In September, 1896, I returned to Antigua—same district, but nearer to swamps; water from stone cistern; plenty of frogs, etc., in water, which was usually boiled; health very unsatisfactory; pain in back severe, but generally yielding to rest and treatment.

In June, 1898, I came to England and returned in January, 1899. In December, 1900, I returned to St. Kitts, but to a different neighbourhood; house 600 ft. above the level of the sea; nearest swamp 3 miles; drinking water from private mountain source; water for baths, etc., from open mountain source (very unsatisfactory at times), passing through a village, and used by everybody. On two or three occasions I got an "itch" in the bath, called locally "cow itch." My health, at first good, soon failed, and for the whole of this year I have had pain in the back, and headache in right side and right eye; also pains in the knee-joints, and always tired. Was invalided home in July.

I ought to have added that between 1891 and 1901 I have been to Nevis on short visits many times; water there is good. To Montserrat two or three times; water there also good. I spent five days in St. Thomas in 1894, and five weeks in Barbadoes in January, 1900. I have never been to Africa or any where else except the British Islands.

SERUM REACTION OF "BACILLUS PESTIS" IN PLAGUE.

A PRELIMINARY COMMUNICATION.

By R. ROW, M.D.LOND., B.Sc.LOND.

India.

ON the basis of the conclusion arrived at by the learned Plague Commissioners—to quote their own words: ".....In conformity with this, we are of opinion that no practical value attaches to the method of serum diagnosis in the case of plague."—I have made a few observations with a view of seeing, in the absence of agglutination or sedimentation reaction, if differences of any kind could be demonstrated in the serum of plague convalescents or plague patients from that of normal individuals or animals. The whole series of my experimental results depend on the phenomenon I constantly met with, that when a quantity of serum is infected with an appreciable amount of plague bacilli, and this well-infected serum be left alone for twenty or more hours, that while the bacillus pestis flourishes in the serums of normal individuals or of advanced and bad cases of plague, the bacillus pestis is destroyed in the serum of plague convalescents, and inhibited, at all events, in the serum of plague cases at an early stage of the disease, or of plague cases tending to recover.

Fig. 1.—Twenty-four-hours drop culture. Normal blood serum infected with *B. pestis*. Vigorous growth in masses and short chains. ($\frac{1}{11}$ in. Zeiss and No. 3 Swift.)

METHOD.

The method I have throughout employed is as follows: A drop of the serum from plague patients and others, obtained twenty-four hours previously by digital puncture, is mixed with a drop of saline emulsion of bacillus pestis (one loopful of a three or four days agar culture to 30 c.cm. of normal saline), and this well-infected mixture is made into a hanging-drop culture, and put away in the dark at the laboratory temperature. After twenty-four hours the drop culture is manipulated as follows: The coverslip is carefully removed from the slide and is allowed to dry in the air with the drop uppermost. As soon as the drop is just dry it is fixed, and

Fig. 2.—Twenty-four-hours drop culture. Bubonic plague case; serum obtained a few hours after the appearance of the bubo. Growth scanty, showing the effort of Nature to make the best fight. One involution form seen in the field as a curved rod.

at the same time rendered sterile with a drop of ether alcohol. The vaseline circumference sticking to the coverslip is removed with a bit of filter paper and the coverslip is now held in a Cornet forceps, and the traces of vaseline are removed by successive drop baths of xylol, chloroform, and absolute alcohol. Now the coverslip with hanging drop sticking to it is ready to be stained and mounted in the usual way for examination. I have used thionine blue with very good results. For rough examination a objective with No. 3 eyepiece is quite sufficient to show the important differences.

With the ordinary sterile precautions I have not had a single contamination in my drop cultures (of which I have now made over 200), and, being a hanging drop, the culture can be examined as such from day to day for over a week or more, or removed when required to be fixed and stained for examination. It has been found important to examine the drop cultures of the same age throughout the series, and in my observations on the plague serums I have examined cultures of twenty-four hours usually, but when longer time was deemed necessary forty-eight hours' or seventy-two hours' cultures have been fixed for the whole series of drops to be examined for comparison.

Fig. 3.—Twenty-four-hours drop culture of the serum of the same case as in Fig. 2, but on the fifth day of fever and fifteen hours before death, showing the failure in the production of adequate anti-toxin. Growth luxuriant.

From the experiments carried on in the way indicated above, I have up till now examined over twenty specimens of serums from plague convalescents and over thirty specimens of normal serums and about half a dozen in plague cases at the various stages of the disease. I herewith append drawings which speak for themselves. From these results I learn the following facts:

1. Serum of plague convalescents is remarkable for its bactericidal property to bacillus pestis. This property has been observed in convalescents of over six weeks, and has been maintained, though to a less extent, in two cases of plague patients who had plague twelve and eighteen months ago respectively, and whose blood I had an opportunity to examine now. The growth is absent; involution forms constantly found (Fig. 5, 585).

2. The serum of patients in the very early stages of the disease is certainly inhibitory to the growth of bacillus pestis. The bacilli are few and far between, found only on "hunting," and involution forms are constantly found (688, Fig. 4 and Fig. 2).

3. The serum of blood from normal individuals gives very

good growths generally speaking. There are some individuals who give a scantier growth than others, but not one instance has been found when the blood has completely destroyed the growth (Figs. 1 and 3).

Fig. 4.—Twenty-four-hours drop culture from the serum of a bubonic plague patient, who eventually recovered: second day of bubo. *B. pestis*: swollen and irregular. Beautiful involution forms: three seen in various stages as processes sticking out of the leucocytes.

The value of serum reaction above given is of scientific interest, but is of doubtful value, I think, from a diagnostic point of view, inasmuch as, while the observation takes at least twenty hours to give a pronounced opinion, the clinical features of the disease develop with such rapidity as to leave no doubt of the nature of the disease. Yet in a suspected or a convalescent new arrival a positive reaction—that is, absence of bacillus *pestis* in drop cultures—is of value in giving a definite information which may enable one to take preventive measures.

Fig. 5.—Twenty-four-hours drop culture of twenty-days' plague convalescent's serum. Absence of *B. pestis*. Two involution forms seen.

The practical value of the reaction in prognosis is also of doubtful nature, as the clinical course of the disease is, I think, in itself sufficient to guide the physician, yet a good or bad reaction is of interest to watch in the laboratory *in vitro* side by side with the clinical course of the disease *in vivo*.

While the practical value of the above observations is, as I have just indicated, of a doubtful nature from a clinical point of view, its application seems to give ample scope to work out the various problems, and the foremost is that of studying the reaction in Haffkinized subjects at the various stages, before and after the inoculation, and already a few observations have been made by me in conjunction with another worker, but as the material is not yet quite sufficient for publication we are not in a position to give our result just now.

The curative serums are also being tested, but owing to various samples not being within easy reach, I shall not give the result obtained from only one or two samples.

REFERENCE.

- ¹ Plague Com. Rept., 3rd para., p. 68.

THE Chelsea Hospital for Women has received a donation of £500 from H. M. E., who founded the Emergency Fund. The donation is in favour of that fund.

UNRECOGNIZED INFLUENZA.*

BY

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As is well known, influenza frequently escapes recognition: this is true not only in the mild cases but even in the fatal ones. In making observations upon broncho-pneumonia we have had occasion to examine a number of lungs, both of children and adults, and we have frequently found the influenza bacillus in cases in which the disease was not suspected. In all, we have examined the lungs from 12 cases, and from 4 of these we have isolated and subsequently identified the *B. influenzae*; in 4 others we have observed bacilli which were morphologically identical with the influenza bacillus, and also resembled that organism in such cultivations as were obtained, but which were not isolated and subjected to those tests necessary to establish their identity absolutely. These cases may be briefly described as follows:

CASE I (*B. P.*, 1) was that of a child 3 months old, who died of broncho-pneumonia. There were large areas of broncho-pneumonia in both lungs, especially at the right base. By inoculating a rabbit into the peritoneal cavity an impure cultivation was obtained from the blood; from this *B. influenzae* was isolated and subjected to the usual tests.

CASE II (*B. P.*, 2), a child 8 years of age, who died of broncho-pneumonia; *post mortem* scattered areas of broncho-pneumonia were observed in the right lung. Microscopical examination of the lung juice showed capsulated diplococci and some fine bacilli. A rabbit which was inoculated into the peritoneal cavity died in forty-eight hours, and from the heart blood a pure cultivation of the *B. influenzae* was obtained.

CASE III (*B. P.*, 3) was a lad 10 years old, who died of broncho-pneumonia following middle-ear suppuration associated with several small abscesses in the adjacent portions of the temporo-sphenoidal lobe. *Post mortem* both lungs contained numerous areas of broncho-pneumonia, some of which were necrotic and foul-smelling. Microscopical examination of the lung juice showed the presence of short, slender bacilli, resembling those of influenza, short chains of streptococci, and a spore-bearing bacillus. By culture methods an impure growth was obtained of the two bacilli, and subsequently the *B. influenzae* was isolated and identified.

CASE IV (*B. P.*, 4).—A male, aged 20 years, was admitted on November 28th into Guy's Hospital and died on December 6th. He had been invalided for three consecutive days on two occasions during the previous five months for cold and headache. The present illness began nine days before admission, that is to say, on November 19th, with headache and shivering. The headache continued, and on the 24th he had to give up work. On that evening and on the 26th and 27th he vomited several times. On admission the temperature was 101° F., pulse 80, respirations 24. He was delirious and irritable, his tongue dry and brown, and he complained of severe frontal headache. The respiratory and circulatory systems were normal but the pulse was slow in relation to the temperature; there was no paralysis, and the knee-jerks were present; the pupils reacted; there was optic neuritis in both eyes. The patient gradually became comatose, the temperature keeping at a fairly constant level of about 103° F., and the pulse varying between 80 and 90. On December 4th he looked dusky, and rales were heard at both bases. On December 5th the respirations were increased to 44; he died on the 6th. At the necropsy the bone in the pituitary fossa was found to be bare, and the pituitary body itself was difficult; there was some clotting in the lateral sinus. The brain was hardened in formalin and subsequently carefully examined but nothing abnormal was observed. There were extensive areas of broncho-pneumonia in both lungs; in the juice of the lung streptococci, diplococci, and fine bacilli were found. Two rabbits inoculated from the lung juice died in two and five days respectively; nothing was found in the heart blood of either. An impure cultivation was obtained from the lung juice, and from this the *B. influenzae* was subsequently isolated.

CASE V (*B. P.*, 5).—An infant who died from broncho-pneumonia following upon measles; in both lungs there were patches of broncho-pneumonia with pleurisy. The microscopical examination of the lung juice showed small bacilli like those of influenza, and cocci like pneumococci. By means of cultivation upon blood agar an impure cultivation of pneumococci and influenza bacilli was obtained.

CASE VI (*B. P.*, 6).—An infant a year and a half old, died of broncho-pneumonia; there was a consolidated area at the base of the upper lobe at the right side, with scattered areas through the middle and lower lobes. A microscopical examination of the lung juice showed the presence of capsulated diplococci and minute bacilli like those of influenza. By means of cultivations from the gland and from the lung an impure cultivation was obtained, and among the bacilli we found those resembling *B. influenzae*.

CASE VII (*B. P.*, 7).—A child, aged 4 years. *Post mortem*, diffuse broncho-pneumonia was present; in the lung juice there were a few cocci, and many small bacilli looking like the influenza bacillus. By means of cultivation we obtained an impure growth of staphylococci and bacilli like the *B. influenzae*.

CASE VIII (*B. P.*, 8).—An infant 4 months old; diffuse areas of broncho-pneumonia scattered throughout the lung were noted at the necropsy.

*The publication of this paper has been delayed for some months owing to the unhappily fatal illness of Dr. Washbourn.