NOTE ON "*CRITHIDIA*" *CLETI* N. SP., PARASITIC IN
THE ALIMENTARY CANAL OF *CLETUS VARIUS*, DALL.

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(With 17 Text-figures.)

WHILST examining the contents of a number of insects from the neighbourhood of Pretoria (Transvaal), a flagellate was found occurring in the alimentary canal of a Hemipterous insect, *Cletus varius* Dall¹. Unfortunately, no observations were made on the living parasite and the following notes on its morphology are only derived from the study of ordinary dried smears, fixed in alcohol and stained with Giemsa. In consequence of the method of preparation, the finer nuclear details have been destroyed, but nevertheless we have been able to make out the main points in the structure of this parasite, and as no further material is available we have decided to publish our results in their present form.

Adopting Patton's (1907) terminology for the stages in its life-cycle the parasites will be described under the heading of pre-flagellate, flagellate or post-flagellate forms.

Pre-flagellate forms. Only two examples have been found which seem to represent this stage of the life-cycle. They are represented in Figs. 13 and 14 respectively. The former consists of a rather irregular ovoid body 7μ in length and 3.5μ in breadth. The tropho-nucleus is

¹ We are indebted to Mr Distant of the British Museum (Natural History) for the identification of this insect.

Figs. 1-17. *"Crithidia" cleti*. All the figures are magnified about 2500 diameters and were drawn with the aid of a camera lucida.

- Fig. 1. Large flagellate form with a well developed undulating membrane. The flattened, somewhat leaf-shape of the parasite is well shown at the spirally twisted posterior extremity.
- Fig. 2. Form in which the kineto-nucleus is situated rather more anteriorly than usual.
- Fig. 3. Large flagellate form with dividing kineto-nucleus.
- Fig. 4. Long slender form with elongated tropho-nucleus. The long flagellum arises from a conspicuous end-bead.
- Fig. 5. Flagellate form showing a distinct karyosome inside the tropho-nucleus.
- Figs. 6-11. Various stages in the longitudinal division of *Crithidia*.
- Figs. 6, 7. Forms showing commencement of division of kineto-nucleus and end-bead.
- Fig. 8. Large flagellate possessing two kineto-nuclei and dividing end-bead.
- Fig. 9. Small dividing form showing the commencement of the formation of a new flagellum from the divided end-bead.
- Fig. 10. Large flagellate form in which both nuclei and end-bead have divided.
- Fig. 11. Commencement of fission at the anterior extremity.
- Fig. 12. Form showing concentration of protoplasm and both nuclei towards the posterior extremity.
- Fig. 13. Pre-flagellate stage with dividing kineto-nucleus.
- Fig. 14. Pre-flagellate form in which both nuclei have divided. The end-bead is in process of division.
- Fig. 15. Stage in the formation of a cyst. The protoplasm is very dense and contains granules.
- Figs. 16, 17. Encysted post-flagellate forms each showing distinct tropho- and kineto-nuclei.

very large and is stained rather faintly, and the kineto-nucleus is also large and horse-shoe shaped and is very densely stained; the latter may be in process of division. Fig. 14 represents a rather interesting form which is at an advanced stage of division. Both nuclei have already divided and are situated at opposite sides of the protoplasm, and, in addition, the end-bead is clearly seen in process of division. No trace of this structure could be found in the other pre-flagellate, or in any of the cysts and therefore it seems probable that the end-bead appears shortly before the flagellum is formed and disappears in the post-flagellate stage, together with the flagellum.

Flagellate forms. This stage is extremely abundant in the films, the flagellates often occurring in large masses apparently as the result of rapid multiplication. Many of the parasites are in process of division, shown by the appearance of the kineto-nucleus or its associated end-bead. The usual variations with regard to size, shape and the relative position of the two nuclei are well shown. The tropho-nucleus is usually situated about the middle of the cytoplasm (Figs. 1, 3), but the kineto-nucleus may vary from a position immediately in front of the tropho-nucleus to one half-way between the latter and the anterior

extremity (Fig. 2). The latter form closely resembles “*Herpetomonas*” in the position of its nuclei and the absence of an undulating membrane.

A typical parasite, however, is that represented in Fig. 1. In this large flagellate form the flattened leaf-like shape of the body is extremely well shown towards the posterior extremity, which displays a slight spiral twist. The cytoplasm is quite free from any of the granules so commonly found in related species. The tropho-nucleus is situated slightly towards the posterior end. Occasionally it presents the appearance of a densely staining central karyosome surrounded by a layer of more diffusely staining chromatin (Fig. 5). More often, however, it seems to consist of numerous chromatic granules arranged either irregularly (Fig. 1) or in a linear series (Fig. 4). The kineto-nucleus is usually situated immediately in front of the tropho-nucleus and slightly to one side of the middle line. In close relation to it a small but distinct end-bead may usually be seen, situated at the apex of a small vacuole which lies immediately in front of the kineto-nucleus (Figs. 5–7). From the end-bead arises the flagellum running forward along the surface of the body, where it forms a distinct undulating membrane, until it becomes free at the anterior extremity. The dimensions of a typical flagellate form are as follows: total length from the posterior extremity to the tip of the flagellum, 25μ ; breadth, 2μ ; total length of flagellum, 16μ ; length of free part of flagellum, 4μ .

Various stages in the division of the flagellate forms are represented in Figs. 6–11. The first sign of the process may usually be seen in the kineto-nucleus or its associated end-bead (Figs. 6–8). All the details of this division cannot be followed in the preparations before us but the kineto-nucleus seems to elongate and then constricts into two daughter nuclei (Figs. 6–8). The end-bead divides independently of the kineto-nucleus (Fig. 8) and from the new end-bead another flagellum arises (Figs. 9, 10). The new flagellum thus arises independently and is not formed by the splitting of the original one. By the time that these divisions are complete the tropho-nucleus usually shows signs of dividing, often evidenced by the arrangement of the intra-nuclear granules in two longitudinal rows one at each side of the nucleus (Fig. 9). The tropho-nucleus then divides into two equal daughter nuclei (Fig. 10) and by the time this division is complete the new flagellum is usually well developed. When the latter reaches the anterior end, the body of the parasite begins to split into two daughter parasites, this splitting always

beginning from the anterior extremity (Fig. 11), as usual in these flagellates. The two daughter parasites often remain attached for some little time before finally separating.

Post-flagellate forms. The only parasite which appears to be a stage in the formation of these post-flagellate forms is that represented in Fig. 15. In this case the protoplasm is concentrated towards the posterior extremity and at one side there is a slight thickening of the ectoplasm suggesting the formation of a cyst wall. This parasite, however, differs from its neighbours in the presence of darkly staining granules and therefore may be a degenerating form.

The fully formed cysts (Figs. 16, 17) are usually spherical bodies about 3μ in diameter, but in one case the dimensions of 3.5μ by 6μ were attained. In both cases these dimensions do not include the thickness of the cyst wall.

Each cyst consists of a mass of densely staining cytoplasm containing the tropho- and kineto-nuclei; the end-bead is apparently absent. The cyst is surrounded by a cyst wall which in consequence of its non-staining properties appears as a hyaline layer. From a consideration of the life-cycle of other species of "*Crithidia*," presumably these are the forms which are excreted and serve to convey the infection to other hosts.

We are in some doubt as to what generic name to apply to this species. There is no doubt that it falls under Patton's definition of the genus *Crithidia* (1908), but as one of us has shown (Hindle, 1912), until the type species of *Leptomonas*, Kent, has been re-examined it is impossible to apply any generic name to these flagellates!

For the sake of convenience, however, we are placing it provisionally in the genus *Crithidia* (*sensu* Patton), and in view of its host, the specific name *cleti* is proposed. "*Crithidia*" *cleti* is a flagellate occurring in the intestinal tract of *Cletus varius* Dall. It is not a stage in the life-cycle of any trypanosome occurring in the blood of vertebrates, for its host feeds entirely on the juices of plants.

REFERENCES.

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