

border-line of good family, who most vaunt themselves regarding their descent. They do not realise that in these days it is a man's ascent that ennoble him, not his descent, even if, paradoxically, ascent is not possible without good rich blood: it is the progressive accretion of properties, not the progressive loss. But, suggests Professor Bateson, in nature it is the opposite: it is by the progressive loss of properties that from being an amorphous mass of protoplasm man has become man. Life, according to him, first appeared upon earth enshrined in matter of maximum complexity, so complex that it was without form and void, and only as through the vast æons of geological time, this matter fell into order and simplified itself, and successive species developed, did we eventually in these latter days arrive at that simplest and least complex of all creatures, man—simple man.

Does it not appear to you that this is topsy-turvydom? Is it not, on the face of it, more probable that the reverse has been the case—that the earliest matter that could be recognised as living was the simplest. It is not that the earliest living matter possessed all the determinants of all the organised parts of all future forms of life, but that its constitution was such that it possessed, in consequence of its metabolic activities, the potentiality to undergo progressive modifications of that constitution, which modifications manifested themselves, as an outcome, in progressive changes of structure. *The potentiality was there, not the determinants.*

CONCLUSION.

One last word. I feel that, as one on active service, some apology may be required from me for having taken your time and, it may be said, my country's time, in dealing in the course of these four lectures with a matter so wholly foreign to the war, to military medicine, and military duties. Were what I have placed before you wholly new, had I collected, thought out, and elaborated the material of these lectures during the two years since I received the invitation to deliver the course, an apology would, I think, rightly be in place. As a matter of fact, these lectures are little beyond what I have taught and written in the 15 years and more preceding the war; they are a digest and compend of those earlier writings and conclusions, brought up to date by means of an occasional modern instance confirmatory of that earlier work. Four hours ago, at lunch time, in order to complete my bibliography, I went to the library in Wimpole-street and took out the volume of the *British Medical Journal* for 1901, containing an address delivered by me at Brooklyn, New York, in May of that year.¹² That address I had not looked up for a decade or so, and it was not with a little surprise that I found laid down there the physico-chemical conception of inheritance here given, and the doctrine of direct inheritance of metabolic conditions, such as gout and of disturbances of the internal secretions. Rather, therefore, the apology should be that I have plagiarised myself in so wholesale a manner. I shall, however, be satisfied if in these Croonian lectures it is demonstrated that the work of medical men of this generation, of pathologists and bacteriologists, work founded upon the observations and methods of the great biologists of the past, is repaying the debt to biology by establishing principles which are basal for general biological advance.

¹² Brit. Med. Jour., 1901, i., 1317.

AN INDIAN CIVIL MEDICAL SERVICE.—The desirability of a separately recruited Indian Civil Medical Service, lately considered by the Royal Commission on the Public Services in India, has been decided in the negative, at all events, for the present. The general feeling in India appears to be that the question will arise in an acute form after the war. Numbers of civilian medical officers are now employed in important if not very lucrative civil surgeoncies.

A SCHOOL OF MASSAGE.—University College Hospital, Gower-street, W.C., and the National Hospital for the Paralysed and Epileptic, Queen-square, W.C., have appointed a joint committee to manage a school of massage and allied treatment on behalf of the two hospitals. The school is situated in Queen-square, Bloomsbury, and has been named the National Hospital and University College Hospital School of Massage and Electrical Treatment. The curriculum will include the teaching of massage, remedial exercises, and medical electricity, and it is expected that the first term will commence early in October. There is a comfortable hostel in connexion with the school for the use of students who desire to be resident.

PURULENT BRONCHITIS.

A STUDY OF CASES OCCURRING AMONGST THE BRITISH TROOPS AT A BASE IN FRANCE.

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THE numerous cases of purulent bronchitis which have arisen at one of the bases in Northern France during the winter of 1916-17 have presented features of marked clinical and pathological interest. Patients suffering from this unusually fatal disease present a symptom complex so distinctive as to constitute a definite clinical entity. The results of bacteriological and post-mortem examinations tend also to support this belief. The earlier cases were admitted during December, 1916, but it was not until the end of the following January, when exceptional cold prevailed, that the disease assumed such proportions as to constitute almost a small epidemic. Later, when the frost abated, there was a very striking diminution in the number of cases.

The disease has been very fatal. This is shown most readily by post-mortem records referring to this period. During February and early March, while the outbreak was at its height 45 per cent. of the necropsies in this area showed the presence of purulent bronchitis.

It is proposed to discuss this condition from three stand-points: (1) that of the clinician; (2) that of the bacteriologist; and (3) that of the morbid anatomist.

1. THE CLINICAL ASPECT.

Clinical types.—The cases which came under our notice can be divided broadly into two types.

The first and more acute presents a clinical picture which closely simulates ordinary lobar pneumonia with a sustained temperature of about 103°, and expectoration at first blood-streaked—rather than rusty—which, however, rapidly becomes quite purulent. The pulse-rate in these cases is out of all proportion to the temperature in its rapidity. Dyspnoea and cyanosis are prominent features. The patient usually dies from "lung block," resulting in embarrassment of the right side of the heart on the fifth or sixth day. For the last day or two there is often incontinence of the fæces, due, no doubt, to the condition of partial asphyxia. The mental state is one of torpor; delirium is the exception.

The second and less acute type is marked by a more swinging temperature with a range of 2° or 3°. The expectoration at first may be frothy and muco-purulent, but it very soon assumes the typically purulent character. This form may run a long course of from three to six weeks, during which time the patient wastes a great deal and has frequent and profuse sweats; indeed, at a certain stage the illness is most suggestive of acute tubercular infection, and it is only by repeated examination of the expectoration that the clinician can satisfy himself he is not really overlooking a case of acute pulmonary tuberculosis. The majority of our cases conforming to this type have ultimately recovered, but the convalescence is slow and tedious.

Detailed Symptomatology.

Onset.—Whilst a history of a previous catarrhal condition lasting for a few days is often obtained, the disease quickly assumes an acute character; we have been able to observe this in patients admitted in the first instance for a surgical condition. Taking the average readings from the charts of patients admitted into this hospital with purulent bronchitis, we find the temperature is between 102° and 103°, the pulse 120 or over, and the respiration about 35. The patient frequently complains of shivering and looks pathetically miserable, but we have not seen an actual rigor. Despite his obvious shortness of breath, the patients have noticed that, at any rate at first, he prefers a lateral position low down in the bed, and resents any attempt to prop him up.

Cough.—This for the first day or two may be irritable and distressing with a little frothy expectoration, but as the latter becomes more purulent the cough is less troublesome,

and soon the patient is expectorating easily and frequently until the latter stages are reached; when owing to increasing asphyxia the patient becomes more and more torpid, the cough subsides, and hardly any secretion is brought up. This failure becomes an added factor in bringing about a rapidly fatal termination.

Expectoration.—The sputum, with its yellowish-green purulent masses, is very characteristic, and may be one of the first indications of the serious nature of the illness the patient is suffering from. A fuller description follows in the bacteriological section.

Temperature.—The fever of this complaint does not follow any very constant type. In nearly all our cases the pyrexia was of sudden onset, and for the first few days was more or less sustained at about 103°. Later it conformed more to the swinging type with a range of several degrees. In a few cases a curious gradual ante-mortem drop has been observed. The accompanying charts demonstrate this point. (See Charts 1, 2, and 3.)

Pulse.—Tachycardia is a very constant feature throughout the illness. The rate is frequently well over 120, though the volume may remain surprisingly good until immediately before death.

Some degree of dyspnoea is always present, and is usually progressive, though towards the end in the fatal cases when the mental acuteness is dulled by the increasing asphyxia the patient is not distressed by its presence. In some cases there have been paroxysmal exacerbations of the breathlessness, accompanied by a state of panic, in which the patient struggles wildly and tries to get out of bed in order to obtain relief. Cyanosis is another prominent feature throughout the illness. At first it may not be more than duskiness, but in the later stages it becomes very evident. It is only slightly relieved by oxygen; this, no doubt, is partly explained by the difficulty in giving the oxygen efficiently owing to the patient's objection to any mouth-piece that fits at all tightly and partly by the blocked condition of the bronchioles interfering with the absorption of the oxygen.

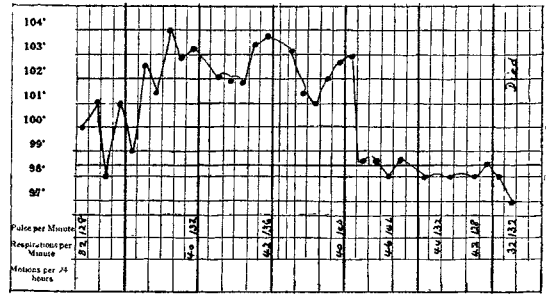
Physical Signs.

The condition usually begins with the presence of a moderate number of sharp crepitant râles, often first heard in the region of the root of the lung; these quickly become generalised. In the majority of the cases signs of broncho-pneumonic patches can be made out; these are generally situated near the root of the lungs. In a certain number of cases these patches spread and become confluent, giving practically all the physical signs of a lobar pneumonia. As the disease progresses the air entry is diminished; on listening one is often struck by the small volume of sound heard. The resonance of the lungs may also be lessened. A slight pleuritic rub was heard in a few of our cases, but this was soon masked by the bronchitic signs.

Treatment.

The treatment of this condition is not satisfactory. So far, in the worst cases, we have been unable to find anything that has any real influence on the course of the disease.

CHART 1 (Private M.).



Shows the temperature course in the more acute type of case. The temperature ends by crisis, but the pulse-rate remains high and the symptoms (cough, dyspnoea, &c.) persist. Death occurred in this case two days after the crisis. *Bacillus influenzae* isolated in this case.

Inhalations of steam with eucalyptus, tinct. benzoin. co., &c., seemed to give considerable relief, and in order to make this as continuous as possible we have recently treated our more urgent cases in a steam tent with encouraging results. The cough is rendered less troublesome, and the expectoration being kept less tenacious is more easily expelled, a most important point, for once the patient ceases to bring up the purulent secretion he quickly goes downhill, becoming more and more cyanosed with right-sided failure of the heart.

The results obtained from oxygen are disappointing, the relief being slight and very transitory. We have already mentioned our explanation of this observation.

Venesection has likewise failed to benefit the patient for more than a very short time, though possibly we have not resorted to this treatment sufficiently early.

For drugs we have chiefly relied on digitalis and iodides with other expectorants. In the last stages, when the

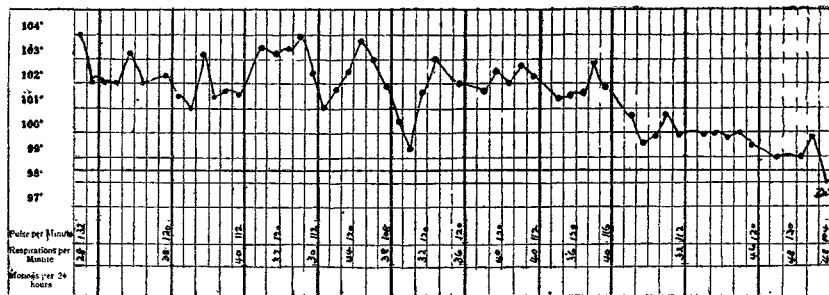
patient has ceased to expectorate, atropine given hypodermically has given temporary relief. Adrenalin has also assisted to prolong life. Pituitary extract increased the incontinence so many of our patients suffered from towards the end, and for this reason probably did more harm than good. Strychnine and camphor in oil were also tried, but without any marked benefit. A suitable vaccine may be shortly forthcoming, but up to the present we have not been able to give this line of treatment a fair trial.

2. BACTERIOLOGY.

Since the outbreak of the epidemic of purulent bronchitis with which this investigation is concerned 20 specimens of sputum have been submitted to the laboratory for bacteriological examination.

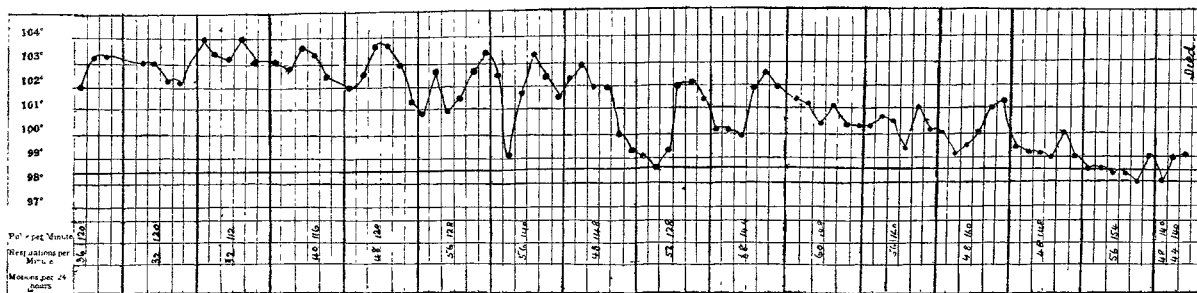
These have all been taken from cases which in their clinical aspect differed from cases of ordinary bronchitis, and most of which presented many of the signs and symptoms described in another part of this paper. In 4 of the cases the sputum examination was supplemented by an examination of pus taken post mortem from one of the

CHART 2 (Private C.).



A less acute case than the preceding. Note the prolonged, rather swinging temperature and the fall by lysis without diminution of pulse-rate just before death. *Bacillus influenzae* isolated.

CHART 3 (Private B.).



This shows a course similar to that of the preceding case but of longer duration. The ante-mortem fall of temperature is again very marked. A Gram-negative bacillus resembling *Bacillus influenzae* present in large numbers in films, but *B. influenzae* was not isolated.

smaller bronchi. In most of the fatal cases a histological examination of the lungs and other organs was made, while in 3 of them an unsuccessful attempt was made to obtain a growth from the enlarged bronchial glands. Certain animal experiments were also made in 3 of the cases; these will be described later.

Sputum Examination.

In each case, after noting the naked-eye appearance of the sputum, films were made and stained by Gram's method and a portion was afterwards plated out on blood-agar or trypsin-broth-legumin-agar.

Character of sputum.—This is in nearly every case markedly purulent. Usually no mucus is present, but in some cases the sputum is muco-purulent. The colour is yellow or greenish-yellow and the consistence thick. Usually it has a nummular character. No blood has been observed in any of the specimens submitted. There has been no appreciable odour.

Examination of films.—In all but three of the cases direct examination of films of the sputum showed the presence of more than one organism. In 18 of the 20 cases there was present a small Gram-negative cocco-bacillus, which was afterwards identified as the *Bacillus influenzae*. This occurred as a rule in typical clumps consisting of large numbers of bacilli. The individual organisms appeared sometimes as minute elongated cocci, often arranged in pairs, and in other cases were less coccoid and more definitely bacillary. In 10 of the cases in which it was found it was the predominating organism, being present in some in enormous numbers. In 3 of the cases no other organisms could be seen in the films, but *B. influenzae* was abundant.

Cultural examination.—The method employed was to remove a small piece of sputum by means of sterilised forceps from the sterile bottle in which it had been collected. The sputum was then thoroughly washed by shaking in sterile saline, and a piece of the washed sputum was plated out on blood-agar or trypsin-broth-legumin-agar. The latter, on account of its transparency and the relative ease with which *B. influenzae* grows on it, gave the better results. In this way the influenza bacillus was isolated in 10 of the 18 cases in which an organism resembling it was seen in direct films.

In the investigation of the other organisms present many were diagnosed both from their morphological and cultural characters. But in some of the cases, owing to lack of time, the appearance of the organism as seen in direct films was alone noted. With this proviso it may be stated that in the cases here shown the following organisms other than *B. influenzae* were found:—

Cases.	Cases.
Pneumococcus 13	<i>M. tetragenus</i> 2
Streptococcus 5	A Gram-positive diplo-
A Gram-negative diplo-	coccus 1
coccus resembling <i>D.</i>	A large Gram-negative
<i>catarrhalis</i> 5	bacillus 1
Staphylococcus 3	<i>B. tuberculosis</i> 1

From the following table it will be seen that in most of the cases in which *B. influenzae* was present in large numbers the pneumococcus also occurred.

Characters of the Bacillus Influenzae Isolated.

The microscopical appearances are usually those of a minute, slightly elongated coccus with a tendency to grow in pairs end to end. Some longer and more definitely bacillary forms are also, as a rule, present. The organism stains somewhat slowly with ordinary stains and is always definitely Gram-negative.

On "tryptagar" growth does not usually appear until 36 hours at least have elapsed. Very small translucent colonies can then be seen which have a convex surface and regular rounded edges. In primary cultures from sputum the influenza bacillus appears to grow more luxuriantly in the vicinity of colonies of other organisms. The colonies are very easily emulsified in water. Attempts at subculture on legumin-agar nearly always failed. On blood-agar growth appears within 24 hours in the form of small transparent colonies. The organism can be repeatedly subcultured on this medium, and though it ultimately tends to die out one strain has at the time of writing been kept going on it for over a month, subcultures being made about once a week. With ordinary agar, glycerine-agar, solidified blood serum, broth and gelatin no growth is obtained. Nor could the organism be cultivated anaerobically on any of the media used.

Table Showing that in Most of the Cases in which *B. Influenzae* was Present in Large Numbers the *Pneumococcus* also Occurred.

Serial No.	Name, &c.	Examina- tion of films.	Result of culture.	Other organisms present.	Death or recovery.	Remarks.
1	Pte. C.	+++	+	...	D	Case of bacillary dysentery with septic bronchitis.
2	Pte. H.	+	—	<i>D. catarrhalis</i> .	D	Had broncho-pneumonia, right pleural effusion and toxic nephritis.
3	Pte. K.	++	+	None.	D	Had broncho-pneumonia
4	Pte. M.	++	+	<i>D. catarrhalis</i> .	D	No pneumonia.
5	Pte. G.	++	—	Streptococcus. Pneumococcus. <i>D. catarrhalis</i> .	D	Broncho-pneumonia and toxic nephritis also.
6	Pte. C.	+++	+	Streptococcus. Pneumococcus. <i>D. catarrhalis</i> .	D	...
7	Pte. A.	+++	+	Pneumococcus (scanty).	D	Marked emaciation.
8	Pte. U.	+	+	Pneumococcus. <i>D. catarrhalis</i> . A Gram-positive diplococcus.	D	Widespread broncho-pneumonia.
9	Pte. G.	++	—	Pneumococcus. Numerous others.	R	...
10	Pte. W.	++	—	Many others.	R	...
11	Pte. W.	++	—	Pneumococcus. Streptococcus.	D	Broncho-pneumonia.
12	L/C. S.	++	—	Pneumococcus.	R	...
13	Pte. D.	—	—	Pneumococcus.	R	...
14	Pte. V.	++	—	<i>B. tuberculosis</i> . Staphylococcus. Pneumococcus.	D	Acute tubercular broncho-pneumonia.
15	Pte. H.	+++	+	Staphylococcus. Streptococcus. <i>M. tetragenus</i> .	D	Broncho-pneumonia and emphysema.
16	Rev. G.	—	—	Pneumococcus. Streptococcus. <i>M. tetragenus</i> .	R	...
17	Pte. T.	—	+	Pneumococcus.	R	...
18	L/C. H.	++	—	Pneumococcus.	D	Double lobar pneumonia.
19	Pte. F.	++	+	Pneumococcus. Large Gram-negative bacillus.	R	Lobar pneumonia.
20	Pte. C.	+++	+	None.	D	No pneumonia. Antemortem fall in temp.

Col. 3: +, *B. influenzae* present in small numbers; ++, in moderate numbers; +++, in large numbers; —, not found.
Col. 4: +, *B. influenzae* isolated; —, not isolated.

Animal experiments.—Two strains of the organism isolated were injected into mice intraperitoneally and into rabbits intravenously. In another case in which the *B. influenzae* was present in the sputum in large numbers and was practically the only organism found, a suspension of the sputum in saline was similarly injected into a rabbit and a mouse. In all cases the animals survived and showed no signs of illness.

Vaccine therapy.—A vaccine was prepared from the organism isolated from one of the later cases, but by the time this was ready the epidemic was almost over, and up to the time of writing there has not been a suitable opportunity of using it. It is not, however, likely, if one may judge from the blocked state of the bronchioles, that vaccine therapy will be of any value except in the early stages.

3. MORBID ANATOMY.

The prevalence of bronchitis of a purulent type is seen from a study of 156 consecutive necropsies made during February and early March, 1917, in which it occurs as a primary condition in 45 and as a secondary condition in 26 of the cases examined. Altogether purulent bronchitis was found in 45.5 per cent. of the total cases. In the cases examined bronchitis is more than five times as numerous as lobar pneumonia, which is the other prominent pulmonary disease. Tuberculosis in the form of obsolete foci in lungs or glands was present in 8 of the total 71 cases. In the whole 156 cases tuberculosis was noted in 14. In none of the cases of bronchitis did tuberculosis appear to be active. It occurred in 3 which are regarded as primary, and in 5 secondary cases. It would appear not to bear any definite relation to the incidence of the condition.

Appearances which might be regarded as typical are as follows.

The face is more often than not cyanosed, and often a considerable degree of wasting is present, though in the more rapidly fatal cases this is not so apparent.

The lungs show three prominent features. They are almost always bulky on account of a great amount of emphysema which affects chiefly their anterior margins. The heart is often greatly obscured by bulky lung when the chest is opened.

Some degree of pleurisy is generally present; more often this is plastic in type, though occasionally small collections of fluid are found in the pleural cavities; clear yellow fluid was found in 8 of the cases examined, 5 of these being primary. In only 2 cases did the effusion exceed a few ounces; both of these were cases of primary bronchitis. Empyemata are not often found.

The third feature is the constant appearance of a thick yellowish pus in the bronchi. In the larger bronchi it is mixed with air, and often is discoloured by altered blood; but in the small tubes cut in section the pus exudes spontaneously as a rule, with little or no admixture of air. A lung cut in the ordinary way may show large numbers of small yellow points from which pus is exuding.

Considerable œdema is commonly associated with the above appearances, and a greater or less degree of collapse, generally at the vertebral borders of the lower lobes, was found in 15 of the cases examined.

A certain number of cases pass on to a condition of broncho-pneumonia, and when this occurs it usually shows itself in the form of small solid nodules, in the centre of which are pus-containing bronchioles. Consolidation has been first observed near to the roots of the lungs, and in a few has been so extensive as to simulate lobar pneumonia at the necropsy. Broncho-pneumonia was recorded in 32 of the 71 cases examined, of which 22 occurred in cases primary from the start.

In 34 of the cases of primary bronchitis lymphatic glands in the root of the lung, the bronchial group, and the tracheal glands were noted as greatly enlarged, and on section they were grey or pinkish-grey in colour. Not uncommonly the mesenteric and retroperitoneal and even inguinal and axillary glands were found affected.

The spleen in many cases was found engorged and not soft. On cutting the organ the corpuscles were often found to stand out prominently as if sharing in the disorder of the lymphatic glands.

Some degree of derangement of the kidneys was noted in 25 out of the 45 primary cases, taking the form of some swelling and pallor of the cortex. Often the kidneys had lost their firm consistence and were flabby and in a few cases soft. Engorgement, on the other hand, was noted in a few, generally accompanied by engorgement of the spleen. The liver very often showed evidence of fatty change.

The right side of the heart was almost always dilated and the myocardium commonly pale and friable. No evidence of endocarditis was found in any case. A few ounces of pericardial fluid, always pale yellow and clear, were found in 10 cases, but this was not associated with any roughening of the pericardium or cohesion of its surfaces. Broadly speaking, these findings fall into two groups. In one the organs are congested, the heart dilated, though fairly healthy, and the patient cyanosed; in the other the organs are flabby or soft, the heart muscle pale and friable, and the patient pallid. The first group corresponds with a suffocative and the second with a toxic death.

Histology.

An examination of portions of lung, bronchial gland, and kidney taken from eight of the fatal cases was made. The following is a summary of the histology of these organs.

Lungs.—The most striking changes are in the smaller bronchi. Their walls are thickened and the vessels engorged; the lining epithelium, which is at first intact, is later detached in parts from its basement membrane, and the epithelial cells can be seen lying free in the lumen. In a still more advanced stage the bronchiole is entirely denuded of mucous membrane, and its wall consists of granulation tissue which greatly diminishes its calibre. The bronchi are in the less advanced stages almost completely filled with pus, in which, in some cases, the influenza bacillus was found in appropriately stained sections. Later on columnar epithelial cells in small masses are mixed with the polymorphonuclear pus cells, and by the time the epithelium is entirely shed the amount of pus in the bronchus is greatly diminished. Many of the specimens show marked broncho-pneumonia, but in some there is no great extension of the inflammatory process to the surrounding lung tissue. Indeed, the small extent to which catarrhal pneumonia is often present in the vicinity of markedly involved bronchi would

suggest that the pneumonia is due to a local toxic effect rather than to an infection of the corresponding area of lung tissue.

Bronchial glands.—There is extreme congestion and enlargement of lymph nodes. In one specimen one of the larger arteries was thrombosed, but no suppurative change was present in any of the cases.

Kidneys.—In almost all there is degenerative change in the tubular epithelium due to toxic action. This varies in degree, and in the most marked cases there is desquamation of epithelium, round-cell infiltration, and congestion, the condition being indistinguishable from an acute tubular nephritis.

CONCLUSIONS.

1. We are here dealing with an epidemic of a variety of purulent bronchitis.

2. For the following reasons we consider the cause of the disease to be the influenza bacillus: (a) The almost constant occurrence of this organism in the sputum; (b) its presence in the pus of the affected bronchioles; (c) in some typical cases it occurs apart from the presence of any other organism; (d) the outbreak of the disease in epidemic form at the time of year when influenza epidemics are most common and whilst one was actually in progress; (e) the marked signs of toxic poisoning which are found during life and post mortem.

3. There are well-marked clinical features which distinguish these cases from ordinary cases of bronchitis. The most prominent are the characteristic sputum, the extreme tachycardia, the cyanosis, the course of the temperature (notably the ante-mortem fall), and the extremely high mortality.

4. Treatment has so far been unsatisfactory. The most encouraging results have been obtained by use of a steam tent. Vaccines have not yet had a trial, but it is unlikely, in view of the blocked condition of the bronchioles, that they would be of great benefit.

5. The morbid anatomy consists of three groups of changes. (a) The lung condition: Marked purulent bronchitis, the smaller bronchi being filled with thick pus, from which air is notably absent. In some cases secondary broncho-pneumonia and œdema, pleurisy, and emphysema are common. (b) Evidence of toxæmia: Especially seen in kidneys, spleen, liver, lymphatic glands, and heart muscle. (c) Signs of right side heart failure and passive congestion. Some cases die of the toxæmia and others of the cardiac failure.

6. The histological changes are those of an acute purulent bronchitis affecting the smaller bronchi with or without some surrounding catarrhal pneumonia. Degenerative changes are seen in other organs, notably in the kidneys, where the appearances of a toxic nephritis may be found.

We are indebted to Colonel Sir John Rose Bradford, K.C.M.G., who originally pointed out to us the distinctive nature of these cases and who has given us much kind assistance throughout the investigation. Our thanks are also due to Professor J. H. Teacher, of Glasgow, for his kindness in preparing the photo-micrographs.

DESCRIPTIONS OF FIGS. 1 TO 6.

FIG. 1 (Case 7).—Marked congestion of bronchial wall with polymorph infiltration. Mucous membrane well preserved except at one part. Lumen almost completely filled with pus. No peri-bronchial pneumonia. (Same size as original.)

FIG. 2 (Case 7).—Part of the wall of a large bronchus showing congestion of submucosa, emigration of leucocytes through the swollen mucous membrane, and the purulent collection in the bronchial lumen. (× 120.)

FIG. 3 (Case 4).—A moderately large bronchus with muscular and cartilaginous wall. There is free desquamation of epithelium which is seen lying among the pus in the lumen. The adjacent lung tissue (of which very little is here shown) is markedly congested, but not consolidated. (× 60.)

FIG. 4 (Case 6).—A bronchiole almost full of pus. Only here and there can the remains of mucous membrane be detected. There is a pneumonic condition in the surrounding air vesicles, large pigmented catarrhal cells being present. (× 60.)

FIG. 5 (Case 6).—A high-power view of part of the preceding specimen. It shows the purulent bronchial contents, the remains of mucous membrane, and the surrounding catarrhal pneumonia. (× 120.)

FIG. 6 (Case 3).—A small bronchus showing a later stage than the other photographs. Epithelium completely shed and the much-thickened mass consisting entirely of young granulation tissue. Surrounding lung tissue congested, but no pneumonia present. (× 60.)

FIG. 1.

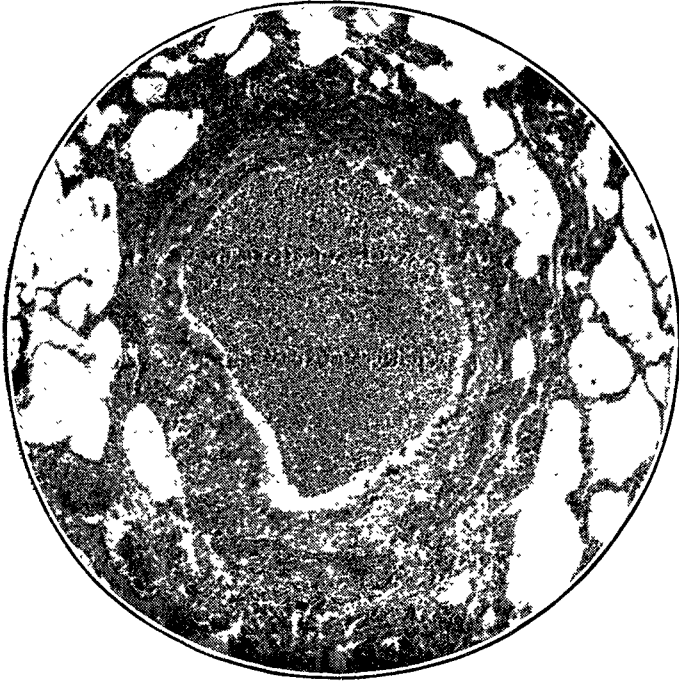


FIG. 2.



FIG. 3.

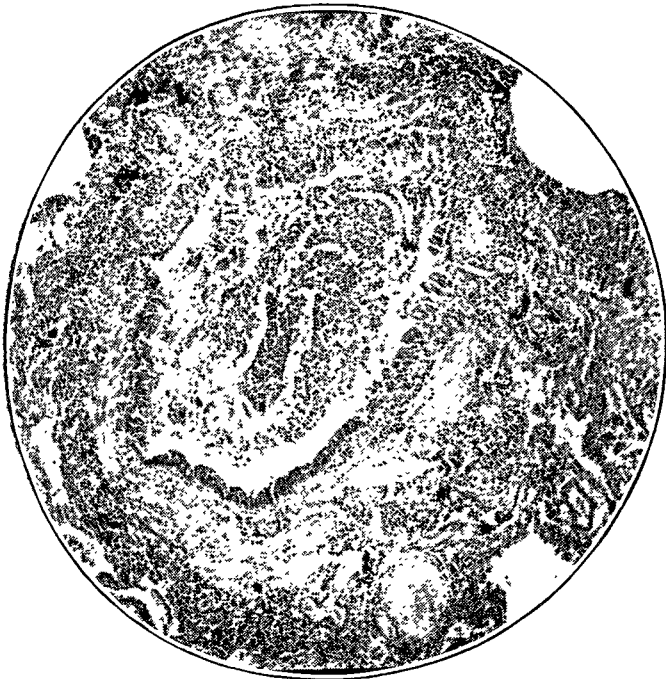


FIG. 4.

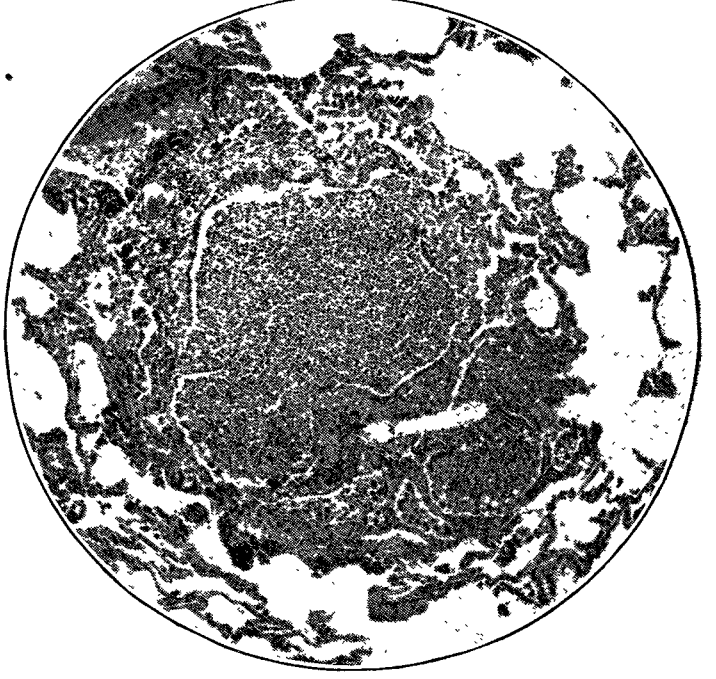


FIG. 5.

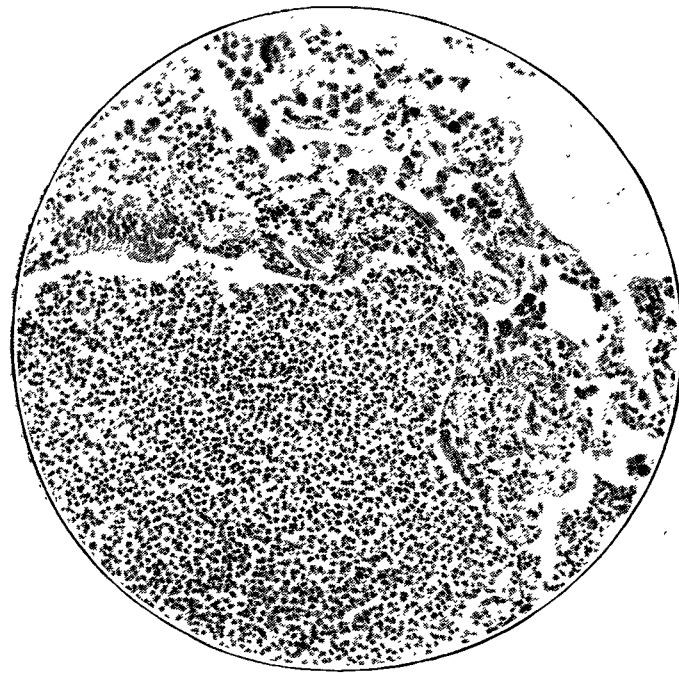
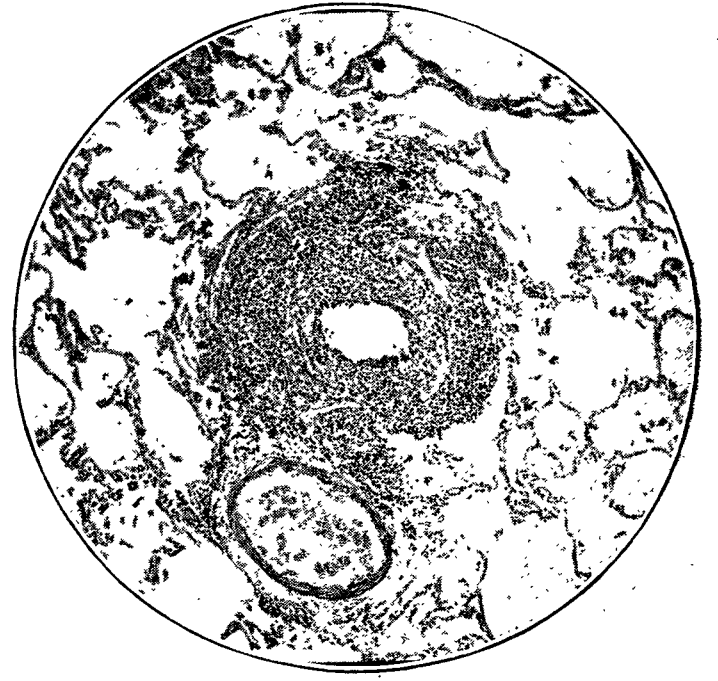


FIG. 6.



Skiagrams Illustrating Captain Pirie's Cases of Marching Fractures.

FIG. 1 (Case 1).



FIG. 3 (Case 3).

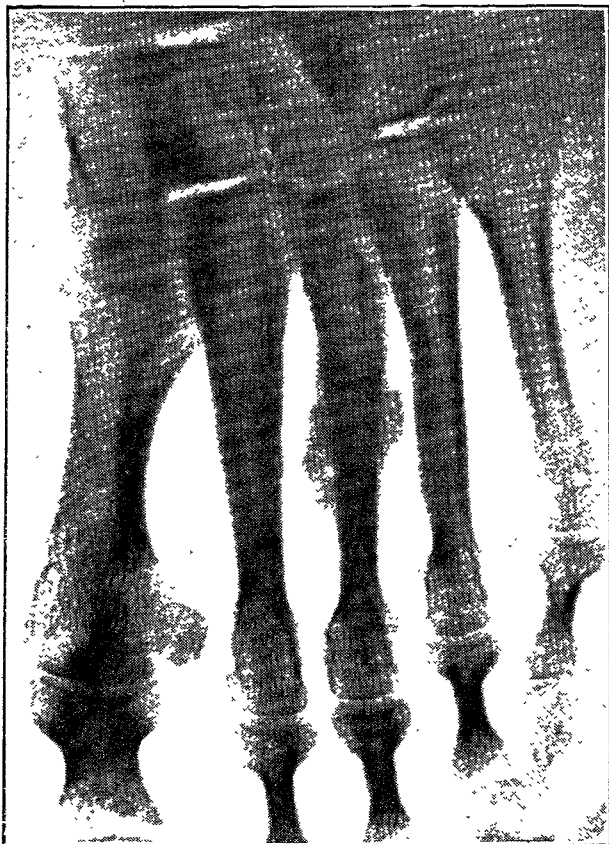
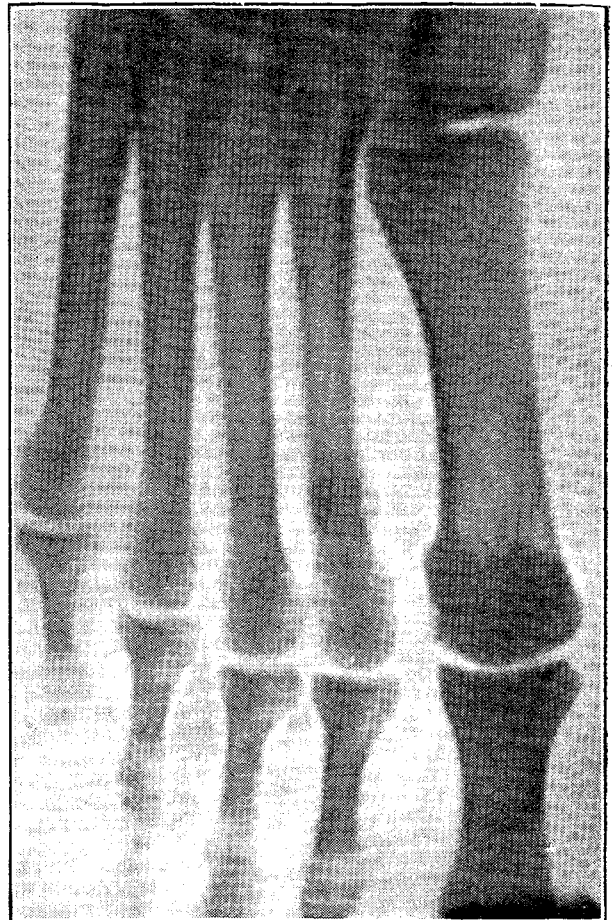


FIG. 2 (Case 2).



FIG. 4 (Case 4).

*Descriptions of Cases.*

CASE 1.—A. J. M., age 39. Unaccustomed to marching; began hard marches. Feet became very sore, specially after resting. Six weeks ago after a hard march the right foot swelled and was more painful than the left. He was not aware of a sudden acute pain like that caused by a bone breaking. The right foot continued painful for a month, but he carried on, going into the trenches and out again. After four weeks he had to give up. At the end of the sixth week he was X-rayed in our hospital, and there was shown to be fracture of the

second right metatarsal bone near the head, surrounded by very abundant callus. (Fig. 1.)

CASE 2.—A. S., age 19. Marched for ten days with full pack, doing about 10 kilometres a day. While marching on the tenth day his feet were very sore and he felt a sudden acute pain. He carried on for nearly three weeks, at the end of which he was sent to our hospital, where an X ray was made, showing fracture of the second and third right metatarsals near the head, with abundant callus. (Fig. 2.)