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SOME MANIFESTATIONS OF INFLUENZA IN YOUNG CHILDREN.*

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It is with some hesitation that one ventures to present a paper on so trite a subject as that of influenza, a term so widely used as a cloak for our ignorance of the explanation of obscure symptoms. I believe, however, that we are now in a position to clear up some of the haze which surrounds this subject and to chart some points at least in this indefinite sea of symptoms. That the term is constantly abused does not prove that there is no such thing as influenza. The same could formerly have been said of malaria. By influenza we mean an infection or inflammation due to Pfeiffer's bacillus and only in this sense is the term used in this paper. The organism is one of those associated with inflammations of the respiratory tract and affects chiefly the lower tract—the trachea, bronchi and lungs—less frequently the upper respiratory tract—the nasopharynx and ears. To apply the term influenza to an ordinary severe head cold is a misnomer; in very few such cases is this organism found. As a rule, the *B. influenzæ* has not a high degree of virulence, but in exceptional instances this may be the case. At such times it may cause a general blood infection and not infrequently meningitis, more rarely joint inflammations.

The diagnosis of influenza is established only by finding the organism in the secretions, usually it must be the bronchial secretion. This renders its discovery difficult in young children. The bronchial secretion is not easy to secure. These patients will not cough and expectorate when desired, and sometimes several trials must be made before satisfactory material for cultures is obtained. The best way of accomplishing this in infants is to excite a cough by tickling the pharynx and to catch upon a pharyngeal swab any secretion brought up from the bronchi. A diagnosis by the examination of smears is unreliable. Only cultures can be depended upon. It should be remembered that the *B. influenzæ* grows only upon media containing hemoglobin

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(blood agar being that generally employed) so that cultures made upon ordinary diphtheria tubes are of no value. The difficulties of isolating the organism, even in cultures, are considerable, and outside of a good hospital laboratory the work can hardly be done satisfactorily on any extensive scale. Hence it is not surprising that so few observations upon the definite diagnosis of influenza have been made.

At the Babies' Hospital during the past five years we have been greatly interested in the study of the bacteriology of respiratory infections. The accompanying chart gives the results

SPUTUM CULTURES FOR FIVE SEASONS.

	1909-1910	1910-1911	1911-1912	1912-1913	1913-1914
B. Influenzæ	32.5%	32%	33%	28%	42%
Pneumococcus ...	62.5 "	66 "	81 "	80 "	87 "
Streptococcus ...	33.5 "	37 "	46 "	43 "	29 "
Staphylococcus ..	76.2 "	76 "	89 "	90 "	84 "

obtained from 1,650 sputum cultures which have been made from 1,053 patients during the winter and spring seasons of this period. It shows the percentage of cases in which the different organisms, the pneumococcus, the streptococcus, the staphylococcus and *B. influenzæ,* have been present in the different seasons.

While there is seen a general correspondence in the different years, it will be noted that there has been an unusual prevalence of influenza during the present season. This has been particularly true during the months of March and April. Our observations for the past five years indicate that influenza begins as the cold weather approaches, usually toward the end of October, but that it is not very frequent until after January. The spring months are usually the time when it is most often seen. Also, that it disappears regularly with the advent of warm weather, about the middle of May. Pneumococcus infections do not follow the same course, but are common throughout the year.

What does the presence of the *B. influenzæ* in the sputum signify? Some have said that it signified nothing; that the organism can hardly be regarded as pathogenic. Although this view was formerly held by many pathologists, there are now

few who maintain it. The occurrence of an acute purulent meningitis in which this is the only organism found and the production of a similar inflammation by its injection in animals with recovery of the organism, certainly establishes the fact of pathogenicity.

The *B. influenzæ* is only one of the common organisms associated with respiratory infections. It is seldom seen alone and it is therefore difficult to determine exactly which of the symptoms present may be fairly attributed to it. It is only by the study of a large number of cases in which the organism is found that this point can be settled.

Probably the most significant manifestation of influenza is a peculiar range of temperature. The variations seen are most puzzling and frequently wrongly interpreted. They often give the physician the greatest concern, especially since they occur so frequently in the course of pneumonia or otitis; they may lead to a suspicion that some serious complication, either medical or surgical, is present. The temperature is apt to be high, to fluctuate widely and irregularly without apparent cause. Its rise is sharp but without chills. In its fall, which is quite as rapid, it frequently goes to subnormal. The want of correspondence between the general symptoms and the temperature is quite diagnostic. I know of no disease in which such high temperatures are seen with so few general symptoms as in influenza.

From our experience at the Babies' Hospital several definite clinical types stand out:—

(1) Pneumonias with unusual, often extraordinary, fluctuations of temperature or with a persistence of temperature after physical signs have disappeared.

(2) Pneumonias running a protracted course, with slow resolution. Frequently there are recurring attacks.

(3) Cases of otitis with very mild catarrhal symptoms, often only a moderate cough and a few coarse râles in the chest, but with a temperature quite out of proportion to the general or local symptoms.

(4) Cases with very few or no catarrhal symptoms whatever, but with a very unusual temperature curve.

(5) Unusual temperature curves accompanying tuberculosis and sometimes other diseases.

(6) Cases resembling whooping-cough, seen chiefly in older children, seldom in infants.

Let us consider this last-mentioned group first.

Pfeiffer's bacillus has many points of likeness to Bordet's bacillus. There are also clinical resemblances between whooping-cough and influenza which I think have not been sufficiently appreciated. Influenza often persists for from six to eight weeks; it may be characterized by a paroxysmal cough which is so like the paroxysms of pertussis that at times the two are indistinguishable. It is my own belief that most of the children who are reported to have recurrent attacks of whooping-cough have, in reality, suffered from influenza.

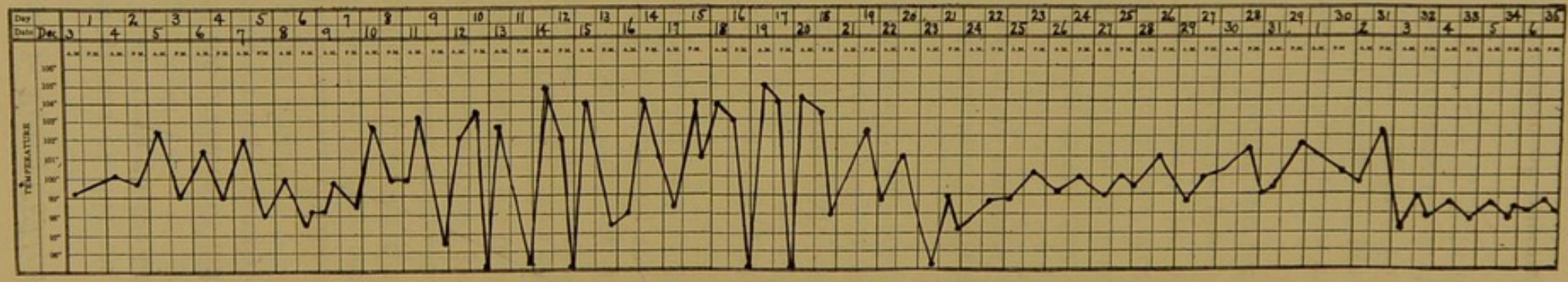
There are some points of differential diagnosis which we may pause here to mention. The blood picture in whooping-cough is quite different from that seen in influenza. Influenza without catarrhal symptoms is seldom seen and then it has a relatively low leukocyte count, but with its usual bronchitis there is a leukocyte count, but with its usual bronchitis there is a leukocytosis of 18,000 to 30,000, the differential count showing 60 to 70 per cent. of polymorphonuclears. In whooping-cough there is a leukocytosis of about the same degree, but a very high lymphocyte percentage is regularly present.

Another point of resemblance is the contagious character of influenza and the fact that there may be in the same family two or three children with identical symptoms. A few years ago three children in a family all had at the same time typical whooping-cough. During the following year all three developed a protracted paroxysmal cough which, except for the previous year's experience, would unquestionably have been regarded as whooping-cough. Sputum cultures from all three during the second season, however, showed the presence of the influenza organism.

During the past few weeks the Resident Physician in a hospital where much influenza was prevalent developed a paroxysmal cough of such severity that vomiting occurred two or three times a day. One physician who saw him made an unqualified diagnosis of whooping-cough. His blood, however, showed 19,000 leukocytes, with 68 per cent. of polymorphonuclears, and his sputum contained great numbers of the influenza organisms, but not Bordet's bacillus, although careful examination for it was made. I think, therefore, that we should be extremely cautious in making the diagnosis of recurring attacks of whooping-cough.

Since January, but especially during the months of March and April of this year, an unusual amount of influenza has been

CASE I. Child with Lobar Pneumonia at Left Base.



CASE II. Child with Bronchitis and Otitis Media.

seen in the Babies' Hospital. In consequence of this, on April 19th and 20th sputum cultures were made from all the hospital inmates—doctors, nurses and patients.

Of 90 persons examined, 31 showed the presence of influenza at this examination and 3 others had shown it previously, making a total of 34 infected persons, or 38 per cent.

The most marked prevalence of influenza was in the wards in which patients with bronchitis and pneumonia were received. In two such wards, containing 21 patients, 10 had influenza. Of 8 nurses in attendance in these wards, 5 showed influenza. Six of the patients were suffering from bronchopneumonia, 3 others previously had slight temperatures not explained by the other symptoms present; a fourth case, one of tuberculous meningitis, showed only a few influenza organisms. Two nurses had no symptoms suggesting influenza infection, but one shortly after the culture was taken developed a severe cold; the other three were suffering from catarrhal symptoms of various degrees of severity.

A nurse in charge of a special ward containing 3 children who were suffering from influenza, showed the organism in her sputum. She had previously suffered from a mild cold.

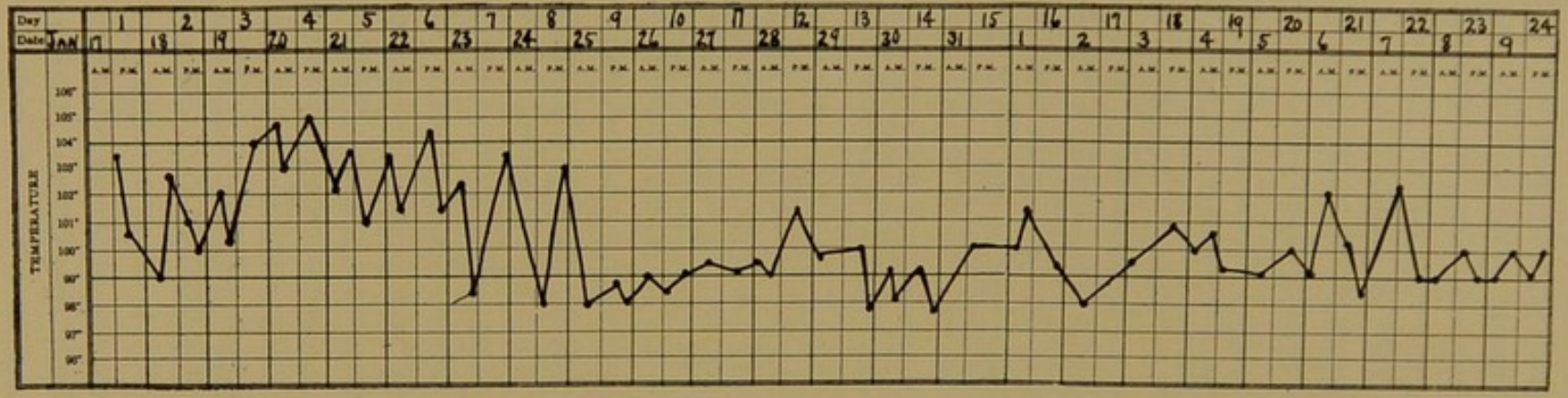
Of the remaining 25 nurses in the hospital only 4 showed the *B. influenzæ,* and 3 of these had suffered from colds or a nasopharyngeal infection.

The Resident Physician, as above stated, had a severe paroxysmal cough and his sputum showed great numbers of influenza bacilli.

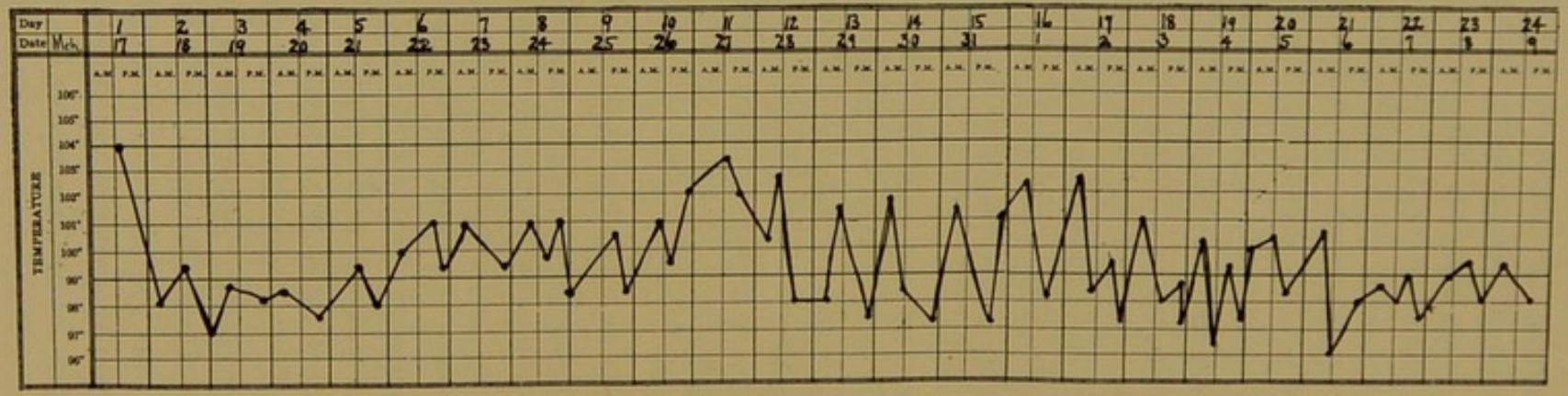
Of 10 cases of pneumonia in the hospital at the time of the routine examination the sputum of 8 showed the B. influenzæ. Of 8 children admitted with pneumonia during the week following, 5 gave positive influenza cultures. Since the number of children admitted with influenza is so large the presumption is that the nurses contracted it from these children and then possibly spread the infection to others.

An unusual prevalence of influenza has been noted in some other institutions in the city where careful sputum cultures have been made. Dr. Swift, of the Rockefeller Institute Hospital, informs me that of 13 pneumonia patients during the first three weeks of April, 8 showed the presence of the B. influenzæ in the sputum cultures.

That the temperature curve and the course of pneumonia is



CASE III. Child with Pneumonia.



CASE IV. Child in Third Week of Pneumonia.

influenced by the influenza complication, no one looking over these charts can for a moment question.

There are still many points to be settled regarding influenza infections. To call every case having an unusual temperature one of influenza is certainly a serious error; but that this infection causes very remarkable fluctuations of temperature in respiratory infections should certainly be recognized. Such temperature curves, I believe, are constantly misinterpreted.

Uncomplicated influenza has a good prognosis; when influenza occurs as a complication of pneumonia it certainly increases the danger of that disease, particularly on account of the tendency to prolong its course and to increase the liability to recurrent attacks. One never can be quite sure when these patients are entirely well. The influenza organism we have found to persist for months in the sputum of children and during this time there was a constant tendency to recurrence of the catarrhal symptoms of greater or less severity.

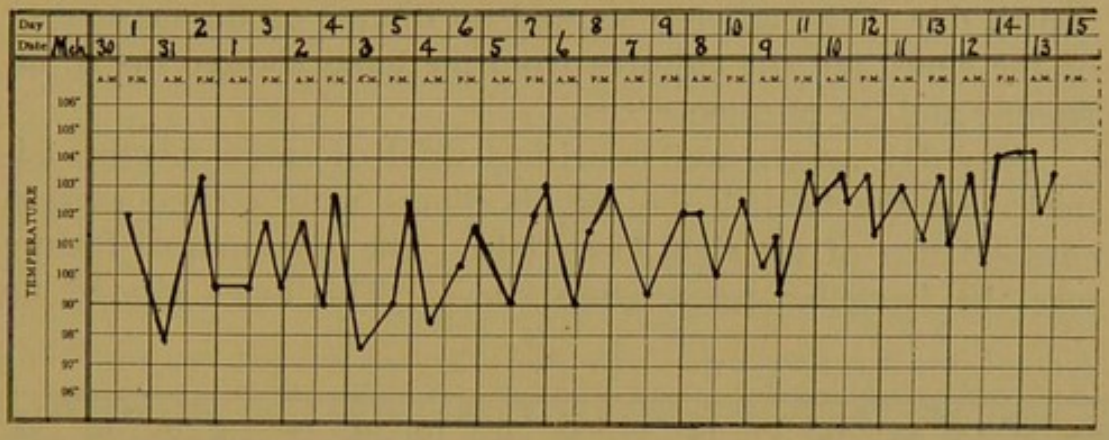
Of treatment there is little to be said. Thus far it has seemed to me quite unsatisfactory. Its definite contagious character certainly increases the necessity for isolation. This is difficult to maintain both in a hospital and a household where nearly always there are several cases in a family. In hospital practice I am convinced that we have been negligent in not paying much greater attention to the separation of these cases from other inmates; for the added risks following infection in children are certainly considerable, not so much from the disease itself as from the complications with which it may be associated.

Cases of respiratory infections complicated by influenza are, in my experience, seldom benefited by cold air, although fresh air certainly is needed. They invariably improve when the warm days of spring come. If symptoms persist it is desirable to send children south to a warm climate. With others, the plan of "watchful waiting" seems to give the most satisfactory results.

The accompanying charts illustrate the most frequent types of temperature seen in influenza cases. With one exception, all of the patients have been observed during the past few weeks.

In none of these cases were any antipyretics given or any measures employed for artificial reduction of the temperature. In all cases a careful examination was made of the urine, the ears, the digestive tract and the other organs to determine if possible whether there was any other factor present which might

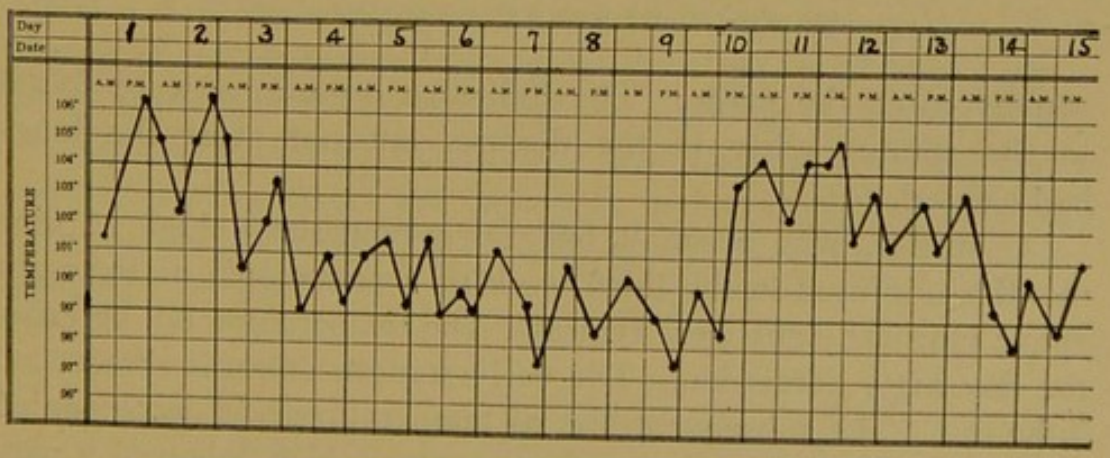
explain the temperature. The diagnosis of influenza was not admitted until all these had been excluded. In every case the diagnosis rested upon the finding of the influenza organism in numbers in the sputum cultures, and, in most cases, they were



CASE V. Child with Tuberculous Peritonitis.

found repeatedly. The evidence seemed conclusive that influenza infection was a factor in the production of the clinical symptoms.

CASE I. was a well-nourished child of fourteen months, admitted with a lobar pneumonia at the left base; signs of resolution appeared shortly after the crisis, but the resolution was slow. The temperature continued some time after the lungs were clear.



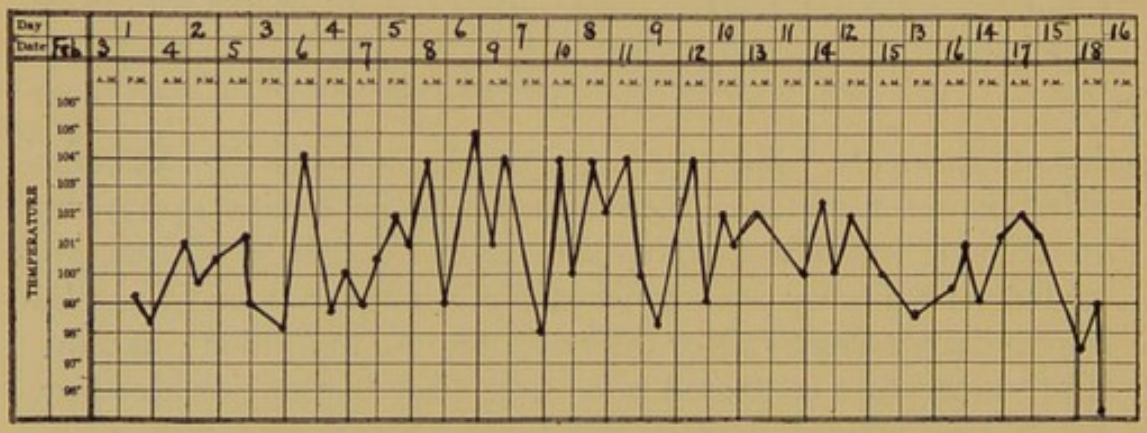
CASE VI. Defective Child. No Catarrhal Symptoms.

Influenza organisms were found in the sputum both during the height of the pneumonia and subsequently.

CASE II. was that of a delicate infant nine months old, admitted with a second attack of bronchitis, having been ill for a week. Otitis developed and double paracentesis was done on the third day, repeated again on the tenth. The left ear was

again opened on the twelfth and the twenty-fourth day. No explanation for the wide fluctuations in temperature could be discovered except the influenza, the sputum cultures showing the presence of the organisms. A small spot of pneumonia developed on the eighteenth day. Death occurred on the forty-fourth day. The autopsy showed no disease of the mastoid or of the sinus, but the cultures from the lungs showed the *B. influenzæ* and the pneumococcus.

CASE III. was a well-nourished child of seven months, admitted on the twelfth day of his illness with a circumscribed consolidation of the right lower lobe. The only unusual feature was the irregular temperature curve. The lungs cleared up



CASE VII. Child with Tuberculous Meningitis.

rapidly after the crisis. The influenza organisms were found in the sputum early in the disease, but not after the lungs had cleared.

CASE IV. was a small, but fairly-nourished child of nine months, admitted in the third week of a pneumonia of the right apex; physical signs were typical. The temperature fell by crisis the day after admission. The early sputum cultures showed no influenza. The subsequent rise of temperature was accompanied by an increase in the catarrhal symptoms which followed a partial resolution and at this time the sputum cultures showed the influenza organism. In this case the child appeared to have contracted the infection in the hospital, as he occupied a bed next to a child who was found to have an influenza infection.

CASE V. was one of tuberculous peritonitis. The symptoms were typical, but no satisfactory explanation could be found for the unusual temperature curve. Frequent and repeated examina-

tion of the lungs and other organs showed no generalized tuberculosis, but, as influenza organisms were present in the sputum in numbers, this disease was suspected. At autopsy there was no sign of a generalized tuberculosis, the lesions being essentially those of a tuberculous peritonitis only.

CASE VI. is that of a child nineteen months old who was admitted to the hospital as a case of mental deficiency. Neither cough nor fever had previously been present nor were they present during the illness. On the day of admission the temperature was found to be 102° and quickly rose to 106½°. There was a leukocytosis of 20,000, with 66 per cent. of polymorphonuclears. The lumbar puncture was negative as well as the examination of the other organs. With this high temperature the child did not appear very ill, and when the temperature fell to, or near, normal the symptoms had quite disappeared. A second rise occurred a few days later with a repetition of the original symptoms and also without any special prostration. At this time also careful examination of lungs, urine, ears were all negative.

CASE VII. was an infant five months old, admitted with the diagnosis of tuberculous meningitis. A clear fluid was drawn by lumbar puncture which contained a large number of cells, chiefly lymphocytes, and tubercle bacilli. On the third day the temperature rose and continued high and fluctuating until death. The clinical symptoms resembled those of a cerebrospinal meningitis. A blood culture and a culture from the sputum both showed the *B. influenzæ;* the spinal fluid remained clear; but a smear contained a few organisms resembling influenza bacilli. The autopsy showed a tuberculous meningitis at the base and a purulent meningitis at the convexity from which the influenza organism was obtained in pure culture. This case has been fully reported elsewhere.