

by osmic acid after bichromate hardening, I found an entire failure of the pigment to stain with osmic acid; in parts it was even lighter than the cytoplasm. Mott attempts to explain this failure to stain, or partial failure (in his cases), by assuming that the process of decomposition of the lipid into glycerophosphoric and oleic acids is incomplete. Mott's hypothesis is ingenious, though how far his efforts to account for the unsatisfactory staining of the pigment with Marchi in his cases are convincing is a moot point. I should like to accept them, but find it difficult to believe that if, as he supposes, there is a process of decomposition going on, at least in places it would not have arrived at the stage when the pigment would be in a condition to react to osmic acid in the way characteristic of non-phosphorized fats. But granting his explanation to be substantially correct, it is still most compatible with a failure in metabolism due to some gland deficiency or anomaly, and if so, then amaurotic idiocy must be ranged alongside the idiocy produced by defective thyroid secretion, and perhaps, like this, it will eventually yield, in part at least, to therapeutic measures.

An Unusual Organism (*Micrococcus zymogenes*) in a Case of Malignant Endocarditis.

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MY excuse for bringing this paper before you is that the isolation of the organism found in this case of ulcerative endocarditis has not been before recorded in this country, as far as I can ascertain from a perusal of the literature. The organism, the cultural characteristics of which I shall describe later on, was first isolated by two Americans, MacCallum and Hastings [4], in 1899, from two cases of ulcerative endocarditis; and they, having thoroughly worked out its cultural peculiarities, named it *Micrococcus zymogenes*, because of the liquefying properties of the products of the organism even after all bacteria had been removed by filtration.

The few subsequent recorded instances of the isolation of this organism have been made by American writers, namely, Harris and Longcope [2], who isolated it from a series of four autopsies where it appeared to be a secondary infection, and once from the contents of

a cesspool, and Birge [1], who found it in the larynx of crows. I cannot find any mention of it in the French and German literature except as references to the American cases, and the only text-book of bacteriology in which I have been able to find any reference to it is that written by our President [3]. I may, however, have overlooked its record, and should be glad to be corrected, if possible, on this point.

CLINICAL HISTORY.

The clinical history of the case was briefly as follows: Mrs. M. M., aged 40, a patient of Dr. Foott, of Enfield, was admitted into Westminster Hospital in March, 1911, under the care of Dr. de Havilland Hall. There was no previous history of any importance, but she said that for the past twelve months she had felt "run down." In September, 1910, she had had a "poisoned finger," which, however, soon got well. Shortly after the finger got well she had an attack of sudden pain in the left side and down the left leg. In October, 1910, she was seized with sudden pain in the right calf, and, later on, by severe pain in the head and left arm. These symptoms disappeared and she improved for a while, when she was seized with sudden pain and swelling of the left foot which compelled her to take to her bed, and where she remained till admission to the hospital in March, 1911. On admission to hospital her physical signs were those of a much enlarged heart (pulsation over third, fourth, fifth, and sixth interspaces and apex-beat 2 in. outside nipple-line), with a feeble apical thrill, faint presystolic and loud systolic apical bruits, with accentuation and reduplication of the pulmonary second sound. No pulsation could be found in the left radial or ulnar arteries, and there was great tenderness over the lower third of the left humerus. The fingers showed clubbing; there was no œdema of the feet. Temperature varied between 98° F. to 100° F. or 101° F. Three weeks after admission the spleen was found to be palpable 3 in. below the left costal margin, and a month after admission there was sudden pain in the left loin with hæmaturia. In April I was asked to make a blood cultivation, and for that purpose took 10 c.c. of blood from the left median basilic vein, using "Hebb's syringe" and the strictest aseptic precautions. The blood thus obtained was inoculated into three broth flasks and from each of these flasks was isolated an organism which subsequently proved to be *Micrococcus zymogenes*. A vaccine was made in the Bacterio-therapeutic Department by Dr. Carmalt Jones, but, owing to the profound disturbance of the patient

which followed even a very small dose of this vaccine, it was discontinued. The patient left hospital in May and died of cerebral embolism in July. No post-mortem was obtained. I am much indebted to Dr. de Havilland Hall and Dr. Foott for their clinical notes on the case.

DESCRIPTION OF THE ORGANISM ISOLATED.

Morphology: The organism is a Gram-positive micrococcus which differs slightly in its arrangement, according to the medium on which it is grown. From solid media it is obtained in film preparations singly, in pairs and in masses and occasionally in chains, though chains are commoner in liquid media and are sometimes quite long. It stains well with aniline dyes and is non-motile.

Agar: On agar it grows well as a thin, slightly elevated, moist, greyish growth somewhat difficult to see by reflected light but readily seen by transmitted light. Occasionally small isolated colonies occur, or the growth may be composed of many coarse streptococcal-like colonies.

Broth: In broth the growth makes the medium cloudy during the first twenty-four hours. After a few days the organisms settle down and leave the supernatant fluid clear. No indol is produced.

Sugar litmus media: Acid, but no gas, was produced in glucose, lactose, saccharose, mannite, maltose.

Gelatine: In gelatine stabs a white, opaque growth occurs along the stab, and, after thirty-six hours, cupping of the medium occurs and liquefaction proceeds slowly downwards.

Potato: On potato a feeble growth occurs, but not always constantly at each subculture.

Blood serum (horse): On this medium the growth was feeble and no liquefaction occurs.

Milk: It is in this medium that we obtain the characteristic reactions of this organism. In litmus milk, the milk rapidly becomes decolorized, and, within twenty-four hours, firmly clotted with a bluish-red layer at the top. The upper layer of this clot now gradually liquefies into turbid fluid which soon takes on a reddish tint above, remaining yellowish below. This softening and liquefaction, with the acquisition of a red tint, progresses day by day, the layer of the red fluid increasing in depth and the remains of the coagulum forming a precipitate at the bottom of the tube. Finally the entire coagulum is liquefied and the precipitate stained deeply red, so that we have a red-

stained precipitate at the bottom of the tube and reddish, clear supernatant fluid above.

Vitality: The organism is a hardy one and survives in subcultures for some time. I have kept mine alive easily by monthly subcultures for ten months.

Pathogenicity: White mice survived the injection of 2 c.c. in the dorsal region. They showed signs of being unfit on the third day after infection, which increased on fourth day. On the sixth day they started to recover and eventually got quite well. Guinea-pigs showed no ill-effects from large intraperitoneal injections.

COMPARISON WITH THE PREVIOUSLY RECORDED ORGANISMS.

The organism I have described is identical with that noted by the previously mentioned American authors. MacCallum and Hastings sometimes obtained a brown growth on potato, which I have not done in my case, but these authors also note that it sometimes fails to grow on potato as I have done. MacCallum and Hastings found that blood serum was slowly liquefied, which I have not been able to confirm, but they used human serum (solidified) which I have not had the opportunity of trying.

With regard to the pathogenicity for animals, this, again, has been found variable by the American recorders. Thus Birge found it non-pathogenic and Harris and Longcope found it non-pathogenic in two out of five cases. Harris and Longcope also found that, grown on media for a short time, it quickly loses its pathogenicity for white mice, which MacCallum and Hastings had found to be the most susceptible to it of the laboratory animals. This possibly explains the lack of pathogenicity in my case, as I did not perform animal experiments till after several subcultures.

Apart from the variabilities I have mentioned, and which have already been noted by previous recorders, the organism is identical with that named *Micrococcus zymogenes* by MacCallum and Hastings.

RELATION OF MICROCOCCUS ZYMOGENES TO THE ULCERATIVE ENDOCARDITIS.

I am not in a position to state what the causal relationship of the organism *Micrococcus zymogenes* is to the ulcerative endocarditis in this case. It is probable that it is merely a terminal infection, as is the

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case with many of the organisms of the streptococcus family in other cases of ulcerative endocarditis. I am sorry that an agglutination reaction could not have been successfully carried out, but the tendency of the organism to cling together in clusters rendered results of very little value. Complement-fixation experiments with the coccal group of bacteria are not, in my experience, of great value.

REFERENCES.

- [1] BIRGE. *Johns Hopkins Hosp. Bull.*, Balt., 1905, xvi, p. 309.
- [2] HARRIS and LONGCOPE. *Centralbl. f. Bakt.*, Jena, 1901, xxx, Abt. 1, p. 353.
- [3] HEWLETT. "Manual of Bacteriology," 1911.
- [4] MACCALLUM and HASTINGS. *Journ. Exper. Med.*, New York, 1899, iv, p. 521.

Typical examples of the cultivations on various media were shown, including a series showing the typical "milk reaction."