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A Study of *Trichomonas* of the Guinea-Pig from Peking.¹⁾

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(With Plate 5 and 1 textfigures.)

KUCZYNSKI (1914) has contributed an admirable study on *Trichomonas caviae*. His descriptions of the morphology and reproduction of this protozoan are detailed and clear. But since material of *Trichomonas* from the guinea pig from Peking which I have had an opportunity to study shows specific differences from the ordinary *Trichomonas caviae*, it seems best to make this study a matter of record.

Description of material.

The trichomonad observed was found in the chyle and intestinal mucosa of an autopsied *Cavia cobaya* from the Animal Room of the Anatomy Department of the Peking Union Medical College. No other infection was found in the animal. Thousands of specimens of the protozoan were seen swarming in each coverglass preparation.

The living organism is elongate pyriform and measures about 11,5 by 8,5 μ . The axostyle is a conspicuous, long narrow rod, extending from the blepharoplast near the anterior end thru the body, ending posteriad in a free spicule two-thirds the body length. The animal moves about mostly by the action of the three anterior flagella. These are found to originate from the same blepharoplast center as the axostyle and are more than half the body length. The middle anterior flagellum is longer by a fourth than the ble-

¹⁾ Contribution from the Departement of Pathology, Peking Union Medical College.

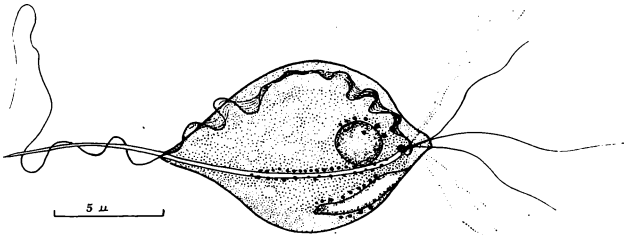
pharoplast. It follows inside the sinistral margin of the body to the posterior end where it is continued into a long free flagellum. Compared with the anterior flagella this marginal filament is sluggish in its action and does not contribute a great deal to the movement of the organism. The free flagellar end is often coiled around the protruding axostyle. The undulating membrane lacks the noticeable myomeric elements which I have observed in *Trichomonas hominis* (DAVAINE).

The nucleus is visible in the living organism as a spherical compact organelle some little distance below the blepharoplast, just to the left of the axostyle. Chromatic granules are frequently found around it. The cytostome lies to the right and below the axostyle. It is elliptical and has a slight sinistral torsion. The endosarc is much more granular than the ectosarc. Pulsating vacuoles are few and small. At times there are numerous food particles of carbohydrate nature clumped together in a single food vacuole or in a few closely associated vacuoles.

When fixed as smears in Gilson's fluid and stained by a modified Heidenhain haematoxylin method, the organism is preserved in much the same position as the living organism had just before fixation (Figs. 1—12). The noticeable difference is found in the contraction of the axostyle along the longitudinal axis, resulting. 1. in the shortening of the portion outside the body, and 2. the partial contraction and distortion of the body. This condition is especially apparent where the axostyle has become markedly bent on itself (Fig. 6) or somewhat telescoped (Fig. 6). Another phenomenon is the loosing of the undulating membrane and marginal filament from the organism up to its point of origin (Figs. 4, 5, 7, 9) in many of the fixed specimens. In some cases (Fig. 6) the entire process is torn free from the body. These conditions have all been observed and recorded by KUCZYŃSKI (loc. cit.) but are more striking in my material because of the longer axostyle and the greater length of free flagellar filament. Fixed specimens of my material vary in measurement from 8 to 14 μ in length by 6.5 to 10 μ in breadth.

While the chromatic granules are noticeable in living specimens they are more easily distinguished in stained smears. Their presence has already been noted about the nucleus. They are likewise found around the anterior two-fifths of the axostyle (Textfig. 1, Figs. 1, 6, 9) and the cytostome. Moreover, a close examination of the parabasal body shows that it is composed of similar chromatic

granules, usually arranged in a single row (Figs. 1, 4, 8, 9) but at times with lateral accretions. This organelle has been considered by authors as a single compact rod paralleling the undulating membrane. It seems more likely that it has the same potential function for the undulating membrane that the similar chromatic elements have in the region of the axostyle and cytostome, namely, nuclear emanations controlling the organelles. The contraction and curving of the axostyle in fixed material causes an even more pronounced bending of the parabasal body, since the latter is always in an ex-centric position with respect to the center of contraction of the former.



Characteristic specimen of living *Trichomonas flagelliphora*, showing all the organelles observed in living material. $\times 5850$.

The blepharoplast is usually a single spherical body anterior to the nucleus. At times, however, it is seen as an elongate object (Fig. 5) and, again (Fig. 2), as a double spherical body whose long axis is that of the organism. It is not apparent whether this represents a predivision stage or not, but in no case have two sets of anterior flagella been observed.

Upon „encysting“ the blepharoplast becomes enlarged (Figs. 10, 11) and more discrete. It applies itself closely to the nucleus and the two organelles come to be enclosed in a common vacuole. The three anterior flagella first become contracted, followed by the flagellar filament. The whole system is finally compacted into a densely staining mass of which only the nucleus is definitely made out (see Figs. 10–12). Meanwhile the resting organism becomes surrounded by a thin tough wall. I have been unable to infect other guinea-pigs with these „cyst“ bodies by injection *per os*.

Discussion.

A comparison of my material with that of *Trichomonas caviae* shows several important structural differences. While the differences in size can not be considered as final they are, at least, sufficient to

separate the material into two groups. Moreover, in life the axostyle and the flagellar filament are distinctly longer in the Peking specimens. The long anterior flagella and the presence of chromatic granules along the axostyle are likewise specific. It seems wise, therefore, to recognize the Peking material as belonging to a new species, to which the name *Trichomonas flagelliphora* is assigned.

Table showing characteristic differences between *Trichomonas caviae* and *Trichomonas flagelliphora* nov. spec.

	<i>Trichomonas caviae</i>	<i>Trichomonas flagelliphora</i>
Size	15—22 μ \times 10—15 μ	8—14 μ \times 6.5—10 μ
Axostyle	Slight posterior extension beyond body; not surrounded by chromatinic granules.	In life extends two-thirds body length beyond posterior limits of body; surrounded by discrete chromatic granules along anterior two-fifths.
Undulating Membrane and flagellar filament	Membrane extends to subcaudal region of body; in life free flagellar filament usually less than body length.	Membrane extends to caudal end of body; in life free flagellar filament always much more than body length.
Anterior flagella	Less than one-half body length; equal or subequal.	One-half body length or more; middle flagellum noticeably longer than remaining two.

Summary.

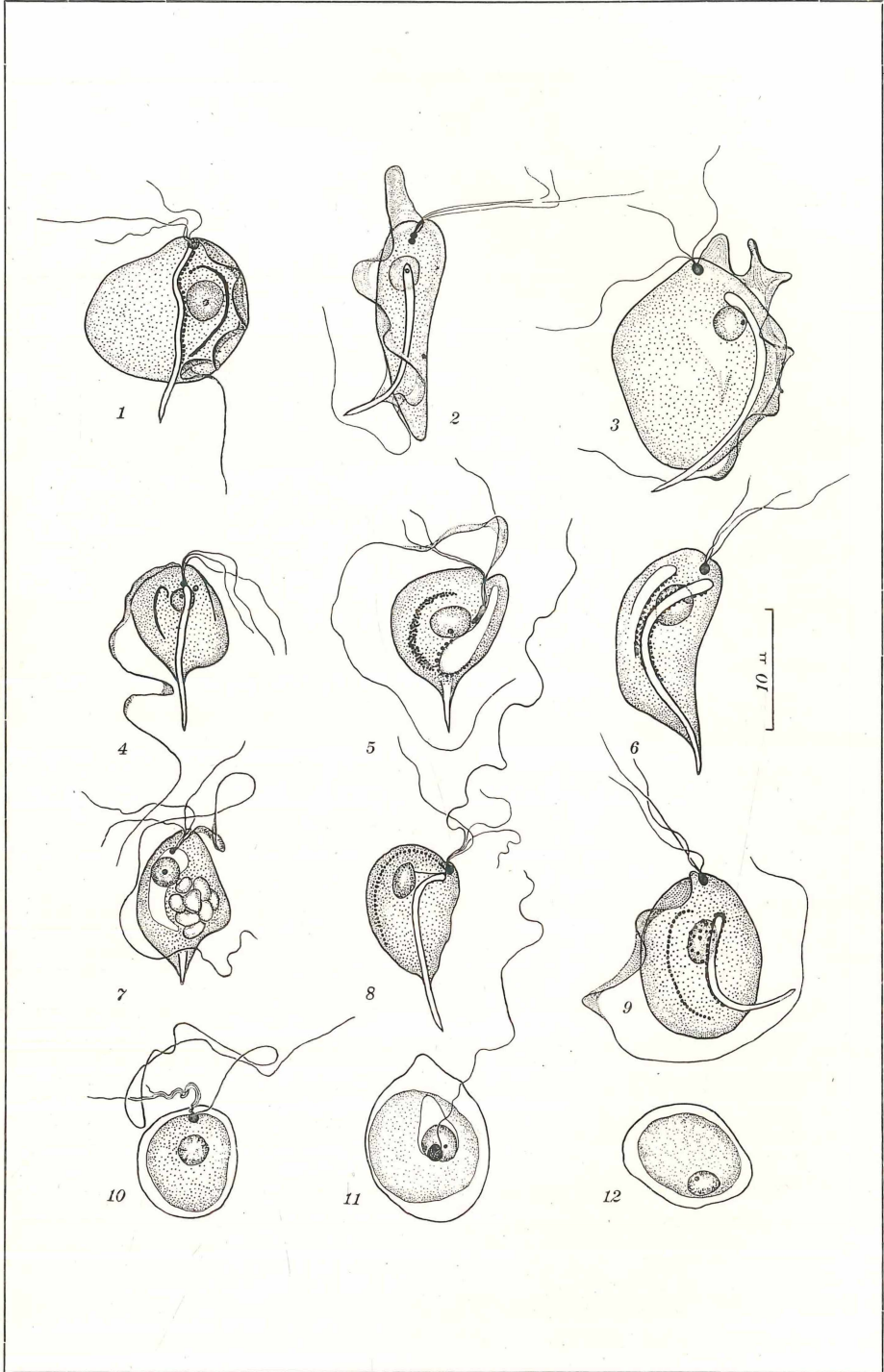
On the basis of smaller body size, longer axostyle, longer undulating membrane and flagellar filament, longer anterior flagella and position of chromatinic granules around the axostyle, a trichomonad from the intestine of the guinea pig from Peking is differentiated from *Trichomonas caviae* (DAVAINE) 1875 and designated as *Trichomonas flagelliphora* nov., spec.

Reference Cited.

KUCZYNSKI, M. H., 1914: Untersuchungen an Trichomonaden. Arch. f. Protistenk. Bd. 33 p. 119—204, 6 pl., 4 Textfigures.

Explanation of Plate.

Figs. 1—12. — Characteristic specimens of fixed material of *Trichomonas flagelliphora*. X 1670.



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