University of Ankara, Faculty of Veterinary Medicine, Department of Protozoology, Arthropodology and Control of Parasitic Diseases

EIMERIA ARLOINGI (MAROTEL, 1905) MARTIN 1909 IN ANGORA GOATS

Fahri Sayın *

In the other reports [17,18] the author indicates the absence of literature concerning coccidia and coccidial infections in Angora goats and mentioned the incidence and danger of coccidiosis in these animals in Turkey. He also presented findings relative to the life cycle and patogenicity of Eimeria parva[17] and the endogenous phase of the life history of Eimeria nina - kohl - yakimovi[18]. The present report is concerned with the findings relative to the endogenous stage of Eimeria arloingi and its oocysts in a kid of Angora goat.

Eimeria arloingi was originally described from a goat under the name "Coccidium arloingi"[14]. Since then it has been reported from sheep and goats in various countries [1,2,3,5,6,8,9,14,15,20,21] including Turkey [16,17]. Yet the detailed description of its oocysts has been given [1,3,9,17,20]. Levine et al [9] and Lotze [13] gave an excellent review of literature on the species and discused the identity of Eimeria arloingi and Eimeria faurei of sheep and goats. The life cycle and pathogenicity of this species were studied in sheep [10,11] but only the endogenous phase of its life history was described in ordinary goats.[9] No data on its pathogenicity and endogenous stage in Angora goats is available.

Material and Methods

In May, 1963 several new born kids of Angora goats were purchased from Lalahan Animal Breeding Research Institute to study the pathogenicity and endogenous phase of the life history of Eimeria parva experimentally. Three of the kids became ill approximately three weeks before the begining of the experiment and began to dis-

* Ass. Prof. Faculty of Veterinary Medicine, Department of Protozoology, Arthropodology and Control of Parasitic Diseases. Ankara - Turkey

charge watery feces and the oocysts of Eimeria. The oocysts shed by one of the kids were pure and were identified as Eimeria arloingi (Marotel, 1905) Martin, 1909. Those excreted by the other two kids consisted of the oocysts of Eimeria ahsata, Eimeria arloingi, Eimeria nina-kohl - yakimovi. The kid expelled pure oocysts of Eimeria arloingi was sacrified to study the endogenous phase of life history of the coccidian parasite, Eimeria arloingi, and the changes in the alimentary tract of the animal. Portion of the intestine and other organs were fixed in 10 % formalin and sections were stained with haematoxilene - eosine for histologic examination and fecal sample was prepared for further study. Fecal sample was mixed with 2.5 per cent Potassium Dichromate solution and placed in a thin layer in a Petri dish for 2 weeks to permit the coccidian oocysts to sporulate. It was then stored in the refrigerator. The oocysts were concentrated by flotation with Sheather's sugar solution prior to examination. They were examined with a Leitz microscope equipped with apochramatic objectives. The pictures of the parasite were taken with Beck microphotography apparatus.

Results

This was not only the case that Eimeria arloingi occurred in the kids of Angora goats, but also the same species was seen on subsequent examination of fecal samples from other Angora goats in the herds in the vicinity of Ankara. Since there is no description of the oocysts of Eimeria arloingi from Angora goats these are given here.

The oocysts of this species were elipsoidal or ovoid, slightly flattened at the micropylar end (fig. 1). Twenty five oocysts measured from each of the samples obtained from 5 different Angora goats. They were found to be 22 to 33 (mean 29) microns in length and 18 to 26 (mean 23) microns in width. Their length - width ratios ranged from 1. 2 to 1. 5 with a mean of 1. 4. Oocysts wall composed of two layers, the outer one smooth, colorless and the inner one brownish yellow. It was 1,3 microns thick. A micropyle was present at the small end of oocyst and it was covered by a prominent, colorless mound - shaped micropylar cap. The micropylar caps of 129 oocysts ranged from 0.5 to 2.1 microns high by 5 to 9.15 microns wide. Sporulation time was 60 hours at a tempareture of 20 Centigrate degrees. Oocyst polar granule was present, but residual body was absent. Sporocysts were alongate ovoid in shape and measured 13 to 17 by 7 to 9 microns with a means of 14. 2 by 7. 7 microns. Their

length - width ratios ranged from 1. 8 to 2. 4. Sporocyst residiums were present (fig. 2).

This species of Eimeria was found to be present in 616 (77 %) out of 900 Angora goats wich were from vicinity of Ankara.

Pathologic cahanges:

The gross lesions in the intestine consisted of numerous diffusely scattered, pale - yellow to white focal plaques approximately 0. 3 to 0. 4 mm. in diameters in mucosa. The borders of these lesions were distinc and irregular in outline. In addition, the presence of few small, slightly haemorrhagic areas scattered troughout the lining of the small intestine was observed. The faeces of the kid was watery and did not contain blood.

Sections of small intestine, cecum and colon were examined. Slight enteritis was present. The cellular reaction consisted of lymphocytes and polymorphonuclear leucocytes. The parasite destroyed the epithelial cells in which they developed and caused the denudation of lamina epithelialis. Numerous mature coccidian macrogametes, microgametocytes, schizonts and oocysts were present in the epithelial cells of the villi of the jejunum and ileum. The epithelial cells at the tips of the villi were more commonly parasitized by the sexual stages than were the cells at the edges of the villi. Those in the glands of Lieberkühn also contained many parasites. The lacteals of some villi were greatly dilated and contained giant schzonts.

Endogenous phases:

Only one type of schizont (giant) was present (fig. 3). They were seen in the ileum and mostly did not reach their maturity. Each had approximately invaded an enlarged cell either attached to the endothelial lining of the central lacteals of the villi or detached and lay free in the lumen of lacteal, enlarging it tremendously. These schizonts measured up to 140.5 by 100 microns in diameters.

Parasites in various stages of development, from that of gametocytes to apparently mature oocysts, were found in epithelial cells of the small intestine of the kid. The plaques in the small intestine consisted essentially of the masses of macrogametes, microgametocytes and young oocysts in the epithelial cells of the tips and sides of the villi and also in the crypts (fig. 4, 5).

Many mature and immature macrogametes were present. Each of immature macrogametes contained a single nucleus and the cytoplasm of each was somewhat granular in appearence (fig.6). In the

mature macrogametes there were large numbers of eosinophilic, plastic granules and they were arranged in close contact with each other in the periphery of the parasite (fig. 7). Mature macrogametes measured 18 to 29 by 22.2 to 14.8 microns.

Only mature microgametocytes were found in the sections (fig. 8). They were measured 15 to 23 by 10 to 14 microns. In these microgametocytes, the microgametes were slender and elongate in shape. A large mass of apparent residual material was usually present in each mature microgametocyte.

The apparently mature oocysts contained well developed membranes and their cytoplasm was finely granular (fig. 9). The oocysts found in the histologic sections did not have polar cap, but those observed in the fresh smears possessed it. The oocysts measured 18 to 27 by 11 to 16 microns.

Discussions

Although the kid shed the pure oocysts of Eimeria arloingi, one may think that the endogenous phase described here does not necessarily belong to that species.

The schizonts, macrogametocytes, microgametocytes and oocysts described in this report were not similar neither in morphology nor in location to those reported from ordinary goats [1], Angora goats [18] and sheep[12] for Eimeria nina-kohl - yakimovi. They did not resemble either to the asexual and sexual forms which have been reported from sheep [4,7,9] for Eimeria parva and Eimeria ahsata and from Angora goats [17] for Eimeria parva.

The schizonts described from the Angora kid in this report were similar both in morphology and in location to those reported from ordinary kid [9] and from sheep [10] for Eimeria arloingi. The schizonts reported from the Angora kid and from sheep aproximately had the same size, but the schizonts found in ordinary goats were larger than these. However there was no fully mature schizont among those measured from the sections of the intestine of the Angora kid.

The macrogametes, microgametocytes and young oocysts found in the present sections were also similar with respect to their sizes, morphologies and locations in the tissues to those describeb by Levine et al [9] for Eimaria arloingi in ordinary goats and by lotze [10] in sheep.

Summary

Oocysts of Eimeria arloingi were found in the feces of an Angora kid with lesion of coccidiosis in the small intestine. The oocyst was

described in detail. The oocysts of Eimeria arloingi were found in the feces of 616 (77 %) out of 900 Angora goats.

Endogenous phase in the small intestine included schizonts, macrogametes, microgametocytes and oocysts in the epithelial cells. These were also described in the report.

Özet

Eimeria parva'nın biyoloji ve patojenitesini incelemek üzere Lalahan Üretme Çiftliğinden, deney hayvanı olarak, alınan tiftik keçisi oğlaklarından 3 ünde tabii coccidiosis zuhur etmiştir. Yapılan gaita muayenesinde, bu oğlaklardan birinde sadece Eimeria arloingi oocystleri tesbit edilmiştir. Diğer ikisinde ise Eimeria arloingi, Eimeria ahsata ve Eimeria nina - kohl - yakimovi bulunmuştur. Mevcut literatürlere göre tiftik keçilerinde Eimeria arloingi'nin organizmadaki gelişme sahfası incelenmemiş olduğundan, gaitasında saf Eimeria arloingi oocystleri tesbit edilen oğlak öldürülmüş ve üzerinde gerekli incelemeler yapılmıştır.

Gaitada görülen oocyst'lerin şekli elipsoidal veya tavuk yumurtasına benzer. Uzunlukları 22 - 23 (ortalama 29) mikron, genişlikleri 18 - 26 (ortalama 23) mikrondur. Oocysr'ler çift cıdarlıdır. İnce kutuplarında birer mikropil ve bunun üzerini örten kubbe şeklinde bir kep mevcuttur. Oocyst'in içinde protoplasma artığı yoktur, fakat kutup granulü vardır. Sporlanma müddetleri 20 C. derecede 60 saattir. Sporocyst'ler uzundur ve içerlerinde protoplasma artığı mevcuttur. 900 tiftik keçisinden 616 (77 %) sında bu türün oocystleri bulunmuştur.

Öldürülen oğlağın ince barsak mukozasında serpilmiş manzarada, soluk sarı renkte, takriben 0. 3-0.4 mm. çapında, kenarları bariz ve gayri muntazam olarak hudutlanmış fuayeler görülmüştür. Barsak mukozasında yer yer kanlanmış sahalar tesbit edilmesine rağmen kanamaya rastlanmamıştır. Gaitanın sulu bir kıvamda bulunduğu müşahede edilmiştir.

İnce barsak mukozasından yapılan taze frotilerde schizont, macrogamete, microgametocyte ve genç oocystler görülmüştür. İnce barsakta villi intestinalis'lerin kilus kanallarında bulunan dev schizontların büyüklükleri 100 x 140.4 mikron olarak tesbit edilmişlerdir. Yine villi intestinalislerin tepe ve yanlarını kaplayan sathi epital hücreleri içerisinde bulunan macrogamet'lerin ebatları 18 - 29 x 22.2 - 14.8 mikron, microgametocyte'lerinki 15 - 23 x 10 - 14 mikron, genç oocyst'lerinki ise 18 - 27 X 11 - 16 mikron olarak bulunmuştur.

References

1 - **Balozet, T.** (1932): *Les coccidies du mouton et de la chevre. Cycle evelative de Eimeria nina - kohl - yakimovi Yakimof et Rastegaive.* 1930. Archives de L'Institute Pasteur de Tunus XXI, 1, 88 - 118.

2 - **Becker, E. R.** (1943): *Coccidia and cocidiosis of domasticated, game, laboratory animals and of man.* Collegiate press Inc. lova, U.S.A.

3 - **Christensen, J. F.** (1938): *Species differentiation in the coccidia from the domestic sheep.* J. Parasitol. 24,5, 453 - 468.

4 - **Davis, L. R., Bowman, G. W. and Smith, W. N.** (1963): *Observation on the endogenous cycle of Eimeria ahsata Hones,* 1942 *in domestic Sheep.* J. Parasitol. 10: supplement, 8.

5 - **Davies, S. F., Joyner, L. P., Kendal, S. B.** (1963): *Coccidiosis. Oliver and Boyd,* Edinburg.

6 - **Deom, J., Mortellmans, J.** (1956): *Observation sur la coccidiosis du mouton et de la chevre au Congo Belge.* Ann. Soc. Belge. Med. Trop. 36: 47 - 57.

7 - **Kotlan, A., Pellerdy, L. und Versenyi, L.** (1951): *Experimentelle studien uber die koksidiose der schafe, I. die endogene entwieklung von E. parva.* Acad. Vet. Budapest. V. I (3), 317 - 331.

8 - **Levine, N. D.** (1961): *Protozoon Parasites of Domestic animals and of man.* Burgess Puplishing Company, USA.

9 - **Levine, N. D., Ivens, V. and Frits, T. E.** (1962): *Eimeria christensini sp. n. and other coccidia of the goat.* J. Parasitol. 48, 2, 255 - 262.

10 - **Lotze, J. C.** (1953): *The life history of the coccidian parasite, Eimeria arloingi, in domestic sheep.* J. Amer. Vet. Res. XIV. 50, 86-95.

11 - **Lotze, J. C.** (1952): *The Pathogenicity of the coccidian parasite, Eimeria arloingi, in domestic sheep.* The Cornell Vet. X LII, 4, 510-517.

12 - **Lotze, J. C.** (1953): *The Pathogenicity of the cocidian parasite, Eimeria nina - kohl - yakimof and Rastegaeva,* 1930 *in domestic sheep.* Amer. Vet Med. Assoc. Nineteen annual meeting (prociding book), 141 - 146.

13 - **Lotze, J. C.** (1953): *The identity of Eimeria arloingi and Eimeria faurei of sheep and goats.* Proc. Hel. Soc. Wash. 20, 1,55 - 58.

14 - **Marotel, G.** (1905): *La coccidiose de la chevre et son parasite.* Bull. Stedes Sci. Vet. Lyon. 8, 52 - 56

15 - **Melikyan, E. L.** (1955): *Coccidios of sheep and goats in the Armenian S. S. R.*, Trud Armenian Nauchno - issled. Vet. Inct. 8: 83 - 91.

16 - **Merdivenci, A.** (1959): *Evcil Koyun ve keçilerimizde coccidia nevileri ve bazı deneyler.* Türk Vet. Hek. Der. Dergisi, 20: 260 - 281.

17 - **Sayın, F.** (1964): *Tiftik keçilerinde bulunan Eimeria türleri. Eimeria parva'nın biyolojisi üzerinde deneysel araştırmalar.* Tcz. A. Ü. Vet. Fak. (Henüz başılmamıştır.).

18 - **Sayın, F.** (1964): *Eimeria-nina - kohl - yakimovi Yakimoff and Rastegaieff,* 1930, *in an Angora goat.* Vet. Fak. Der. XI, 3 - 4, 135 - 144.

19 - **Smith, W. N., Davis, L, R,** (1960): *The life cycle of Eimeria ahsata.* J. Parasitol. 7 (suppl) 8.

20 - **Svanbaev, S. K.** (1957): *K Vaprosu o fauna i morfoloji kokdidii ovetsi koz zopodnogo Kazakkhstane,* Trudy Instita Zoologii Akad. Nauk Kazakh S. S. R. Tom, VII, 252, - 257.

21 - **Yakimof, W. L.** (1933): *La coccidiose des animoux domestiques dans l'Azerbaidjan.* Ann. Soc. Bel. Med. Trop. 13, 93 - 130.

Received Sept., 17. 9. 1965

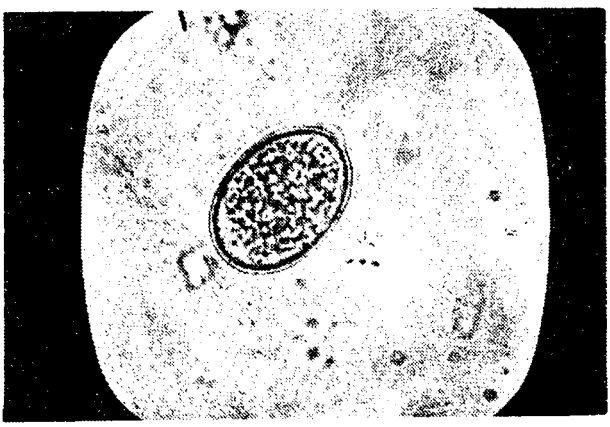

Fig. 1 - Unsporilated oocyst of Eimeria arloingi.

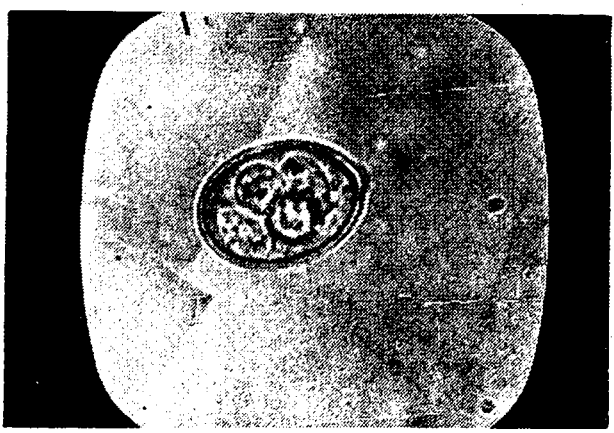

Fig. 2 - Sporulated oocyst of Eimeria arloingi.

Fig. 3 - Giant schizont of Eimeria arlongi.

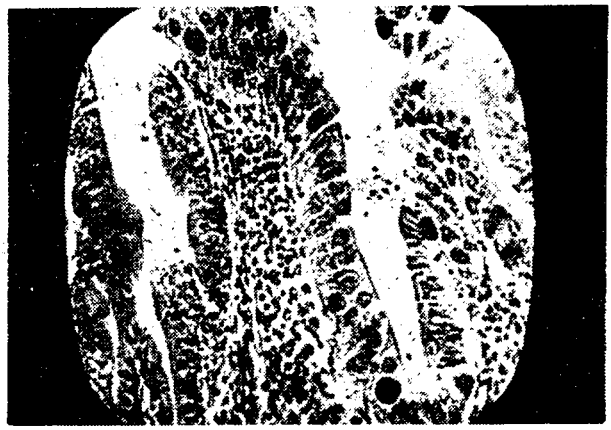

Fig. 4 - Macrogametes and microgametocytes in the epithelial cells of the tip and side of the willi.

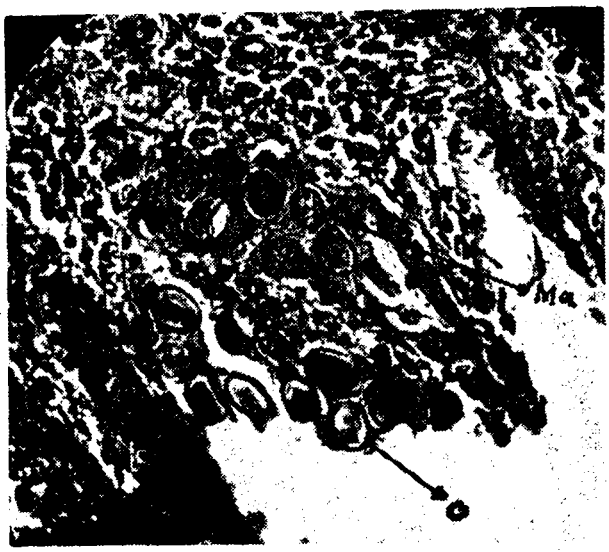

Fig. 5 - Macrogametes (Ma) and young oocysts (o) in the epithelial celles of a villi.

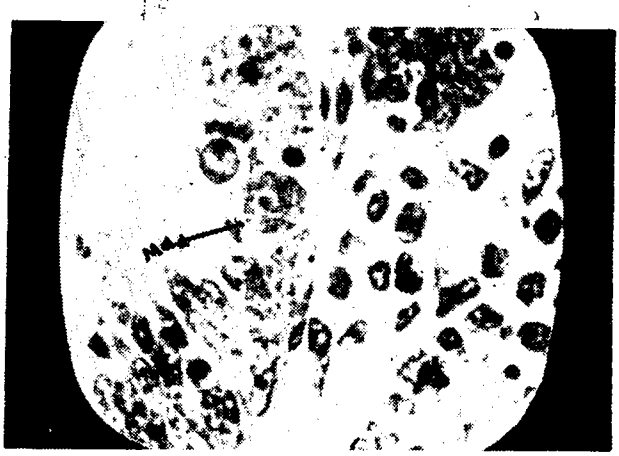

Fig. 6 - Immature macrogametes of Eimeria arloingi (Ma).

Fig. 7 - Mature macrogametes of Eimeria arloingi (Ma).

Fig. 8 - Mature microgametocyte (Mi), macrogametes (Ma) and young oocysts (o) of Eimeria arloingi.

Fig. 9 - Young oocysts of Eimeria arloingi (o).