(From the Department of Zoology, Calcutta University, Calcutta, India.)

Observations on a Coccidium, *Eimeria columbae* n. sp. from the intestine of Indian pigeon, *Columba intermedia.*

By

Matiranjan Das-Gupta M. Sc. (Cal.)
(University Research Scholar).

With plate 5.

Introduction.

In January 1934, while examining the gut contents of pigeons *Columba intermedia*, I came across a coccidian belonging to the genus *Eimeria*. From the literature available on this subject I find that a species of *Eimeria* was first described from the domestic pigeon by Labbé in 1896 in the name of *Coccidium pfeifferi* [1]). The description is short, only the measurements of the oocyst and duration of sporulation have been given. Later on, Nieschulz (1921 a, 1921 b and 1925) has studied this *Eimeria labbeana* in an exhaustive manner. But the presence of oocystic residue and the ellipsoidal sporocysts without a cap or refractile 'knob' at one end, at once distinguish the coccidium in question from *E. labbeana* Pinto. I therefore, propose to call this parasite *Eimeria columbae* n. sp., the specific name being given after its host.

[1]) Pinto (1928) pointed out that Labbé (1896) proposed the names *E. pfeifferi* for a Coccidium one the centepede, *Geophilus ferruginosus* and *Coccidium pfeifferi* for the pigeon parasite in the same publication. However it has since been shown that both species belong to the genus *Eimeria*, and since the centepede parasite has page priority over that of pigeon. Pinto was therefore free to rename the latter. He named it as *E. labbeana*, the specific name being given after Labbé, the original disemerer.

Material and Methods.

Systematic examination of the rectal contents of several dozens of pigeons *Columba intermedia*, which were dissected in the class from time to time (purchased from the Bengal Veterinary College, Calcutta) revealed the presence of oocysts of this particular *Eimeria* in three cases only. The oocysts were transferred to separate pots containing 1 % Chromic Acid solution. For studying the endogenous stages, portions of the intestine were transferred and fixed in BOUIN-DUBOSCQ-BRASIL'S fluid and a later on sections were cut 6 μ thick and stained in HEIDENHAIN'S Iron-alum-haematoxylin. Oocysts in 1 % Chromic Acid solution were examined daily and camera lucida drawings in various stages of their development were made from time to time. Measurements of the oocysts were taken from specimens both in fresh state as well as in Chromic Acid solution.

Observations on *Eimeria columbae* n. sp.

As no sporozoite was seen entering the intestinal epithelium, I shall begin my description with the smallest intracellular stage (Pl. 5 Fig. 1)' that I have seen. It measures 2 μ in diameter and is seen clearly lying in the vacuole of the epithelial cell. It always remained spherical and never became oval at later stage as stated by NIESCHULZ (1921a) in — *E. labbeana*. I have seen the early stage of schizogony (Pl. 5 Fig. 2) in which the nucleus of the schizont is divided into four, each enclosed with a clear space around it, within a round nuclear membrane. This schizont measures 4.12 μ in diameter and when fully formed produced eight merozoites (Pl. 5 Fig. 3) and not four to twenty as stated by NIESCHULZ in *E. labbeana*. NIESCHULZ perhaps was dealing with a case where more than one schizont were developing side by side and undergoing the process of schizogony. Each merozoite measures 4.2 $\mu \times$ 1.8 μ with one end broad and rounded while the other is pointed. I have also observed a transverse section through a group of merozoites as depicted in Pl. 5 Fig. 4. This however leaves no doubt as to the number of merozoites formed at a time.

In the early stage, the macrogametocyte measures 6.18 μ in diameter (Pl. 5 Fig. 5) and has got its cytoplasm non-vacuolated without reserve granules. With the advancement of age, reserve granules appear within the alveoli of the vacuolated cytoplasm towards the peripheral region (Pl. 5 Fig. 6); the fully formed macrogametocyte measures 10.3 μ in diameter.

At a later stage, a tube-like structure opening externally and enclosing the nucleus internally, appeared in the cytoplasm of the macrogametocyte (Pl. 5 Fig. 7). A male gamete was observed in this tube-like structure, approaching the nucleus (Pl. 5 Fig. 7). At a still later stage, the external opening of this fertilization tube became closed when a spindle was formed and the nucleus divided (Pl. 5 Fig. 8).

A reference to this structure was made by NIESCHULZ (1921 a) in *E. labbeana* as 'the tube-like formation of the nucleus' and by LÉGER and HOLLANDE (1912) in *Pfeifferinella impudica* from land snail (*Limax marginatus*).

The mature microgametocyte measures 10.3 μ in diameter and contains a big residual mass in the centre. I have observed both early and late stages of male gamete formation in my preparations (Pl. 5 Figs. 9 & 10). The fully formed biflagellated male gamete measures 4 $\mu \times 1$ μ (Pl. 5 Fig. 11).

Coarsely granular unsegmented oocysts measuring 16.4 $\mu \times 14.35$ μ in diameter (Pl. 5 Fig. 12) with a thick inner and a thin outer membranes were found in the rectal contents. When kept in 1 % Chromic Acid solution, they completed their development within 4—5 days (Pl. 5 Fig. 13). After the sporocysts are formed, a residue is left in the oocyst. Sporocysts are ellipsoidal and measure 7.2 $\mu \times 4.8$ μ. The sporozoites are curved and have one end pointed while the other, rounded and broad. Sporocystic residue is present.

Diagnosis & systematic position of *Eimeria columbae* n. sp. (Coccidiida, Eimeridae).

Oocyst, thick walled, sub-spherical; 16.4 $\mu \times 14.35$ μ in diameter. No visible micropyle or operculum; oocystic residue present; sporocyst ellipsoidal, no cap or knob-like structure at one end, 7.2 $\mu \times 4.8$ μ in diameter; sporocystic residue present; coarsely granular unsegmented oocyst discharged from host; sporulation time 4—5 days.

Habitat: — Small intestine and caeca (intracellular) of *Columba intermedia.*

Locality: — Calcutta, Bengal, India.

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Reference.

Labbé, A. (1896): Recherches Zoologiques, Cytologiques et biologiques sur les coccidies. Archives de Zool. **4**, 517.

Leger, L. et Hollande, A. Ch. (1912): La reproduction sexuee chez les coccidies Monosporees du genre Pfeifferinella. Archives de Zool., 5e Serie, **9**, 1—8.

Nieschulz, O. (1921 a): Beiträge zur Kenntnis der Gattung Eimeria. I. Über das Taubencoccid. Arch. Protistenkde **44**, 71—82.

— (1921 b): Over de betrakking tusschen het duiven-en Keppen-coccidium. Tijdschr. Diergeneesk. **48**, 707.

— (1925): Über die Entwicklung des Taubencoccids Eimeria pfeifferi (Labbé, 1896). Arch. Protistenkde **51**, 479—494.

Pinto, C. (1928): Synonimie de quelques espèces du genre Eimeria (Eimeridia sporozoa). C. r. Soc. Biol. Paris **98**, 1564—1565.

Explanation of plate.

Plate 5.

All figures were drawn under camera lucida and the magnification is × 1666, unless otherwise stated. Figs. 1—11 were made from sections of *Eimeria columbae* n. sp. as seen in the intestinal epithelium of three different pigeons. Figs. 12—13 were made from intestinal contents in the fresh state and in 1 % Chromic Acid solution respectively.

Eimeria columbae n. sp.

Fig. 1. A young schizont.

Fig. 2. A schizont, with four nuclei.

Fig. 3. Mature merozoites.

Fig. 4. Transverse section of a group of merozoites.

Fig. 5. Immature macro-gametocyte with big circular nucleus but no reserve granules in the cytoplasm.

Fig. 6. Fully formed macro-gametocyte with reserve granules in the alveoli of the vacuolated cytoplasm.

Fig. 7. A macro-gametocyte, with a tube-like structure enclosing the nucleus internally and opening externally. A male gamete is seen in the tube, approaching the nucleus.

Fig. 8. A macro-gametocyte with a fertilization spindle in the tube having no external opening.

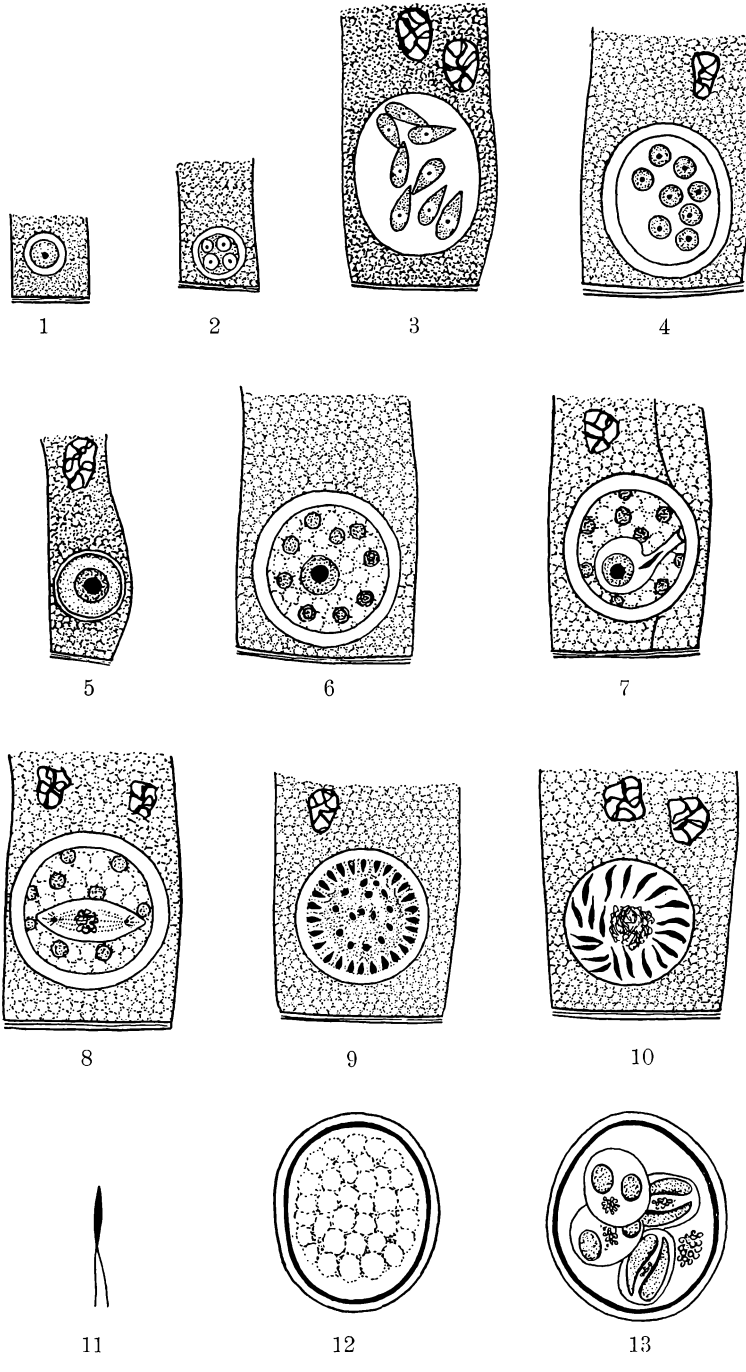
Fig. 9. Micro-gamete formation — early stage.

Fig. 10. Micro-gamete formation — late stage with a large residual mass in the centre.

Fig. 11. A male gamete with two flagella. $\times 2700$.

Fig. 12. An unsegmented oocyst.

Fig. 13. A mature oocyst with four sporocyst and a residual mass.



Das Gupta

VERLAG VON GUSTAV FISCHER IN JENA