simply became feverish and rapidly developed lung symptoms. None of them had herpes labialis. One of us saw the children on the third day after the onset of symptoms (Oct. 14th) and the condition of matters was tragic in the extreme. All of them had broncho-pneumonia involving both lungs, and three of them had temperatures of 102° F. or over, a pulse-rate of over 140, and respirations over 70 per minute. The two worst, the boy aged 7 years and a girl aged 2, were unconscious, and the boy evidently had not long to live. The boy was too ill to be moved, but the two younger girls were admitted to hospital, leaving the baby and the oldest girl, who was not very ill, to be nursed at home, as the mother's resources were somewhat limited. The pneumonia was of broncho-pneumonic rather than of lobar type, the dulness and tubular breathing not being so extreme and extensive as in pneumococcic pneumonia. The boy never rallied at all and died on Oct. 15th, the fourth day of his illness. The girl aged 2 years died on the fifth day of her illness, gradually sinking in spite of all that could be done, and the other three children recovered, the two older girls somewhat rapidly and the baby after three weeks' illness.

An endeavour was made to ascertain the nature of the micro-organism causing the condition, both by taking cultivations from the organs of the boy who died on Oct. 15th and by cultivations from fluid obtained by exploratory puncture of the consolidated lung from the children in hospital; but no organism was isolated until the organs from the child who died in hospital were carefully investigated. The ears of the children were carefully examined, but suppurative otitis media was not the cause of the severity of the symptoms. In the case of the girl who died in hospital there was some congestion of the left membrana tympani two days prior to her death, but no suppuration, although at the necropsy pus was found. Clinically the remarkable feature of the cases was the suddenness with which all five children were attacked and the severity of the pneumonia in each case.

Necropsy.—A post-mortem examination was performed by one of us on the body of the girl, aged 2 years, who died in hospital, on Oct. 19th. The body was that of a well-developed and well-nourished child. Rigidity was present but not marked. There was some lividity of the lips. There was nothing of note in the heart. Both lungs showed a recent acute fibrinous pleurisy; both showed irregularly distributed purple areas scattered over the surface with intervening paler areas, the typical appearances in lobular pneumonia. On palpation numerous solid nodules could be felt. On section the lungs appeared congested with more darkly coloured solid nodules scattered through their substance. The bronchi contained some secretion and their mucous membrane was congested. The bronchial glands were enlarged and congested. The peritoneum showed chronic inflammation, evidenced by thickening of the capsule of the liver and spleen. The liver and the kidneys showed fairly well-marked cloudy swelling, and the spleen was slightly enlarged, and, on section, pale with prominent Malpighian bodies. The vessels of the brain were congested and there was some excess of cerebro-spinal fluid. Both middle ears contained pus.

The surface of one of the lungs was seared, an incision was made with a sterile knife, and portions of the fluid exuding from the lung substance were inoculated into broth and blood agar. No growth was observed on the first day, but after 48 hours minute, discrete, translucent colonies were visible on the blood agar. The broth also showed some turbidity. On examination the organism was found to be a very minute bacillus, although at first it had the appearance of a coccus. The organisms occurred singly or in pairs, end-to-end. They stained fairly readily with ordinary stains, but dilute fuchsin gave the best results. The Gram reaction was negative. The organism did not grow well on broth or agar, but on blood agar the growth was fairly profuse, the colonies being barely visible to the naked eye after 48 hours and did not become subsequently much larger. They were most numerous at the margins of the blood streaks. It was found that subcultivation every week or ten days was sufficient to keep the cultures alive. In this way the organism was kept growing for five or six months. After some months, however, microscopic examination of the growth showed very remarkable appearances. The bacilli were on an average larger, some were thin, and others thick and club-shaped; filamentous forms were not infrequently observed. Soon after the organism was isolated a strong emulsion of it was made in normal saline and injected into the ear vein of a rabbit. The animal did not develop any symptoms at all. At first we had little difficulty in concluding that the germ was the influenza bacillus. Later on, when the involution forms appeared, we had some doubt as to its identity, but when we found that such forms have been frequently described in connexion with old cultures of the organism, notably by Grassberger,[1] the fact merely confirmed us in our original conclusion. We are indebted to Dr. C. J. Lewis for assisting us to classify the germ.

Microscopic sections of the lung showed the usual appearances of a capillary bronchitis and broncho-pneumonia, and sections stained with dilute fuchsin showed minute bacilli in small numbers in alveoli and bronchi similar to those cultivated.

Pathologically the chief points of interest in the cases are the epidemic nature of the disease and the occurrence of the influenza bacillus as the only organism present in the lung in one of the cases. From the occurrence of the cases at one and the same time, and from the fact that cultures upon ordinary media failed to show any growth in the other fatal case, one may fairly conclude that the causal germ in all the other cases was the influenza bacillus. The occurrence of this germ in broncho-pneumonia has long been recognised, and the fact that it is not infrequently the only organism present in the lungs is emphasised by Fraenkel.[2] The main point of interest in the present instance is therefore the occurrence of the influenza bacillus as a cause of a number of cases of broncho-pneumonia arising so obviously in connexion with one another as to warrant the term epidemic.

EIGHT CASES OF EXTERNAL ANTHRAX.

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CASE 1.—A man, aged 23 years, a willower, was admitted to hospital at 5.45 P.M. on April 12th, 1906. On April 9th the patient noticed a sore on the left upper eyelid. On the 10th the eyelid was swollen and he was not able to open the eye; there was no pain. On the 11th the left side of the face began to swell, and on the 12th he saw his medical attendant who advised him to go to the infirmary. On admission the temperature was 101·2° F. and the pulse was 120. The left upper eyelid was swollen and covered with vesicles; there was a red inflammatory zone just below the eyebrow. The left side of the face was swollen and brawny as far as the angle of the jaw; there were no enlarged glands, no soreness of the throat, and no history of vomiting or shivering. Owing to the position of the pustule it was decided not to excise it. At 9 P.M. 40 cubic centimetres of Sclavo's serum were injected subcutaneously. On April 13th the temperature was 101·4°, the pulse was 104, and the respirations were 22. The left side of the neck was swollen. 40 cubic centimetres of serum were injected subcutaneously, and also, close to the pustule, 10 minims of carbolic acid solution (5 per cent.). The evening temperature was 103·4° and the pulse was 106; the patient vomited four times during the day. On the 14th the temperature was 103·4° and the pulse was 110. I injected 30 cubic centimetres of serum and also 10 minims of carbolic acid solution. There was no improvement in the condition of the patient. On the 15th the temperature was 102°, the pulse was 104, and the respirations were 20. The right side of the face and neck was swollen and the left cheek was covered with vesicles; 10 minims of carbolic acid solution were injected. On the 16th, at 1.30 A.M., the right eye was closed and the œdema now involved the chest as far as the nipples. I made four incisions, two on the forehead and two on the left side of the face. At 10 A.M. the temperature was 100° and the pulse was 108; the œdema of the face was less; 40 cubic centimetres of serum were injected. On the 17th the condition of the patient was much improved; there was eversion of the left upper eyelid owing to œdema of the conjunctiva.

[1] Grassberger: Centralblatt für Bakteriologie, Band xxiii., 1898, S. 353.
[2] Fraenkel: Spezielle Pathologie und Therapie der Lungenkrankheiten.

The temperature was 100° and the pulse was 108, on the 18th falling to 99° and 100 respectively. There was also on the 18th considerable diminution in the œdema of the face, neck, and chest. I injected 20 cubic centimetres of serum; the left cornea was clear. On the 19th the local and general condition of the patient was much improved. I incised the swollen conjunctiva; the temperature was 100·4° and the pulse was 100. On the 20th there was a rash all over the body; he complained of pains in the back, thighs, and right elbow. I prescribed aspirin, 10 grains, thrice daily. The temperature was 99° and the pulse was 112; 20 cubic centimetres of serum were injected. On the 21st the temperature was 101·4° and the pulse was 110; there was a large slough on the left upper eyelid. The œdema of the face, neck, and chest was considerably diminished. On the 22nd the temperature was 100·8°; the pains were not so severe and the rash was disappearing. On the 23rd the temperature was 99° and the pulse was 80. The patient's condition was much improved and he was evidently out of danger. On May 2nd he was photographed; the slough on the eyelid and the swollen conjunctiva are well shown (Fig. 1). On May 14th the slough was removed; and on June 12th, the ulcer having healed, I incised the scar and removed the thickened conjunctiva.

FIG. 1.

CASE 1.—Slough on the eyelid and swollen conjunctiva before operation.

The lids were brought together with Pagenstecher's thread. The patient was discharged on July 14th. Fig. 2 (reproduced from a photograph taken in September, 1906) shows the result of the operation.

CASE 2.—A married woman, aged 32 years, a weaver, was admitted at 10.45 A.M. on June 1st, 1906. On May 27th she noticed a "heat lump" over the left eyebrow, on the 29th there was some swelling around the sore, and on the 30th she complained of pain below the left ear, and was unable to open the eye. She consulted her medical attendant on the 31st and was advised to go to the infirmary. On admission the temperature was 100° F. and the pulse was 110. About half an inch above the left eyebrow there was a typical malignant pustule; the forehead, eyelids (left) and left side of the face and neck were œdematous. Two enlarged glands were felt below the left ear. She did not complain of sore-throat; there was no history of vomiting or shivering. Under local anæsthesia (cocaine and adrenalin) I excised the pustule and injected 40 cubic centimetres of Sclavo's serum. The œdema disappeared rapidly and the patient felt quite well in a few days. On June 10th, by undercutting the skin all round the ulcer, I was able to bring the edges almost together. This patient left the hospital on June 13th. I saw her on March 20th, 1909, and the scar was scarcely visible.

CASE 3.—A youth, aged 18 years, a wool-shaker, was admitted at 11.30 P.M. on Nov. 1st, 1906. On Oct. 29th and 30th this boy was "packing sheets of wool" for the willower, and on the 31st he was shaking wool which had passed through the willow-machine. On the evening of the 31st he felt a "sore place" on the right side of the neck; there was no swelling. On Nov. 1st he went to work at 6.30 A.M.; the right side of the neck was swollen; he had no pain. During the day the right side of the face began to swell, and about 10 P.M. he saw his medical attendant, who sent him to the infirmary. On admission the temperature was 100·4° F., and the pulse was 108; the tongue was clean. On the right side of the neck, about 2 inches below the lobule of the ear, there was a well-developed anthrax pustule. There was œdema of the right side of the face and neck. No enlarged glands could be felt. There was no history of vomiting, sore-throat, or shivering. On Nov. 2nd, at 12.30 A.M., under chloroform, I excised the pustule and injected 40 cubic centimetres of Sclavo's serum. The boy slept well during the night. At 10 A.M. the temperature was 101° and the pulse was 96. The face, neck, and upper part of the chest were very œdematous. The patient was drowsy. At 6 P.M. the temperature was 102°, and the pulse was 112. He vomited once. At 11 P.M. I injected 40 cubic centimetres of serum. On the 3rd the temperature was 100·6° and the pulse was 110. The boy vomited twice. The face, neck, and chest were very much swollen; the right side of the neck and face was hard and brawny and covered with vesicles. The patient was very restless and had difficulty in swallowing. At 6 P.M. the temperature was 101·2°, and the pulse was small and rapid. At midnight I made four incisions and injected 20 cubic centimetres of serum. On the 4th the boy's condition was very bad; the temperature was 97·6°. I was unable to count the pulse. At 7.30 P.M. the temperature was 99·8°, the pulse was 130, he had difficulty in swallowing, and the breathing was stertorous; he vomited several times. 20 cubic centimetres of serum were injected. On Nov. 5th the temperature was 100·6° and the pulse was 130; there was very little change in the œdema. There was a thick cloud of albumin in the urine. At 6 P.M. the temperature was 101·2° and the pulse was 136; the boy was restless and had great difficulty in swallowing; 40 cubic centimetres of serum were injected. On the 6th at 4 A.M. the boy was very restless; the pulse was quick and irregular. I changed the dressing and injected liquor strychninæ (5 minims). At 6 A.M. the nurse came to my room and said that the boy was much worse. When I reached the ward he was dead. No post-mortem examination was made, the coroner being satisfied with the bacteriological report from the Public Health Laboratory, Wakefield. Figs. 3 and 4 are reproduced from photographs taken, one six months before the boy's fatal illness and the other on Nov. 4th at 2 P.M.

FIG. 2.

CASE 1.—Result after operation.

CASE 4.—A girl, aged 14 years, a hanker, came to the infirmary on March 4th, 1907. On Feb. 27th she noticed "a

sore" on the front of the right forearm. She saw a herbalist on March 1st and was told to apply poultices. On admission there was a well-developed malignant pustule on the front of the right forearm about four inches above the wrist and the forearm was swollen as far as the elbow. The temperature was 100° F. and the pulse was 84. Under an anæsthetic the pustule was excised and 40 cubic centimetres of Sclavo's serum were injected subcutaneously. The local and general condition of the girl improved rapidly, and she was made an out-patient on March 23rd. She was discharged on April 27th. This girl came to the hospital on March 21st, 1909, and on the forearm there was a thin depressed scar about the size of a florin.

CASE 5.—A schoolboy, aged 13 years, was admitted at 11 A.M. on August 23rd, 1908. The following history was obtained. After school hours the boy usually "took the tea" to one of the men employed by a hide and skin merchant, and he generally spent the afternoon helping the men in the warehouse. On August 20th he noticed a "heat spot" on the left side of the face. On the 22nd his face began to swell and he felt cold. On admission the tongue was clean; the temperature was 100·6° F., the pulse was 108, and the respirations were 24. The pustule was on the left cheek close to the angle of the jaw; the left side of the face and the upper part of the neck were swollen.

FIG. 3.

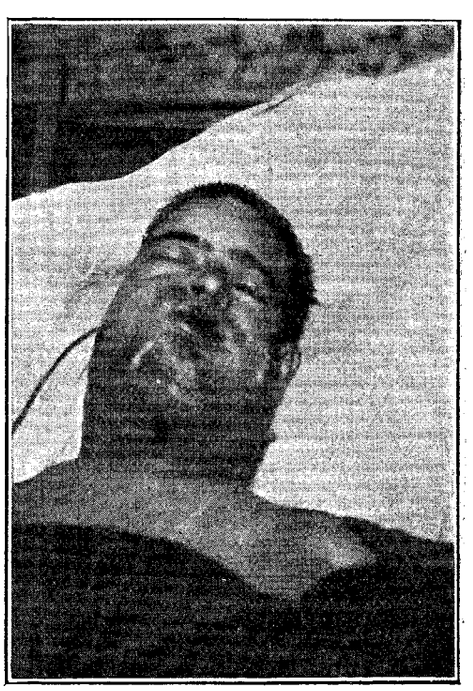
CASE 3.—Reproduction of photograph taken six months before fatal illness.

At 8 P.M., under an anæsthetic, 80 cubic centimetres of Sclavo's serum were injected under the skin of the abdomen. The pustule was not excised. At 10 P.M. the temperature was 101·6°. On the 24th the temperature was 99·4° and the pulse was 88; the œdema was much less and the boy's general condition had improved. On the 25th the pulse was 80, the temperature was 97·8°, and the respirations were 18. He complained of slight pains in the back and limbs and there was a rash on the chest and abdomen. The œdema of the face and neck was considerably diminished. The boy was made an out-patient on Sept. 2nd, and he was discharged on Oct. 16th. In reply to a postcard he came to the infirmary on March 18th, 1909; at the angle of the jaw there was a thick scar about a quarter of an inch long.

CASE 6.—A man, aged 55 years, was admitted at 1 P.M. on August 29th, 1908. This patient had not worked for several months, but his wife was a "condenser-minder" in a wool mill. The following history was obtained. On August 25th the patient washed a blouse usually worn by his wife to protect her clothing whilst at work. On the 26th he noticed a pimple on the right side of the face close to the eye, and on the following day his face was swollen. On admission the temperature was 98·6° F. and the pulse was 82. Over the right zygoma there was a necrotic patch about three-quarters of an inch in length and half an inch wide, surrounded by an extensive ring of vesicles. The right side of the face and neck was swollen and the right eye was closed. This was the largest malignant pustule that I have seen. At 3 P.M. 40 cubic centimetres of serum were injected subcutaneously and a boric acid fomentation was applied. The pustule was not excised. There was no reaction after the serum. The local and general condition of the patient improved rapidly and he felt quite well in a few days. He was made an out-patient on Sept. 12th and was discharged on Oct. 3rd. In reply to a post-card he came to the infirmary on March 18th, 1909. The scar, thin and depressed, was scarcely visible.

CASE 7.—A man, aged 44 years, a farmer and butcher, was admitted at 3 P.M. on Oct. 4th, 1908. About ten days before admission he received a scratch on the front of the left forearm. On Sept. 28th one of his cows died suddenly, and he skinned and cut up the carcass the same day. The meat was sold to the "neighbours" and the hide to a fellmonger. On admission the tongue was furred, the temperature was 103·3° F., the pulse was 92, and the respirations were 24. The whole of the left upper extremity was swollen, and on the front of the forearm, about 3 inches above the wrist, there was a typical anthrax pustule. There were several bullæ on the forearm; no enlarged glands were

FIG. 4.



CASE 7.—Reproduction of photograph taken Nov. 4th, at 2 P.M., shortly before death.

felt. He complained of headache and "cold shivers"; there was no history of vomiting. At 6 P.M. 40 cubic centimetres of Sclavo's serum were injected and the arm was placed in an izal bath. The pustule was not excised. On the 5th the temperature was 103·4°, the pulse was 92, and the respirations were 24. The arm was much worse; there were numerous bullæ on the forearm, and a few on the upper arm. There was no vomiting; the urine was free from albumin and sugar. At 12.30 P.M. 40 cubic centimetres were injected (10 cubic centimetres intravenously). At 5 P.M. I made three incisions along the front of the forearm and one in the back of the hand. The cut tissues were of a greyish colour and gelatinous. The temperature was 104° and the pulse was 110 (10 P.M.). On the 6th the temperature was 100·4° and the pulse was 104. The upper arm was incised and 30 cubic centimetres of serum were injected. He was rather better. On the 7th the temperature was 99·8° and the pulse was 88; the patient was better in every way. On the 8th there were signs of delirium tremens; the pulse was 80 and the temperature was 98°. I prescribed bromidia, one drachm every three hours. At 11 P.M. a quarter of a grain of morphia was injected. On the 9th at 1.30 A.M. the patient got up and pulled the bandages and dressing off. He became very violent and after

a struggle I injected half a grain of morphia into the left leg. He slept for several hours. On the 10th the temperature was 98° and the pulse was 70. The œdema of the arm was considerably diminished, but near the pustule a large area of skin showed signs of sloughing. The general condition of the patient was excellent. On removal of the gangrenous patch it was seen that some of the flexor tendons were going to slough. He would not consent to have the ulcer skin-grafted and he was made an out-patient on Oct. 31st. There is an ugly puckered scar just above the wrist and considerable impairment in the mobility of the fingers and hand.

As stated before, the carcass was sold to the neighbours at reduced prices, and probably over 100 persons partook of it. The patient and a butcher who assisted in dressing the carcass contracted external anthrax on the forearm, and one woman who handled the raw meat developed a malignant pustule on her face, but no case of intestinal anthrax was recorded. A second cow contracted the disease and was cremated in the orthodox fashion. The most probable source of infection was the dust from a willow machine in a mill being carried by the wind to the field in which the cows were pasturing. The butcher and the woman were treated by Dr. Leslie Milne, Mirfield, and both recovered.

CASE 8.—A man, aged 52 years, a rag-grinder, was admitted at 9 P.M. on March 13th, 1909. The following history was obtained. He was working on a "blend of merino and wool," and on March 9th he noticed a pimple on the front of the right forearm, a few inches above the wrist. On the 11th the sore was larger and the forearm was swollen; he went to work as usual. He vomited once on the 12th and noticed a "red ring" around the sore; there was some increase in the swelling. On admission the temperature was 100·6° F., and the pulse was 116; about 3 inches above the wrist there was a well-developed anthrax pustule; the forearm was swollen as far as the elbow; no enlarged glands were felt. He was perspiring freely. About 9.20 P.M. a swab was taken for bacteriological examination. On the 14th the temperature was 100·8°, and the pulse was 80. There was no change in the local condition. At 4 P.M. Sclavo's serum—40 cubic centimetres—was injected subcutaneously and a fomentation was applied to the forearm. The temperature at 5 P.M. was 101·8° and at 7.30 P.M. a second swab was taken for examination. On the 15th the temperature was 99·2° and the pulse was 82. The general condition of the patient was good; there was no change in the local condition. At 1 P.M. a third swab was taken. On the 16th the temperature and pulse were normal. The swelling of the forearm was much less. At 12.20 P.M. a fourth swab was taken. The patient left the hospital on the 23rd and was made an out-patient. On March 18th I received the following report from the Public Health Laboratory, Wakefield: "*Re* Specimens VI., Nos. 31, 32, 35, and 36. The culture obtained from Specimen VI., No. 31, received from you on Sunday, the 14th March, was inoculated into a guinea-pig and caused death 24 hours later, anthrax bacilli being recovered from the blood. I failed to find any anthrax bacilli in the specimens received 15th March (32), 15th March (35), 17th March (36)."

Remarks.—Before Sclavo published the results of his trials of serum-therapy, the treatment usually recommended in cases of external anthrax was excision of the necrotic patch and of the infiltrated tissues around, followed by the application of pure carbolic acid or the actual cautery. Since 1899 several cases have been treated successfully in Italy with serum alone, and during the last few years this method of treatment has been carried out in England, combined with excision or alone. Since 1905 nine cases of cutaneous anthrax were treated in the General Infirmary, Dewsbury: in four cases the pustule was excised and serum was injected, one case was treated with serum and three injections of carbolic acid solution, and four cases with serum alone. During the same period three cases were treated by private practitioners in Dewsbury: in two cases the pustule was excised and serum was injected; one case was treated with serum alone. Of the 12 cases one was fatal—8·3 per cent.

Case 1 was a virulent type of the disease; the patient received 190 cubic centimetres of serum in eight days, and his recovery must be attributed to it. In Case 3 the boy walked into the ward and undressed without assistance. After excision of the pustule œdema increased so rapidly that I regret not having treated the case with serum alone. Dr. Legge[1] states that "examination of the notes on 64 cases treated in St. Bartholomew's Hospital and Guy's Hospital shows that in 10 œdema increased after excision, and in a small number of the deaths in London hospitals generalisation of the disease followed so quickly after excision as to raise suspicion that they were connected." Case 7 was a very malignant type of the disease and the patient owes his recovery to Sclavo's serum, of which 110 cubic centimetres were administered in two days.

I am indebted to the visiting staff of the infirmary for permission to publish these cases.

Dewsbury.

LOCAL SEPSIS AS A FACTOR IN RHEUMATISM AND GOUT.

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AND

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THE microbic hypothesis of the origin of gout, rheumatism, and rheumatoid arthritis appears to be generally accepted in the recent literature of the subject. The distinction between the various forms of these diseases tends to disappear as it becomes more recognised that the many intermediate types shade off so gradually into each other that no sharp dividing line can be drawn between them. Radiography lends its support to this view. The plates of the various types are hardly to be differentiated without knowing the previous history. Elsewhere[2] our views as to the probable foci of infection have been explained, but a brief recapitulation may be useful. Our attention was called to the possibilities of an original septic cause for the above maladies some time ago, and since then we have made it a routine practice to examine every such case thoroughly for any possible local sepsis. In every case such a condition has been found. In the majority of adult cases pyorrhœa alveolaris is the most common initial lesion, tonsillar sepsis to a lesser degree, but still not infrequent. Nasal disease has also been found, but is very rare in comparison with the previous two in adults; but in children adenoids and septic tonsils are the prevailing septic foci. Not one single case of rheumatism or gout has been found without some accompanying local sepsis. Of course, this has long been realised in an inverted way, for "rheumatic tonsillitis" and "gouty gums" are among the most ancient of medical terms.

As stated above, there are various situations where the sepsis may originate. Most of them are well recognised and no description is needed either of their appearance or potentialities—most, but curiously enough not the one to which we believe the majority of cases occurring in adult life can be traced, i.e., pyorrhœa alveolaris. This paper will therefore deal principally with this form of septic infection. We wish it to be clearly understood, however, that it is not supposed to be either the sole source of infection in every case of these affections nor to give rise only to these particular diseases. On the contrary, it is allowed nowadays to be of the utmost importance in the anæmias and in many derangements of the digestive tract. This, however, is well recognised, while we venture to think that its rôle in the diseases here discussed has been overlooked.

The types and signs, therefore, of this particular infection may be briefly described. The term "pyorrhœa" has been used for the sake of brevity and convenience to indicate any form of oral sepsis. Strictly speaking, it should connote the presence of pus. Actual pus, however, is by no means invariably present. Pyorrhœa, then, used in a general sense, in this paper may indicate any of the following types. 1. The superficial inflammation around the teeth in ill-kept mouths, which, once restored to a healthy condition, can be kept in order by the patient's own efforts. 2. Pockets

[1] The Milroy Lectures on Industrial Anthrax, March 7th, 9th, and 14th, 1905, by T. M. Legge, M.D. Oxon., D.P.H. Cantab. See THE LANCET, March 25th, 1905, p. 765.

[2] Clinical Journal, February, 1909.