ON THE *SPIROBACILLUS ZEYLANICUS* (CASTELLANI).¹

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(PLATE XVI.)

THE *Spirobacillus zeylanicus* (Castellani) is a little known organism which presents several features of special interest. Discovered by Castellani in Ceylon in 1904, it was first described by him (1909¹), and again, more fully (1910²). He applied to it the following names: (1) *Spirillum zeylanicum*, (2) *Spirobacillus zeylanicus*, (3) *Vibrio zeylanicum*, and (4) *Vibriothrix zeylanica*. This plurality of nomenclature indicates the doubts which were held as to the correct position and classification of this organism. In 1917 Castellani, Spagnolo, and Russo (1917³) frequently encountered the *Spirobacillus zeylanicus* (Castellani) in Italy, in the course of the routine bacteriological examination of dysenteric stools at Taranto.

As I have recently isolated this organism from the stools of a case of post-dysenteric colitis, I propose to give a brief account of the observations I have made upon it.

The patient, Mr. B., was a middle-aged man who had resided in Ceylon for twelve years and returned to England in 1915. For the last three years he has suffered from colitis of a dysentiform character.

The *B. dysenteriae* (Flexner) is stated to have been isolated from the stools in 1917, and amœbæ either free or encysted were not found.

In June 1918 a sample of the stools was received for a protozoal and bacteriological examination. It was fairly normal in consistence and appearance. The search for *Entamoeba histolytica* and its cysts gave a negative result, nor were any other Protozoa found. The stools were suitably diluted with normal saline and plated on to Conradi-Drigalski agar (without crystal violet) and on to MacConkey neutral-red agar. White colonies similar to those produced by the typhoid-paratyphoid-dysentery group of bacilli were obtained. These were then subcultured and investigated and found to be the *Spirobacillus zeylanicus* presenting the following characters: It grows freely on all the ordinary laboratory culture media. It stains readily with the usual staining reagents. It is Gram-negative and motile. On agar slopes the culture in twenty-four hours forms a rather delicate film of a greyish-white colour, somewhat resembling cultures of *B. dysenteriae*. On gelatin and on inspissated blood serum similar but less abundant growths develop and show

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no liquefaction of either medium. On potato the growth often develops a characteristic brownish-red coloration, somewhat resembling cultures of *B. mallei* on this medium. In broth an abundant growth develops with the formation, frequently, of a thick grey pellicle. In peptone water a similar but less abundant growth is obtained. In litmus peptone water, to which the following carbohydrates were added, namely, glucose, lactose, saccharose, dulcitol, mannitol, maltose, levulose, galactose, salicin, and inulin, neither acid nor gas was produced, alkalinity being generally observed. Milk is rendered alkaline, and is not clotted.

Pathogenicity.—This was tested by subcutaneous injection of a broth culture into a rabbit and a guinea-pig, 2 c.c. in the former and 1 c.c. in the latter. Another guinea-pig was given 1 c.c. intraperitoneally. In none of these animals were ill effects observed. Practically all strains isolated by Castellani and his co-workers have also been non-pathogenic to rabbits and guinea-pigs. Agglutination experiments were carried out with the patient's serum. Negative results were obtained in all dilutions.

DISCUSSION AND CONCLUSIONS.

The *Spirobacillus zeylanicus* (Castellani) possesses characters of both theoretical and practical importance. The chief point of theoretical interest is provided by the extreme pleomorphism exhibited by this organism under different cultural conditions, and this characteristic renders its exact classification a matter of some difficulty. The same preparation from a culture, especially from the water of condensation of a glucose-agar culture, may show at the same time vibrio-like, bacillus-like, and spirillar or pseudo-spirillar forms (Plate XVI). In this connection it is interesting to quote a portion of Castellani's original description given in the *Philippine Journal of Science*, vol. v. No. 2, Section B, "Medical Sciences," July 1910. Castellani says:

"The difference in shape is so great that at first I believed I had encountered an instance of symbiosis between a bacillus and a spirillum, but even by plating and replating I never succeeded in separating the two forms, and therefore I consider them to be of one and the same organism." It is certainly not an ordinary bacillus or vibrio, and it is doubtful whether it really belongs to the genus *Spirobacillus*, as defined by Metchnikoff in 1899. Castellani has suggested that the long filamentous forms with roundish bodies found in the pellicles which develop on the surface of liquid media point to the organism belonging to higher fungi than bacteria (genus *Vibriothrix*). Further investigations on this point are desirable. The practical importance of this organism is based on the fact that the colonies on agar media, and on coloured special media such as Conradi-Drigalski, MacConkey, Endo, etc., present a fairly close resemblance to those of the typhoid-dysentery group of bacilli. This character, together with the fact that it is a Gram-negative bacillus which does not produce gas in any of the sugars, might cause it to be mistaken for one of the members of this group, on superficial examination. It is also interesting to note that it is most numerous and most frequently found in dysenteric and

dysenteriform stools. It seems, however, to have no causal connection with these conditions, since it has been found non-pathogenic when injected into laboratory animals, and producing no antibodies (agglutinins) in the blood of individuals from whose stools the organisms have been recovered.

REFERENCES.

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2. CASTELLANI AND CHALMERS "Manual of Tropical Medicine," Second Edition, 1913 (Table of Intestinal Bacteria).
3. CASTELLANI, SPAGNOLO, AND RUSSO *Bull. Soc. Path. Exot.*, 1918, No. 4.

DESCRIPTION OF PLATE XVI.

FIG. 1.—*Spirobacillus zeylanicus*, showing vibrio-like and long pseudo-spirillary forms. ($\times 1000$.)

FIG. 2.—*Spirobacillus zeylanicus*, showing long filamentous forms. ($\times 1000$.)

FIG. 1.

FIG. 2.