

and loss of appetite because of the continual taste of ether in the mouth.

Nephritis also is noted by some physicians as a possible result, and one company physician is careful to shift to other work men who show any symptoms of kidney involvement. The fatal case of ether poisoning on my list was one of uremia, but the man was a syphilitic and doubtless had damaged kidneys when he went to work.

Sometimes the narcosis is profound and is accompanied by signs of irritation in the lungs, which may develop into a bronchopneumonia. Since diphenylamin is added to many of these smokeless powders, one should remember that the symptoms of an amidobenzene may be also present in poisoning from this solvent.

In 1910, Sand¹⁶ presented the results of experiments on dogs with ether-alcohol fumes. His findings are significant in connection with the possible chronic poisoning of these ether workers in explosive manufacture. The ether-alcohol administered in vapor form, 500 gm. being evaporated during ten hours in a kennel 1 cubic meter in size. These animals showed all the manifestations of "ether jag" as they are seen in industrial poisoning. Then tolerance was gained and they did not suffer in health; in fact, three of them gained somewhat in weight; but when two were killed and examined, a general condition of stasis was found in the organs and brain, with fatty degeneration in the liver and in the kidney epithelium.

Amyl Acetate; Acetone.—These are the solvents used for other powders. Amyl acetate is called banana oil by the workmen; and perhaps because of its strong, sickeningly sweet odor, they attribute to it the headache, dizziness, smarting of the eyes, and other symptoms from which they suffer when using a mixture containing it.¹⁷ Lehmann,¹⁸ however, experimenting on men as well as on animals, found it slightly toxic, and in powder works, when it is not used in combination with other poisons, it does not seem to cause any discomfort. Acetone is listed by Sommerfeld as a poison, but Kobert thinks industrial poisoning from it hardly thinkable. I found the men in one plant using it as an eye wash when they got a foreign particle in the eye, and in another plant the physician told me that acetone was a good substitute for iodine in the treatment of slight wounds.

Nitroglycerin.—It sounds strange to say that this very dangerous explosive is the safest of all, but that is true if one is considering poisoning, not accidents. Indeed, it is probably true of accidents also, because we have been making nitroglycerin a great many years and have learned how to do it, as we have not learned how to make the newer explosives. All the precautions taken in nitroglycerin works against accidents serve also as preventives of poisoning: strict cleanliness of the premises, separation of different processes so that as small a number of men as possible will be in any one building, close watch against decomposition during nitration, and prompt drowning of the charge when that occurs.¹⁹

There are a few other poisons given off in gaseous form during the preparation of compounds used in this industry. There is chlorin gas, which passes off during the early stage of nitric acid manufacture, when the sulphuric acid acting on Chili saltpeter meets the common salt that is always present as an impurity. Most acid works try to provide in some way for the carrying off of these fumes, and they are in any case so irrespirable that men get away as soon as possible, before much harm has been done. There is ammonia from the aqua ammonia used in dynamite plants for ammonium nitrate, which is added to the "dope." Sulphur dioxide, very irritating and dangerous, is given off in the making of sulphuric acid and at one stage in the manufacture of phenol.

This hasty review of the substances which are necessary for the production of explosives is enough to show that it is an industry full of dangers to the workers quite aside from the ever present danger of violent explosions. Indeed, it offers an unusually rich field of research for those who are interested in the effect of volatile poisons on the human subject.

Hull House.

THE THERAPEUTIC VALUE OF PERTUSSIS VACCINE IN WHOOPING COUGH *

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This study was made during the late summer of 1916, as part of the investigation by the Research Laboratory of the New York City Health Department on the value of pertussis vaccine in whooping cough.

Because of the infantile paralysis epidemic, car strikes and the expiration, October 1, of the lease of the building used for clinical purposes, the number of patients used for this study is far less than we could wish. The deductions, however, are suggestive, and show the danger of drawing conclusions too hastily and without making a critical comparison with control cases.

Dr. Lutinger, in his report of May, 1915, pointed out the pitfalls in accepting the statements of patients in the clinic; but in spite of the difficulties he encountered, he gathered from his records that pertussis vaccine lessened the duration of the whoop by 37.5 per cent. as against treatment with drugs. Hoag¹ is enthusiastic about the vaccine, claiming a reduction of the whoop to from sixteen to nineteen and one half days, after from three to ten injections of the vaccine, in contrast to the duration, from fifty to one hundred and forty-five days, in cases in which only one injection is given. Many other physicians, who have received and used the New York Health Department pertussis vaccine, verbally and by letter have reported most encouraging results. Drs. A. F. Hess and Matthias Nicoll are among those who are skeptical of the marked curative effects of a vaccine. Dr. Hess believes it has some prophylactic value. Before tabulation of our records, we had the impression that pertussis vaccine had had a somewhat favorable influence on the disease, but in scientific work, impressions,

* From the Bureau of Laboratories, New York City Health Department.

1. Hoag, W. B.: *Am. Med.*, 1916, **11**, 255.

16. Sand, René: *Internat. Cong. Indust. Hyg.*, Brussels, 1910.

17. Paint removers and varnish removers which smell strongly of amyl acetate contain in addition such volatile poisons as benzene, methyl alcohol and carbon disulphid, but the odor of the banana oil overpowers or masks the others.

18. Lehmann: *Arch. f. Hyg.*, 1911, **74**, 1.

19. The singular absence of symptoms such as one would expect in nitroglycerin workers has been discussed by C. E. Laws (*Nitroglycerin Head*, *THE JOURNAL A. M. A.*, March 5, 1910, p. 793); by G. E. Ehrig (The Effects of Nitroglycerin on Those Engaged in Its Manufacture, *ibid.*, Jan. 17, 1914, p. 201), and by Hudson (*Med. Rec.*, New York, 1917, **91**, 89).

naturally, cannot count against the recorded fact. We believe now that the hope for a favorable reaction intensified the memory of those responses which were favorable, and impressed these cumulative mental records on our minds more strongly than the unfavorable, making them seem more numerous than they actually were.

In spite of the preponderance of favorable comments on the vaccine which were chiefly impressions, the directors of the whooping cough studies felt that further control work was necessary to determine the real and permanent place of pertussis vaccine in our therapeutic armamentarium.

Whooping cough is not easily studied. There is not the control of observations as in an illness confining the patient to bed. Like all diseases, it varies in degree according to epidemics, season, individual reaction,

sudden (as they are not with pertussis vaccine), it must make a difference whether the interpreter of the symptoms is an optimist or a pessimist.

As Dr. Luttinger has pointed out, the ideal place to study the disease is the hospital, where the children may be controlled and watched by trained observers. Unfortunately, the children brought to the hospital with pertussis, or those who contract it there, do not represent the average. They more commonly have advanced cases with complications, or cases so severe that the parents are alarmed. Children with early cases contracted in the hospital usually leave when they have recovered from their primary trouble. On the whole, under present conditions, these cases are not favorable for testing the vaccine.

A pertussis crèche, in which children could be segregated during the day while the parents are at work,

TABLE 1.—AVERAGE DURATION OF THE DISEASE, ACCORDING TO SYMPTOMS

	Whoop or Paroxysmal Cough Developed after Injections Began				Injections Given During First Week of Whoop				Injections During Second Week of Whoop				Controls Terpin Hydrate Medication or Milk Injections		Dilute Milk Injections; Whoop or Paroxysmal Cough Developing after Injections		Dilute Milk Injections First Week; Whoop or Paroxysmal Cough	
	Pertussis Vaccine		Influenza Vaccine		Pertussis Vaccine		Influenza Vaccine		Pertussis Vaccine		Influenza Vaccine		Number of Cases	Aver. Duration, Wks.	Number of Cases	Aver. Duration, Wks.	Number of Cases	Aver. Duration, Wks.
	Number of Cases	Aver. Duration, Wks.	Number of Cases	Aver. Duration, Wks.	Number of Cases	Aver. Duration, Wks.	Number of Cases	Aver. Duration, Wks.	Number of Cases	Aver. Duration, Wks.	Number of Cases	Aver. Duration, Wks.						
Mild onset; 3 or 4 injections																		
Cough.....	25	7-8	21	7-8	23	8	6	7-8	4	8-9	4	0-10	5	9	4	5	5	7-8
Whoop.....	21	2-3	18	4-5	22	4-5	5	4-5	4	3-4	3	7-8	5	2-3	2	2-3	3	3-4
Vomiting....	17	3	14	3-4	19	3-4	3	4-5	3	2-3	3	<1	4	2-3	1	<1	4	2-3
Parox. cough	4	4-5	3	4-5	1	6-7	..	....	..	....	1	3	..	....	2	2-3	2	3-4
Moderate or severe onset; 3 or 4 injections																		
Cough.....	5	10	7	7-8	43	8	34	8-9	36	8-9	22	0-10	18	11-12	1	8-9	1	12
Whoop.....	4	5-6	6	4-5	41	5-6	32	4-5	34	5-6	22	5-6	17	6-7	1	4-5	1	2-3
Vomiting....	5	4-5	6	2-3	39	4	30	3-4	31	4-5	19	5	11	6	1	4-5	1	11
Parox. cough	..	....	1	5-6	2	6	2	6	2	5	..	....	1	4-5	..	....	..	....
Mild onset; 2 injections																		
Cough.....	2	5-6	2	7	1	7-8	2	5	..	....	2	11-12	..	....	..	....	..	....
Whoop.....	2	3-4	2	2-3	1	1-2	2	3	..	....	2	0-10	..	....	..	....	..	....
Vomiting....	1	<1	..	....	..	....	..	....	..	....	2	5	..	....	..	....	..	....
Moderate or severe onset																		
Cough.....	1	7-8	3	7-8	2	10	2	11-12	3	9-10	7	8-9	..	....	..	....	..	....
Whoop.....	1	5-6	3	6-7	2	6	2	9	3	6-7	7	6-7	..	....	..	....	..	....
Vomiting....	1	6-7	3	5-6	2	4-5	2	5	3	1-2	7	4-5	..	....	..	....	..	....
Mild onset; 1 injection																		
Cough.....	1	7-8	1	10-12	4	6-7	1	6-7	2	7-8	1	9-10	..	....	..	....	..	....
Whoop.....	1	3-4	1	7-8	3	5-6	1	3-4	2	6	1	2-3	..	....	..	....	..	....
Vomiting....	..	....	..	....	4	2	1	<1	2	2-3	1	3-4	..	....	..	....	..	....
Parox. cough	..	....	..	....	1	4-5	0	0	..	....	..	....	..	....	..	....	..	....
Moderate or severe onset																		
Cough.....	..	....	..	....	2	9	3	7-8	4	7-8	8	8-9	..	....	..	....	..	....
Whoop.....	..	....	..	....	2	5-6	2	3-4	4	5-6	8	6-7	..	....	..	....	..	....
Vomiting....	..	....	..	....	2	2-3	2	4-5	4	3	8	4-5	..	....	..	....	..	....
Parox. cough	..	....	..	....	..	....	1	8-9	..	....	..	....	..	....	..	....	..	....

etc. Members of the same family, ill at the same time, react differently. While one person in a family exhibits a mild and short paroxysmal stage of the disease, another, under apparently the same conditions, suffers a severe and alarming attack. The others may escape entirely. It is unsafe, therefore, to draw comparisons between the vaccine treated and the nonvaccine treated in a single family. Most of our impressions are probably obtained thus.

The only statistics which can be of value are those culled from a large number of cases and carefully and critically observed, so that the extreme variations of the disease itself and the errors which must creep in when one has to depend on the word of parent or guardian for our knowledge of the progress of the disease are leveled down and reduced to a minimum.

The personal equation of the examiner, too, must be reckoned with. When results are not striking and

would afford a fair opportunity of study; but, as far as we know, there are none. Of course, the child could not be observed at night. It is at this time of the twenty-four hours that the mothers, according to Dr. Luttinger, report favorable results from the vaccine. Unless such a crèche could be located in a whooping cough neighborhood, its value, from the sanitarian's point of view, would be minimized by the danger of conveying infection during transportation of the child to it.

The clinic, then, at present in New York is the available, but not altogether satisfactory place for trying out the effects of the vaccine. Leaving out the question of the danger of transmitting contagion during the journey to and from the clinic and in the waiting room, we cannot get away from the fact that we are obliged to rely on the untrained, if not ignorant, unintelligent or mendacious parent or guardian for

our facts. As often as not, they try to answer to please the questioner; or exaggerate symptoms, hoping for better treatment; or they lessen symptoms to get a discharge for the child to go to the country or return to school, etc.

Unless the child coughs in the clinic or presents some corroborative suggestive symptoms, such as subconjunctival hemorrhage, ulcer of the frenum, or puffy eyelids, how can one be sure that the child has whooping cough? It is not unusual for a young mother to say after one or more visits, "My child does not cough like those I have heard. I do not believe he has whoop-

senting themselves before the third week of the paroxysmal stage or the third week of the whoop were injected. Injections were intramuscular. Other patients were treated with terpin hydrate by mouth and also a few by intramuscular injections of a highly diluted milk solution. These were used as controls to show how the disease was running at that season. Three or four injections were given each patient who returned to the clinic, one every other day, and a fourth from five to seven days after the third. The last mentioned was given only when the paroxysmal stage was progressing unfavorably.

TABLE 2.—IMMUNITY

	Number of Children in Family											Families Total	Children in Families Total	Immunes	Cases Whooping Cough	Per Cent. Immune
	1	2	3	4	5	6	7	8	9	10	11					
Number families with 100 per cent. whooping cough	67	46	23	15	7	4	1	2	..	..	1	166	381	0	381	0
Number whooping cough families 1-6 immunes (nonvaccinated) first exposure in family	..	11	18	17	12	4	2	2	1	..	..	67	267	155	112	58
Number families with immunes, second exposure in family	1	3	3	..	..	1	1	..	..	9	47	18	27	
Number families with immunes, third exposure in family	1	..	..	..	..	..	..	1	5	1	4	
Number families with immunes who received influenza vaccine	..	5	3	..	2	1	..	..	1	..	..	12	44	10	18	
Number families with immunes, some receiving influenza vaccine and some pertussis vaccine	2	3	..	1	..	..	..	..	..	6	24			
Number families with immunes who received pertussis vaccine	..	6	7	3	2	2	..	..	..	..	..	20	67	30	37	

ing cough after all." During last summer, at least, according to subsequent confession, some mothers brought their children for injections "because they thought 'the needle' would prevent infantile paralysis." The Italians, particularly, feel that the "syringa" is wonderful treatment for anything that happens to ail one. It makes weak children strong.

The cases suitable for treatment, too, are cut down by the fact that the parent is apt to wait for the height of the paroxysmal stage before she brings the child for treatment. A vaccine that "cures" when begun at the end of the second or during the third week must be accepted with a grain of salt. One would expect spontaneous recession. Some observers report giving the vaccine every other day until they get a response — from six to ten or more injections. This would cover a period of two, three or more weeks and, if the injections were begun after the paroxysmal cough or whoop had declared itself, would carry them over into what would ordinarily be the declining stage of the disease.

Because of these difficulties (and others) we were obliged to throw out many of our records in collating our figures. Over 1,000 patients were seen by us from July 10 to Sept. 30, 1916. About 500 were rejected because they presented themselves after the second week of the disease, or because the records were too incomplete; 93, because of questionable whooping cough; 49, because the information was unreliable; 126, who had either moved or given a wrong address so that their subsequent history after the closing of the clinic could not be obtained; 6, because they were not at home on several visits of inquiry; 3, because of questionable exposure to whooping cough, and 1, because the original record card was lost.

The plan of our investigation differs from Dr. Luttinger's in using, as a control, inoculations, made for purposes of comparison, of alternate patients, with a vaccine made of an organism somewhat similar to *Bacillus pertussis* and one likewise found in throat secretions — the influenza bacillus. Only patients pre-

The intelligence of the guardian or parent who reported the symptoms was noted in a record, careful cross examinations were made to rule out false reports as far as possible, and note was taken of every child actually heard with a typical paroxysmal cough in the clinic. Home visits to complete the records were made in every case in which the patient failed to return to the clinic until discharged.

In recording the remarks on the charts, the investigators were not biased by a knowledge of the vaccines

TABLE 3.—EXPOSED CHILDREN WHO DID NOT CONTRACT WHOOPING COUGH (FAMILY EXPOSURE; SIXTY-SEVEN FAMILIES)

Number Children (67 Families)	Number Children in Family									Total
	2	3	4	5	6	7	8	9		
Number immunes (nonvaccinated); first exposure in family	11	26	38	44	18	8	8	1	154	
Number immune children inoculated with influenza vaccine	5	5	3	2	3	..	..	1	19
Number immunes inoculated with pertussis vaccine	6	10	7	3	4	..	..	..	30
Number children in partially immune families who contracted whooping cough, first exposure in family	..	..	..	..	..	..	..	..	112
Number children in partially immune families who contracted whooping cough, second exposure in family	..	2	1	..	..	..	..	..	3

employed, as they did not know until the study was finished which was which. This secret was safeguarded by the maker of the vaccines.

Dr. Luttinger's 204 cases, reported in May, 1915, showed that the patients treated with vaccine whooped; on an average, twenty-five days, while the patients treated with drugs whooped, on an average, forty days.

We wish to remind the reader that we feel that our numbers are much too small to be of full scientific value. We quote them chiefly for the interest of comparison.

Group 1: Grouping together, as did Dr. Luttinger and Dr. Hoag, all our patients treated with pertussis

vaccine (136), we find that the whoop averaged thirty-two days. In those treated with the influenza vaccine (94), the whoop averaged thirty-five days. In the controls treated with highly diluted milk injections or terpin hydrate medication (34), the whoop averaged twenty-six days.

Group 2: In a somewhat different grouping, division was made into those that were mild in intensity before the vaccine treatment and those that showed a moderate or severe onset before treatment.

about two weeks less than under influenza vaccine; when injected during the first week of the whoop, both pertussis and influenza vaccine seemed to act equally well; when injected during the second week, pertussis vaccine seemed to cut short the whoop by four weeks. In controls, however, untreated by vaccines, the whoop lasted only two or three weeks.

Vomiting is of about the same duration for both pertussis and influenza vaccine given before the whoop developed; less under pertussis vaccine than under

TABLE 4.—EXPOSED CHILDREN WHO ESCAPED WHOOPING COUGH (SEVENTY-NINE FAMILIES) ACCORDING TO AGE

	Year																				Total
	Under 1	1st	2d	3d	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	17th	18th	19th		20th
Nonvaccinated	7	2	6	7	6	11	9	9	14	8	10	7	11	4	7	6	8	3	2	4	144
1, 2 or 3 vaccinations of pertussis vaccine	3	2	3	2	3	3	4	2	1	2	4		1								30
1, 2 or 3 injections of influenza vaccine	1	4	1	3	3	3	1	1	1	1											19

In the mild cases treated with pertussis vaccine, whether injections were given before the whoop developed or during the first or second week of the whoop, it averaged twenty-five days. In similar cases treated with influenza vaccine, the whoop averaged thirty-nine days. In the controls (milk injections or terpin hydrate medication), the whoop averaged nineteen days.

In the cases with moderate or severe onset, treated with pertussis vaccine, the whoop averaged thirty-nine days. In similar cases treated with influenza vaccine, the whoop averaged thirty-one days. In the controls treated as above, the whoop averaged thirty-one days.

If we were to make our deductions of the values of the vaccines in these comparatively few cases, from the first arrangement of averages, we would have to infer that there was not much choice between pertussis and influenza vaccine, and that terpin hydrate by mouth or dilute milk injections were superior in curative effect to either.

From the second arrangement of averages, we would have to conclude that pertussis vaccine transcends influenza vaccine in the mild cases, and that influenza vaccine is more valuable in the moderate or severe cases.

It would seem fairer to draw our conclusions from a still different arrangement of our figures: a division into the degrees of intensity of the disease and, at the same time, a division into the stage of the disease in which the vaccine treatment was begun. If specific vaccines are valuable, they must prove their value when given early in the disease, and not during the height, just before the decline, or during the declining stage.

Group 3: After weeding out the questionable, unreliable and incomplete records, we divided the cases as mentioned above. We judged the intensity of the paroxysm by the degree of asphyxia exhibited by the color of the face and lips. Many cases can be vouched for as true cases since the patients were seen and heard to whoop in the clinic. The rest were judged by the mother's intelligence, by cross examinations, etc.

Of the mild cases, the average duration of the cough was from seven to eight weeks under both influenza and pertussis vaccine, except for those cases in which the injections were made during the second week of the whoop; in these the whoop under influenza vaccine runs about a week longer than under pertussis vaccine.

The whoop, in the cases in which pertussis vaccine was injected before the whoop appeared, averages

influenza vaccine when given during the first week of the whoop; less under influenza vaccine given during the second week of the whoop and in the non-vaccinated control cases, the same as under pertussis vaccine given during the second week of the whoop.

In this series of cases, pertussis vaccine seems to have the advantage over influenza vaccine, and the nonvaccinated controls somewhat the advantage over both.

Of the moderate and severe cases, pertussis vaccine given before the whoop developed allows the average of the cough to run ten weeks, while influenza vaccine cuts it shorter by two or three weeks. Given during the first week of the whoop, the cough averages about

TABLE 5.—CHILDREN WHO RECEIVED PROPHYLACTIC INJECTIONS

	Exposure in Family				Exposed to Neighbors			
	Pertussis Vaccine		Influenza Vaccine		Pertussis Vaccine		Influenza Vaccine	
	No. Cases	Aver. Duration, Wks.	No. Cases	Aver. Duration, Wks.	No. Cases	Aver. Duration, Wks.	No. Cases	Aver. Duration, Wks.
Three injections								
Simple cough.....	12	5-6	6	6-7	2	2	1	<1
No cough.....	8	0	6	0	1	0		
Total.....	20	....	12	....	3	....	1	
Two injections								
Simple cough.....	4	6-7						
No cough.....	1	0	1	0	1	0		
Total.....	5	....	1	....	1	....	
One injection								
Simple cough.....	2	5-6						
No cough.....	..	....	2	0				
Total.....	2	....	2					
Terpin hydrate medication								
Cough.....	1	10-12						
Total.....	1							
Grand total.....	28	....	15	....	4	....	1	=48

the same length for both vaccines. Given during the second week of the whoop, the cough runs about a week longer under influenza vaccine. In the controls (nonvaccinated), the cough averages three weeks longer than the average of both vaccines.

The whoop averaged from five to six weeks with pertussis vaccine, whether given before the whoop developed or during the first or second week of the whoop, and in the first two instances runs about a week longer than under influenza vaccine. The controls run still a week longer.

The vomiting lasts longer under pertussis vaccine given before the whoop develops, or during the first week, and about the same under influenza vaccine treatment given during the second week of the whoop. The control cases run one or two weeks longer.

On the whole, in these cases, influenza vaccine seems to average more points than pertussis vaccine in relieving symptoms.

Before going further, we wish to repeat that we feel our numbers are too few to do more than demonstrate

both a local and febrile reaction than the pertussis vaccine.

Of the nonspecifically treated controls (terpin hydrate medication or dilute milk injections), 5.9 per cent. more were said to be improved after the third visit than with influenza vaccine; 10.6 per cent. fewer were slightly improved than with the pertussis vaccine, and 4.9 per cent. more remained stationary. Practically the same number as under pertussis or influenza vaccine, about one fourth of the cases, progressed unfavorably.

Contrary to our impressions, the mothers' reports do not make out a case for pertussis vaccine. In the mild cases, in which water made slightly turbid with milk, and thought at the time to be a vaccine by both doctor and parent of the child, was injected before the whoop or paroxysmal cough developed or during the first week of the whoop, the trouble terminated in less time than in cases treated with either pertussis or influenza vaccine.

Of the twenty-seven patients receiving only two injections of vaccine, if either vaccine had any effect at all, influenza vaccine in some groups did as well as the pertussis vaccine, and often better.

Of the twenty-seven patients receiving only one injection the same may be said.

PROPHYLACTIC VALUE OF THE VACCINES;
FAMILY IMMUNITY

Of the children exposed to whooping cough in their immediate family, nineteen received injections of influenza vaccine and thirty injections of pertussis vaccine. Some of these children had a mild bronchial cough at the time of inoculation. These coughs ran a variable

TABLE 6.—PROGRESS OF THE DISEASE AFTER THREE INJECTIONS OR VISITS, ACCORDING TO MOTHER'S OR GUARDIAN'S COMMENTS

Treated with	Total No. Cases	Improved		Slight Improvement		No Change		Worse	
		No.	%	No.	%	No.	%	No.	%
Pertussis vaccine	146	39	26.7	35	23.9	32	21.9	40	27.4
Influenza vaccine	113	31	27.4	37	32.7	15	13.2	30	26.5
Terpin hydrate medication or dilute milk injections.....	15	5	33.3	2	13.2	4	26.6	4	26.6

anew that deductions drawn from small numbers are faulty.

Of the 274 cases tabulated, according to the mother's or guardian's opinions of the course of the disease, immediately after the third injection or third visit, the percentage of children reported distinctly improved is almost the same for both pertussis and influenza vaccine, with 0.7 per cent. in favor of influenza vaccine. (It must be acknowledged that one cannot rule out a favorable reaction from the protein of the influenza bacillus.)

TABLE 7.—DEATHS

Treatment	No. Cases	No. Injections	When Begun	Last Injection	Date of Death	Cause of Death	Remarks
Pertussis vaccine.....	1	4	1st day whoop	13th day whoop	13th day whoop?	Gastro-enteritis	Died in Metropolitan Hospital; full data not obtained
	1	3	14th day whoop	20th day whoop	1 month after cough stopped	Convulsion	Whoop lasted forty-three days and cough sixty-four days
	1	1	14th day whoop	.....	3d after injection	Convulsion	
	1	1	7th day whoop	.....	5 days after injection	Pneumonia	
	1	3	14th day whoop	19th day whoop	5 weeks after injection	Pneumonia	
Total.....	5						
Influenza vaccine.....	1	3	.....	.....	?	Unknown	Information from neighbors
	1	2	3d day paroxysmal cough	5th day paroxysmal cough	2 weeks after injection	Meningitic symptoms	Died on 18th day of paroxysmal cough; 15 days after 2d injection
	1	3	14th day whoop	19th day whoop	12 days after injection	Tuberculous meningitis or infantile paralysis (?)	Said to have had pneumonia day after last injection; convulsions and death 10 and 12 days later; died at Bellevue Hospital
	1	4	10th day whoop	20th day whoop	1 month after whoop stopped	Nephritis	
Total.....	4						
Terpin hydrate medication.....	1	.....	.....	.....	.....	Pneumonia and empyema	Died 85th day of cough

Among those reported slightly better after the third injection, influenza vaccine was 8.8 per cent. more potent.

Of those reported stationary, influenza vaccine shows 8.7 per cent. fewer unchanged than pertussis vaccine.

Of those reported worse, there is 0.9 per cent. difference again in favor of influenza vaccine.

Needless to say, the mothers did not know that there were two vaccines used. Likewise, it must be mentioned that the influenza vaccine was more apt to give

time, but no case developed into a characteristic pertussis. These children were observed and visited in their homes for several months; none came down with pertussis. One child who had received one injection of pertussis vaccine contracted whooping cough two months afterward. Hoag reports seventeen cases in which persons injected prophylactically did not contract the disease. Luttinger gives a similar report. Hess reports that of 244 exposed patients (in an institution) inoculated prophylactically, twenty developed whooping cough.

From this it might be concluded that both pertussis and influenza vaccine protect against whooping cough; but we can also show by our figures that of 267 children exposed to whooping cough in the families which showed partial immunity and not vaccinated against it, 155 (58 per cent.) did not contract it. Altogether, of 700 exposed children in 243 of our families, 174, or 24.8 per cent., escaped the disease. We have a record of three children who came down with pertussis on the second exposure in their family.

In nine families, totaling forty-seven children, eighteen children escaped a second exposure in the family; and in one family of five children, one child escaped a third exposure in the family.

In 166 families of 381 children, all of the children either had had whooping cough or were suffering from it at the time of their attendance at the clinic.

Of 243 families, the children of which were exposed to whooping cough, seventy-seven families (31.6 per cent.) exhibited an immunity in some of the children.

In Dr. Luttinger's series of ninety-two families, twenty-seven (29.3 per cent.) showed partial immunity.

In the light of these natural immunes, can we be sure that pertussis vaccine conferred immunity, especially since, according to our statistics, influenza vaccine apparently can do the same?

There were ten deaths in our series; five of the patients had received pertussis vaccine, four had received influenza vaccine, and one had been treated with drugs. Three of those receiving pertussis vaccine had received three or four injections. All the injections were given before the end of the second week.

SUMMARY

Since whooping cough vaccine statistics under present conditions must be based chiefly on parents' reports, one must use careful judgment in accepting what they say.

Statistics, to be of any value, must be drawn from several thousand cases, as shown by the variable results obtained with the different groupings of our figures.

One must beware of "impressions."

Our figures show that the nonspecific influenza vaccine in Group 1 differs very little from pertussis vaccine in influencing the duration of the paroxysmal stages of the disease. In Group 2 it shortens the average length of this stage by eight days. In Group 3 it acts less well, on the whole, than the specific vaccine in the mild cases, and better than the specific vaccine in the moderate and severe cases.

Of all the cases, the shortest course was run in our nonvaccinated controls and those receiving inert, milk-colored water.

None of our patients inoculated for prophylaxis with either influenza or pertussis vaccine contracted the disease.

A partial immunity was exhibited by 31.6 per cent. of our families.

Fifty-eight per cent. of the children in these partially immune families escaped after exposure in the family.

Of 700 children exposed in their families, 24.8 per cent. escaped whooping cough.

CONCLUSIONS

More observations and more critical observations with controls for comparison must be made before the case can be considered made out for the curative and prophylactic value of a specific pertussis vaccine.

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THE TREATMENT OF CARRIERS OF ENDAMOEBIA HISTOLYTICA WITH OIL OF CHENOPODIUM*

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In a previous publication, one of us (Walker¹), called attention to the prevalence of carriers of *Endamoeba histolytica* among the people of endemic countries, and later (with Sellards²) demonstrated the important rôle which they play in the dissemination of endamebic dysentery. These carriers are always liable to develop dysentery or liver abscess and, because they continue for an indefinite time to pass large numbers of encysted endamebas in their stools, are a constant menace to the community. Consequently the control of this important tropical disease depends primarily on an efficient treatment to eradicate these carriers. Experience has shown that while subcutaneous injections of the soluble salts of emetin are very effective in the treatment of acute dysenteries and liver abscesses of endamebic origin, they fail in many cases to eliminate the encysted endamebas from the intestine. The other drugs which have been employed in endamebiasis, with the possible exception of thymol and male fern (Ujihara³), the claims for which are based on the results of one case treated with each drug, are either more or less ineffective on carriers or require long and disagreeable courses of treatment. A satisfactory treatment for carriers of *Endamoeba histolytica* not only must be capable of clearing the intestine of the parasites, but also it should not occupy too much of the patient's time, and its administration should be accompanied by as few disagreeable features as possible, in order that healthy carriers may be induced to undergo it.

Our experiments with the chenopodium treatment of endameba carriers were conducted at the Candelaria Hospital of the Madeira-Marmoré Railroad Company, Porto Velho, Amazonas, Brazil. They were not undertaken until shortly before the departure of one of us from South America, and consequently little more than the development of the method of treatment was accomplished. The oil of chenopodium used by us had been kept exposed to tropical light and temperature for over a year, and had undoubtedly lost some of its potency. The treatment found most effective by us consists of (1) magnesium sulphate, from ½ to 1 ounce, at 6 a. m.; (2) oil of chenopodium 16 minims in gelatin capsules at 8 a. m., 10 a. m. and 12 m., and (3) castor oil 1 ounce containing chloroform, 50 minims, at 2 p. m. This dosage is for adults; for children it should be reduced according to age. The administration of oil of chenopodium in gelatin capsules obviates all the disagreeable odor and taste of the oil.

* From the George Williams Hooper Foundation for Medical Research, University of California.

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