infection by the *Diplococcus pneumoniae* rather than by other forms of organism.

As might be expected, the treatment by antistreptococcal serum was without any appreciable result on the course of the illness. Though the temperature fell slightly after the injections, the pulse and respirations were not affected. The identification of the *Diplococcus pneumoniae* was only completed by the result of the inoculation experiments, and so came too late to modify the vigorous antistreptococcal treatment pursued.

REFERENCES.

- ¹ *Obstet. Trans.*, vol. xlv, 1903, p. 128. ² *Ibid.*, vol. xlvii, 1905, p. 11.
³ *Trans. Amer. Gyn. Soc.*, 1898, p. 141.

A NOTE ON

THE ETIOLOGY OF GRANULOMA PUDENDI.

By K. S. WISE, M.B.,

BACTERIOLOGIST TO THE COLONY OF BRITISH GUIANA.

THOUGH granuloma pudendi is extremely prevalent in British Guiana, the first adequate clinical description of it, by Conyers and Daniels,¹ only appeared in 1896. Later this was added to by Daniels,² Ozzard,³ and Fowler,⁴ and the disease has now acquired a position in manuals on tropical diseases, Galloway,⁵ in 1897, describing the pathological characters of the lesion. Though a better knowledge of the disease has shown it to occur in the New Hebrides, Solomon Islands, New Guinea, India, and North Australia, a particular causative factor has not been discovered.

During the past few weeks in British Guiana I have had an opportunity of examining cases of granuloma pudendi, and in three successively have demonstrated spirochaetes.

CASE I.—An extensive granuloma in the height of its activity, spreading up into the groin. Excised by operation. Smears made from the growth, just superficial to its fibrous base, but yet well below the surface, showed many spirochaetes when stained by Leishman's method. These were short and much resembled the *S. refringens*. On staining by Giemsa's method, others were visible; some of these presented a different character, having closer-wound spirals and being straighter and more rigid than the above. They were more like the *S. pallida*, yet, so far as I could remember from specimens seen recently in England, not exactly similar.

CASE II was almost exactly similar in the number of spirochaetes, their distribution, and reaction to stains.

CASE III is more interesting, in that extremely few spirochaetes were found when staining by Leishman's method, though always of the *refringens* type. Giemsa's method, on the contrary, demonstrated not a few of the closely-twisted spirilla which I have mentioned above.

All three cases were in black women, natives of British Guiana.

The readily-stained spirochaete, I have little doubt, is *S. refringens*. The second spirochaete gives cause for hesitation. If it be the *S. pallida*, this fact strongly supports the view of the minority that this granuloma is a manifestation of syphilis. However, in the present state of knowledge it is useless to speculate on the identity of spirochaetes.

I hope to pursue the subject later and forward a further report indicating its distribution, with the result of inoculation and cultivation experiments.

REFERENCES.

- ¹ Conyers and Daniels, *Brit. Guian. med. Ann.*, 1896. ² Daniels, *ibid.*, 1898. ³ Ozzard, *ibid.*, 1898. ⁴ Fowler, *ibid.*, 1899. ⁵ Galloway, *Brit. Journ. of Dermat.*, 1897.

A NOTE ON SYPHILIS AND CANCER, ETC., AND ON SOME PROTOZOA.

By J. JACKSON CLARKE, M.B. LOND., F.R.C.S.,
SURGEON TO THE NORTH-WEST LONDON HOSPITAL, ETC.

Syphilis and Spirochaetes.

THE recent discovery of mobile spirochaetes in the primary and secondary, cutaneous and glandular lesions, and in some tertiary lesions of acquired syphilis, and in the skin and viscera of congenital syphilis, is of the highest interest in pathology. Dr. Schaudinn's¹ description of the *Spirochaeta pallida* of syphilis needs no confirmation, coming as it does from one of the ablest of modern protozoologists²; but if confirmation were needed, it has had it

amply. The organism (Fig. I, 4 and 5) is characterized by the numerous (10 to 26) spiral turns and by their permanence, as well as by its physical properties, which

include a low power of refracting light, whence the name "pallida." The commoner spirochaetes, such as the *Spirochaeta refringens* (Fig. I, 3), possess the spiral form only when in movement.

Before the appearance of Schaudinn's preliminary note² on another spirochaete (*S. ziemannii*) which during part of its life-cycle infests the white blood cells of birds, and during the remainder of its life-cycle

different parts of the body of the common gnat, bacteriology had claimed spirochaetes, confusing them with the spiral bacteria or spirilla. Now

we know that they are protozoa of most complicated life-history, including various forms, some of which, compared to the spirochaetes, are giant cells.

It will be instructive, in passing, to glance at some of the stages of *Spirochaeta ziemannii* depicted by Schaudinn as he found it in the bowel of the gnat, where, as with the malaria parasites, the fertilized mobile ovum cell (oökinet) undergoes development (Fig. II, 1). The original description (translated) reads:

The giant oökinet rounds itself off and produces in the gut of the gnat an enormous number of trypanosome-like offspring which change into true spirochaetes. The spirochaetes are thus not bacteria, but flagellates.

Now syphilis is a disease in which, as we know, the parasites' life-cycle is completed within the human host, so that if the *S. pallida* has to do with causing the disease, the other larger forms must be found in the tissues. They

Fig. I.—1. Molluscum body with oscillating particles; 2. Flagellate bodies derived from same; 3. *Spirochaeta refringens*, a common spirochaete. 4. *Spirochaeta pallida* of syphilis. 5. *Spirochaeta pallida* of syphilis (?) dividing (3, 4, 5 are after Schaudinn from *Deut. med. Woch.*, October 19th, 1905).

Fig. II.—*Spirochaeta ziemannii*, after Schaudinn. Stages in the intestine of the common gnat: 1. Oökinet, or adult mobile fertilized parasite. 2. The same, later stage elongated and coiled, and with several nuclei. 3. The same, still later stage, much convoluted, with multiple nuclei. 4. The same, rounded off, and giving rise to a multitude of small trypanosomes which change to spirochaetes.

pallida has to do with causing the disease, the other larger forms must be found in the tissues. They

can be none other than the forms that I described in 1894, and reproduce in Fig. III, which is copied from the original article with some slight corrections. The description of the figure gives my interpretation of the appearances seen at the margin of this secondary* syphilitic ulcer. Since 1894 I have observed them in fresh living cells of scrapings of tertiary ulcers, and they confirm my view of the appearances shown in Fig. III. I have not the slightest doubt that they are protozoa, and, if I am right, the bodies that I have described as protozoa in cystic urethritis, cancers, sarcomas, etc., are really such—a point to which I will revert.

As bearing on the structure of spirochaetes in general, a study of *Trypanosoma balbiani*, a primitive form which occurs in the alimentary tract of the oyster, is of interest. W. S. Perrin³ describes the life-history and the strange nuclear changes of these parasites. The encystment of the asexual forms is especially interesting:

Motion ceases and the periplast bursts, protoplasm and nuclear elements flowing out to form an irregular mass, which condenses to form a spherical cyst. The chromosomes undergo secondary fusion into irregular masses, and later become indistinct.

In the encysted female form also the nuclear matter becomes indistinct. "possibly being diffused through the cyst protoplasm, giving rise to a chromidial condition." These forms, apparently without nuclei, are of great importance in view of the occurrence of similar bodies in small-pox, syphilis, cancer, sarcoma, etc.

Molluscum Contagiosum.

The superficial resemblance of molluscum bodies to protozoa has long been recognized; the first scientific claim to their being protozoa was made on histological grounds by A. Neisser.⁴ The only published account of evidence of vital activity in molluscum bodies is that given by myself.⁵ The description (translated) runs as follows:

The most remarkable appearance consists in the presence of a great number of actively-moving flagellate bodies. They have a roundish head of the size of a red blood corpuscle, and a single powerful flagellum, and under a $\frac{1}{2}$ immersion lens were easily seen and unmistakable; many passed across the microscopic field and then escaped from sight. Many of the molluscum bodies were unchanged; of others, but a thin bacterium-filled shell remained; still others had apparently undergone a liquefaction in their central part, and in this area numerous highly-refracting fragments in oscillating movement (Fig. I, 1), such as one not only seen when unorganized particles are suspended in liquids, but also in many living protozoa.

I may add that in what I called the heads of the moving bodies (see Fig. I, 2) there were oscillating particles similar to those in the molluscum bodies. The circumstances under which the observation was made only allowed me time to make the drawing here reproduced, and by an accident the whole of the material was thrown away. I did not imagine that there would be any difficulty in repeating the observations, but I have twice tried this without result, and this has led me to recall care-

fully the conditions under which the first experiment was made. In my original description, I gave only the day temperature of the room. It was a small room facing North, and the preparations were placed on the chimney-piece. At night the temperature would be not much above freezing, and by day quite up to blood heat. I am now repeating the attempt, reproducing these conditions. These negative results do not, however, affect the one positive result. What I saw could be the result of nothing but life, and life in the molluscum bodies as well as in the flagellate bodies. I thought the latter were most likely the swarm spores of a mycetozoon, but in view of Schaudinn's work I now think they were more probably the microgametes of the encysted flagellate that we term a molluscum body, the "head" would then be a portion of the mother cell still adhering to the young flagellate.

Sarcoma and Cancer.

Among the lines of investigation that have recently been pursued in the study of malignant disease, none is more interesting than that resulting in the finding of "gametoid" cells in cancer. The importance of exact cytological knowledge in pathology is very great, and we have all learned much from the papers of Farmer, Moore, and Walker. Coming

fresh to pathology, however, these investigators seem to have suffered from a want of familiarity with previous work on similar lines. Twelve years ago⁶ a paper of mine on the cell forms in a sarcoma was published; incidentally it dealt with the work of Klebs and Hansemann. Unfortunately, no illustrations were published with this paper, but, having kept them, I reproduce three in this place (Fig. IV). Such cells may be "gametoid," but there is no gradation of forms leading up to them from the tissue cells of the tumour, and many of them are devoid of nucleus—that is, are in the chromidial state common in protozoa.

Fig. IV, 2, is more like a budding suctorian* than any human cell. It is only when cancer or sarcoma tissue is studied broadly from the point of view of the origin of the tissue

Fig. III.—A group of epidermal cells near the margin of a secondary syphilitic ulcer. 1. Dense parasites devoid of nucleus: the nuclear matter distributed throughout the cell. 2, 2'. Parasites with nuclear chains of chromatin. 3. Large reticular parasitic mass. 4. Formation of spirochaetes. 5. Large club-shaped parasite. 6. (?) Intranuclear parasite (*Path. Soc. Trans.*, 1895).

elements, and by patient training of the eye by previous study of recognized parasitic diseases in human tissues that such cell forms as those depicted in Fig. IV can be recognized as parasitic. It is now over thirteen years⁷ since I first described my view of a cancer of the nasal fossa, being led to it by a case of cystic urethritis, in which, after careful study, I came to the conclusion that the disease was caused by protozoa. By further study I extended the view to other cancers and sarcomas, and to syphilis, etc. Every time during these past years that I have re-examined my specimens—even when I have tried to take the opposite view—I have been confirmed in my view, which is to the effect that the common forms of cancer and sarcoma are caused by more or less local infections by protozoa, and differ from the infective granulomata only in the more intimate character of the parasitism and the more complicated life-history of the parasites.

* As mentioned in my original article (*Trans. Path. Soc.*, 1895) and again in *Cent. für Bakt.*, 1895, I found structures similar to those in Fig. III in primary, secondary, and tertiary lesions. The preparation from which Fig. III was taken was included amongst those from primary sores, and is described as such in the two places mentioned above, but a subsequent careful comparison of the series of preparations has led me to class this as a secondary lesion.

* It must not be inferred from this that I deem them to belong to the Suctorians. On the contrary, I think, we must be prepared to learn that the forms assumed by parasitic protozoa are more protean than has hitherto been thought possible. It should be remembered that spirochaetes have recently been found in cancers, and I am prepared to find different kinds of protozoa in different cancers.

The general interest in the protozoa has greatly increased in recent years, and many new facts have already been established, and others will be forthcoming. I hope very shortly to produce the second volume of my work on *Protozoa and Disease*, and I

Fig. IV.—Three cells from a myxo-sarcoma of the uterus ($\times 100$ diameters). These cells, according to the author, are protozoa. 1. Large cell undergoing mitotic binary fission. 2. Large cell with multiple budding and irregular mitosis. 3. Large non-nucleated cell within a capillary blood vessel.

believe that, with recent additions to biological science, I shall be able to convince biologists and pathologists alike that in every essential, what I have advanced concerning cancer, sarcoma, syphilis, small-pox, etc., since the year 1892 is true.

REFERENCES.

- ¹ Schaudinn and Hoffmann, *Deut. med. Woch.*, April 23rd, 1905. ² *Arb. a. d. kaiserl. Gesund.*, Band XX, Heft 3, 1904. ³ *Proc. Roy. Soc.*, August 3rd, 1905. ⁴ *Verhandlung. der IV. Dermatol. Congress.* ⁵ *Centralbl. für Bakt.*, 1895, vol. i, p. 245. ⁶ *Trans. Path. Soc.*, 1894, p. 249. ⁷ *BRITISH MEDICAL JOURNAL*, December 24th, 1892.

SEVERE PUNCTURED WOUND OF LOWER JAW.

By E. G. WALES, M.A., M.B. CANTAB.,
DOWNHAM MARKET, NORFOLK.

THE following case may be of interest not only on account of the unusual and severe nature of the accident, but as an example of the difficulties the general practitioner may be called upon to meet.

On May 22nd, 1905, at 11 p.m. I was summoned in haste to a man who was said to be "hung up" on some park palings about three miles away, as the result of a cycle accident, the messenger could not say whether the man was much hurt, the difficulty was "they could not get him down." I found A. B., a young man of 26, standing supported by a policeman against some iron palings mounted on a low stone wall, which separated a private park from the road; it was a lonely spot situated in some woods, and the night was dark with cold showers of hail. By the light of a lantern I was somewhat startled to see one of the cruel-looking iron spikes with a broad-arrow head protruding from the man's mouth, his chin rested on the cross-bar, his feet just touched the ground and he was able partly to support himself with his arms. He had been impaled in this position for about an hour; he was pale, cold, with a feeble pulse, and evidently suffering much pain and shock. Unsuccessful efforts had been made to lift him off, resulting only in increased pain; he could articulate indistinctly and implored not to be touched. From the shape of the spike, a photo of which is

given one-third natural size, it was obvious that any attempt of this kind would be futile.

The history of the accident was this: He was cycling home with two friends, one on each side, when, running downhill, the road divided right and left; one companion went to the right, the other to the left, both calling out: "This way!" The man in the middle hesitated which way to turn, with the result that he dashed straight forward, his front wheel striking the low wall. He shot over his handle-bar and came down with his chin on top of the iron spear-head; this penetrated into his mouth and out just in front of his upper incisor teeth, knocking out several. No doubt his head was thrown back at the time, otherwise the spike must have gone up through his palate. The ball seen under the spike-head was embedded in the lower part of the wound; the flat broad head was pressed against his upper lip and nose.

Sending for the nearest blacksmith and his tools, we filed through the shaft a few inches below the horizontal cross-bar through which the vertical bars passed. There was no room to file between the man's chin and the cross-bar, and this method would have left no handle for subsequent extraction. While this was being done a room was prepared in a neighbouring cottage, with hot blankets, etc. The patient was then held well up while the now detached spike was hammered up from below through the cross-bar in which it was tightly fitted. This must have been a very painful process, but it was impossible to give an anaesthetic. The proceedings were rendered more unpleasant by the presence of a beehive fixed on the far side of the railings just at the poor man's feet, and the light from the lanterns caused these creatures to buzz around in a threatening manner.

The patient was then carried indoors, and, having wrapped him in hot blankets and applied hot bottles to his feet, I gave chloroform, and was able, with a great amount of traction, to withdraw the spike by the way it had entered; it would have been impossible to pull it right through his mouth, as not only was there not enough of it to grasp, but so tightly was it jammed between the bones of the lower jaw that there was great risk of fracture. Very little haemorrhage followed the extraction, the track being immediately almost closed by muscular contraction. I syringed the wound and packed it with gauze. As soon as the patient recovered from the anaesthetic, from being pale, cold, and almost pulseless, he was warm, of good colour, with a full pulse, and, what much surprised me, could talk almost distinctly and without much pain. He was then moved to Lynn Hospital, where the house-surgeon, the late Mr. Hand, told me next morning that he could only with difficulty pass a probe through the wound in the floor of the mouth. Subsequently a good deal of suppuration took place (the spike was rusty, and the paint flaked off into the wound), and small portions of the lower jaw necrosed with formation of abscesses; but now, after nearly twelve months, the man is in good health, with practically no alteration in speech and very little disfigurement. When I visited him in hospital the day after the accident his chief complaint was of stiffness and soreness in the muscles at the back of the neck, which he attributed to his frantic efforts to wrench himself free when he first found himself impaled.

One-third natural size.

LATIN-AMERICAN MEDICAL CONGRESS.—The third Latin-American Congress will be held at Montevideo from January 13th to 20th, 1907, under the patronage of the President of the Republic of Uruguay, Don José Battle y Ordoñez, the Minister of Education and Public Works, Don Juan A. Capurro, and the Minister of Foreign Affairs, Dr. José Romeu. An Exposition of Hygiene will be held in connexion with the Congress. The Government has allocated a sum of 20,000 pesos for the purposes of the Congress. The previous meetings of the Congress were held at Santiago de Chile and Buenos Aires.