aspect of research that serves to perfect the definite skills he wishes to develop under the guidance of a senior staff member. The staff associate may participate in either clinical or laboratory research or both. Although his appointment is not characterized by a formal program of instruction, when circumstances permit he may broaden his research assignment by attendance at the seminars and conferences which interest him.

It is expected that about 60 clinical associates, 40 research associates, and 20 staff associates will be appointed July 1, 1967. To consider an applicant for one, two, or all three types of appointments, the National Institutes of Health must receive the appropriate application forms, properly executed, no later than May 14, 1965.

In addition to requirements for commission in the Public Health Service and participation in the Commissioned Officers Residency Deferment Program, applicants, when their appointments become effective in 1967, shall have completed internship and usually a year or more of assistant residency. The training required beyond internship is determined by the programs to which applicants seek appointment.

Intellectual attainment and demonstrated interest and ability in research determine appointments. A man's background in research often is a decisive factor in his selection. His program preferences, which are treated confidentially, are matched against nominations of the major NIH components seeking associates.

Soon after May 14 the candidates' qualifications will be reviewed by NIH program chiefs, and the National Institutes of Health will invite specified candidates for interviews during a 3-week period in June. The candidates' preferences will be matched against NIH nominations during the first week of July. Successful candidates will be notified by telephone during the second week of July, when they will have the opportunity to accept or reject the positions for which they have been selected.

Application forms and additional information on program areas may be obtained from the Clinical and Professional Education Branch, National Institutes of Health, Bethesda, Md., 20014.

Grants for Sewage Treatment Facilities

Since 1956 more than $500 million, matched by $2.28 billion in State and local funds has been granted by the Public Health Service to 5,581 communities for construction or expansion of sewage treatment facilities.

The Federal Water Pollution Control Act authorizes grants to communities to pay up to 30 percent of the cost of building sewage treatment works, with maximums of $600,000 for a single municipal project and $2.4 million for multimunicipal projects.

Appropriations are provided for such construction through 1967, when the grant program is scheduled to expire under present legislation.

The projects supported by the water pollution control program funds will serve 48 million people and result in improvements of about 52,000 miles of streams. However, sewage treatment facilities for 18.5 million people still require improvements, and wastes from another 12 million populations are discharged into waterways without treatment.

Federal Publications

The Role of the Dentist in National Disaster. *PHS Publication No. 1071–I–2; Health Mobilization Series No. I–2; 1965; 16 pages.* Report prepared by the committee of the Council on Federal Dental Services, American Dental Association, in cooperation with the Division of Health Mobilization, Public Health Service. Sets forth, in detail, the expanded and additional functions that dentists can perform in a postdisaster period without extradisciplinary training. Responsibilities are considered to fall within the civil or community, administrative, and professional categories. To meet these responsibilities the dentist will be called upon to exercise community leadership in disaster preparedness programs. He will be expected to apply his knowledge of professional techniques and procedures to the care of the sick and injured. Report concludes that guidance in disaster planning must come from the Government and adds that the dental profession is ready to assist in the development and implementation of effective programs to assure a healthy and productive population.

The Role of the Veterinarian in National Disaster. *PHS Publication No. 1071–I–3; Health Mobilization Series I–3; 1964; 15 pages; 15 cents.* Reports results of a study by the Veterinary Public Health Section of the Communicable Disease Center and the Division of Health Mobilization. Identifies and defines the potential capabilities and functional roles of veterinarians for the provision of health and medical care to the sick and injured following a national disaster. Recommends supplemental training in special areas such as radiation and long-term care of human patients; also recommends training for full use of paraveterinary personnel. Points out the veterinarian's major public health responsibility—the conservation of animal sources of human food to insure a continuing food supply for surviving population. Suggests that existing academic programs include teaching disaster veterinary medicine to provide proper preparation for the new and expanded functions veterinarians will be expected to undertake in a disaster.

The Role of the Pharmacist in National Disaster. *PHS Publication No. 1071–I–4; Health Mobilization Series I–4; 1964; 28 pages.* Developed by the American Pharmaceutical Association's Committee on Disaster and National Security in cooperation with the Division of Health Mobilization. Outlines the role of the pharmacist in national disaster planning. Expanded and additional functions for a disaster situation are detailed, as well as emergency application of their usual functions in the community, in industry, and in hospitals. Recommends that pharmacists be made aware of the problem, that they be motivated to better equip themselves for assuming responsibilities in disaster programs, and that suitable educational or training mechanisms be established to achieve these results. Report urges closer coordination with Federal, State, and local government, more use of the medical self-help training program, and better use of the community pharmaceutical resources in shelter programs.

Occupational Diseases. A guide to their recognition. *PHS Publication No. 1097; 1964; 375 pages; $2.25. Series I–3; 1964; 15 pages; 15 cents.* Serves as a reference book to physicians, consultants, industrial hygienists, and allied professional personnel in the detection and control of job-related diseases. Covers chemical, physical, and biological categories of occupational hazards. Lists special diagnostic tests and recommended threshold limits under chemical hazards and occupations associated with potentially harmful environmental agents. Explores basic information on the mode of entry of various hazards and their effects in the body. Includes separate sections on skin irritants and sensitizers, pneumoconiosis, and pesticides; also plastics and synthetic resins and plant and wood hazards. Concludes with a listing of sources of consultation on occupational health and industrial hygiene problems and a basic reference list.

Preventing Child Entrapment in Refrigerators. *PHS Publication No. 1258; 1964; 8 pages; 5 cents.* Describes 10 easy ways to "childproof" idle or abandoned household refrigerators and freezers. Information is designed primarily for distribution to individual householders and community leaders.

Availability of Services for Nursing Care of the Sick at Home. *PHS Publication No. 1265; 1964; 47 pages.* Report of a study made in July 1963 to determine what places in the United States have agencies that offer a program of nursing care of the sick at home on a continuing basis. Includes interpretation of the data, tables showing availability of services throughout the 50 States, and a discussion of the paramedical and home health aide services available to the sick at home and of payment of fees for service.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Public Health Service, Washington, D.C., 20201.

The Public Health Service does not supply publications other than its own.

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SYNOPSES

REIDER, FRANK (Public Health Service): *Medical self-help training program. Public Health Reports, Vol. 80, April 1965, pp. 283–286.*

The Public Health Service, in cooperation with the Office of Civil Defense, has developed a national medical self-help training program whose goal is to train a member of each household in the United States. Endorsed and supported by the American Medical Association, the program is designed to train the public in simple procedures to meet individual health needs when professional medical care is not available. Preparedness in health care, an important element of national defense, is also valuable when natural disasters occur.

Lessons in the course are devoted to radioactive fallout and shelter, healthful living in emergencies, artificial respiration, bleeding and bandaging, fractures and splinting, burns, shock, transportation of the injured, nursing care of the sick and injured, infant and child care, and emergency childbirth.

The Federal Government has supplied the States and local communities with a variety of training aids to assist with instruction, for example, kits with materials for teaching basic health survival principles and techniques and 16 mm. sound-color films. By the end of fiscal 1965, it will have produced 43,950 medical self-help training kits for instructors, in full or abbreviated form, some with Spanish translations, and also material for more than 5 million students.

Inclusion of the medical self-help training course in high school and college curriculums probably offers the best long-term approach to achieving a trained population.

OROZCO, GUILLERMO (Universidad del Valle, Cali, Colombia), and HAYES, GUY S.: *Comparison of Heaf and Mantoux tests in the Cali area of Colombia. Public Health Reports, Vol. 80, April 1965, pp. 293–299.*

In the area of Cali, Colombia, 1,315 subjects of varying age, sex, and status with regard to active tuberculous infection were tested simultaneously with the multiple-puncture Heaf method and the Mantoux technique. Intermediate-strength standard PPD was used. The results indicated that the Heaf test is more sensitive than the Mantoux, particularly in the range where reactions are less marked.

Parallel studies with the Battey antigen in slightly more than 50 percent of the group indicated that this strain of atypical mycobacterium is, for the moment at least, unimportant in the epidemiology of tuberculosis in the local environment.

The Heaf method for tuberculin tests has a number of technical and administrative advantages over the Mantoux test, particularly in surveys and with large groups. It is cheaper, faster and easier to apply, more acceptable to subjects, and provides results easier to read.

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SYNOPSES

KLOTZ, ALDEN W. (Idaho Department of Health): *Application of FA techniques to detection of Clostridium perfringens.* *Public Health Reports, Vol. 80, April 1965, pp. 305–311.*

One hundred and fifty strains of *Clostridium perfringens* (toxigenic types A to E) were obtained from a variety of sources. Employing formalin-treated antigens, serums were prepared in rabbits for 56 of these strains. The serums and the fluorescein labeled conjugates derived from them were arranged into five pools for screening cultures by slide agglutination and fluorescent antibody (FA) tests, respectively. These reagents were shown to be highly specific for the capsular antigen when the capsular swelling and FA tests were employed.

The five pools of FA reagents were used in an attempt to type a group of 79 unknown cultures of *C. perfringens*. Thirty-four of these were typable, and 21 were identified as Hobbs' serotypes.

C. perfringens was experimentally grown in a variety of foods and the encapsulated organisms were brilliantly stained by the appropriate FA reagent in smears made directly from the food.

Mixed strains of *C. perfringens* were commonly found in human feces, but the organisms apparently were not well encapsulated. Their presence was easily demonstrated by a combination of enrichment and FA techniques without the necessity of obtaining pure cultures.

It was concluded that immunofluorescence may prove to be a valuable tool for the rapid identification and enumeration of *C. perfringens* in food and feces during investigations of food poisoning outbreaks.

BRANCH, GERALDINE (Los Angeles County Health Department) and PAXTON, RUTH: *A study of gonococcal infections among infants and children.* *Public Health Reports, Vol. 80, April 1965, pp. 347–352.*

In a study of 180 children under 15 years of age with gonococcal infections, conjunctivitis was observed in all the infants under 1 year of age and infections of the genitals in all the children aged from 1 to 14 years. Complications involving the conjunctiva, joints, urethra, rectum, or tubes occurred in 6 percent of all the children.

Gonococcal infections in infants under 28 days of age were associated with infections in the birth canal of the mothers. In infants under 1 year of age, the infections were attributed to poor personal hygiene practices of the parents. These practices as well as molestation by relatives also accounted for most of the infections in the children under 9 years of age.

Among the children aged 10–14 years, the infections were associated with unsatisfactory parent-child relationships, overcrowded homes, and sexual activity outside the home. Ninety percent of the infections in this age group resulted from boyfriend-girlfriend relationships or casual acquaintances.

Infections in the 10- to 14-year age group represent an entirely separate and distinct problem, emphasizing the need for beginning venereal disease education in grammar school.

PHR

SYNOPSES

PIRAINO, FRANK F. (City of Milwaukee Health Department), WISNIEWSKI, H., ABEL, C., and HAITA, A.: *Human psittacosis in Milwaukee County associated with parakeets and pigeons. Public Health Reports, Vol. 80, April 1965, pp. 353–360.*

Eight cases of psittacosis in human beings occurred in Milwaukee County in 1962 and 1963, four attributed to exposures to pet parakeets and four to infected caged pigeons. Six of the eight cases were confirmed serologically; of the six, three were associated with pigeons and three with parakeets.

Serum specimens were obtained from 40 caged pigeons associated directly or indirectly with the psittacosis cases and from 95 wild pigeons collected in various parts of the city of Milwaukee and adjacent areas in Milwaukee County. All were tested for psittacosis complement fixing antibody. A group of caged pigeons also were tested for neutralizing antibody. Complement fixation reactor rates associated with the caged pigeons ranged from 16 to 71 percent compared with 0 to 12 percent for wild pigeons, from which we conclude that caged pigeons are potentially more hazardous sources of human infections than wild pigeons.

WALDMAN, H. BARRY (Western Reserve University): *Dental care for the chronically ill, the aged, and the handicapped. Public Health Reports, Vol. 80, April 1965, pp. 361–364.*

A demonstration dental home care and outpatient program has been developed at a hospital in Cleveland, Ohio. Federal funds provide primary support. Local voluntary and governmental agencies provide additional finances. Complete dental care is provided to chronically ill, aged, and handicapped patients in their own homes, in nursing homes, and at an outpatient clinic. A small bus that is fitted with a hydraulic lift transports wheelchair patients to the clinic for care.

The program is investigating the conditions that determine where the patient should receive dental care. The time-conserving value of using the services of dental hygienists and assistants also is being evaluated in the home setting.

In addition, private dentists use the program's portable dental equipment and services of auxiliary personnel to provide care to their own homebound patients. Senior students of Western Reserve University School of Dentistry are assigned to the program as part of their training.

LAMBERT, HAROLD J. (Michigan Department of Health): *Epidemiology of a small pertussis outbreak in Kent County, Mich. Public Health Reports, Vol. 80, April 1965, pp. 365–369.*

The 89 families in which at least 1 member harbored *Bordetella pertussis* formed the group studied in a 1962 pertussis outbreak in Kent County, Mich. Approximately one-half of the 474 family members had been vaccinated previously with 3 or more injections of pertussis vaccine. All susceptible unvaccinated persons acquired pertussis during the study, as did 46 percent of vaccinated family members. *B. pertussis* was isolated from 2 healthy as well as 69 ill vaccinated persons. The increased incidence of pertussis in vaccinated persons was directly related to the interval since the last injection of pertussis vaccine.

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