

ORD. PROF. HİLMİ DİLGİMEN'İ KAYBETTİK

Mehmet Hilmi Dalgimen 1882'de Selanikte doğmuştur. Babası Ali Bey, annesi Refia Hanımdır. İlk öğrenimini 1891-1894 yıllarında Selanikte, orta öğrenimini aynı şehirde 1894-1900 yıllarında yapmıştır. 1905'de Mülkiye Baytar Mektebi Âlisi'nden mezun olmuştur. Veterinerliğin ilk yıllarında Yarımburgaz (Çatalca), İnebolu mez-baha veterinerliği ve Vadina sıhhiye veterinerliği görevlerinde bulunduktan sonra 1910'da Fransaya Alfort Veteriner Mektebine gönderilmiştir. Orada anatomi, histoloji ve embriyoloji ihtisası yaparak 1912 yılında yurda dönmüştür. Aynı yıl askerlik görevine başlamış, 1913'de terhis olmuştur.

Askerlik görevinden sonra Baytar Mektebi Âlisi teşrih (anatomi) muallim muavinliğine ve kısa bir süre sonra, aynı yılda, "teşrihi tat-biki hayvanatı ehliye" muallimliğine atandı, 1914'de tekrar askere alındı. Bu defa askerlik görevini Askerî ve Mülki Baytar Mekteplerinde teşrih muallimi olarak yaptı, 1918'de terhis olup tekrar öğretim görevine başladı. 27. 10. 1932'de Yüksek Baytar Mektebi rektörlüğü görevine getirildi. 1933 yılında Yüksek Ziraat Enstitüsünü açılış ile öğretime başlayan Baytar Fakültesinin Anatomi Enstitüsüne 2 nci sınıf doçent tayin edildi (28. 10. 1933). 1935'de birinci sınıf doçentliğe, 19. 5. 1936'da ikinci sınıf profesörlüğe ve 26. 8. 1939'da birinci sınıf profesörlüğe yükseldi.

Richter'in 1941'de Almanyaya dönmesiyle Anatomi Enstitüsü direktörlüğüne getirilmiştir.

30. 6. 1944'de 2 nci sınıf ordinarius profesörlüğe yükselmiş ve 13 Temmuz 1947 günü 65 yaşını doldurduğundan emekliye sevk edilmiştir.

new species and indicates the possibility of transmission of coccidia from buffalo to cattle.

Materials and Methods

The present study is based on the examination of sporulated oocysts of *Eimeria* species from the feces of 130 buffalo (*Bubalus bubalis*). The fecal samples were obtained from rectums of apparently healthy animals during the period of 1966 to 1968. The animals were from the provinces of Ankara, Kayseri, Çorum, Samsun, Sakarya and Bolu. The age of the animals varied from two months to ten years old.

After washing and straining of the fecal samples, the oocysts were concentrated by centrifugal flotation method with Sheather's sugar solution for their discovery. The samples which contained the oocysts of *Eimeria* species were mixed with 2.5 % Potassium Dichromate solution and placed in a thin layer in a petri dish at room temperature to permit the cooccidian oocysts to sporulate. The sporulated oocysts were concentrated by the method which was mentioned above prior to examination for their identification. They were examined with Leitz microscope equipped with apochromatic objectives. The pictures of the sporulated oocysts were drawn by camera lucida or taken by microphotography apparatus.

In order to determine the pattern of transmission of coccidia from buffalo to cow, three cow calves about one week old were inoculated with sporulated oocysts of *Eimeria ellipsoidalis*, *E. zurnii*, *E. bovis*, *E. auburnensis*, and *E. ankarensis* from buffalo. A total of 6, 550 oocysts (3500 *E. Zurnii*, 1500 *E. ellipsoidalis*, 1000 *E. bovis*, 500 *E. auburnensis* and 50 *E. ankarensis* oocysts) were administered to each calf. Daily fecal examination was made to discover oocysts in their feces for about 30 days after the beginning of inoculation. The oocysts observed in the feces of inoculated calves were counted and identified.

Results

The fecal examination showed that 124 out of 130 (95. 38 %) buffalo were infected with coccidia and most of the *Eimeria* species described from bovine were found to be present in these animals in Turkey. A total of 11 species were observed, including one which did not fit any previous description and which is therefore described

as a new species under the name of *Eimeria ankarensis* n. sp. The sporulated oocyst of each species is described below in detail.

Eimeria ankarensis n. sp.

Oocysts of *Eimeria ankarensis* (fig. 1 and 3) are elongate ovoid in shape. Oocyst wall is yellowish-brown in color, composed of two distinct layers about 3 to 3.5 microns thick and lined by a membrane. The outer layer is thick, rough and not detachable. It leaves the anterior pole of oocyst uncovered. The surface of this layer uniformly has a punctuated appearance under microscope. The inner layer is very thick and dark brown in color. A well visible micropyle is present at the small end of oocyst. It is about 6 microns in diameter. The micropylar end of oocyst is narrower than the opposite end. Twenty five sporulated oocysts from 5 animals were 32-43 by 25-29 microns with a mean of 39.2 by 26.4 microns. Their length-width ratios ranged from 1.28-1.45 with a mean of 1.44. Sporulation of oocyst is completed in about 3 to 4 days at room temperature. Oocyst polar granule and oocyst residuum are absent. Sporocysts are elongate, almost ellipsoidal, but with one end smaller than the other. Twenty five sporocysts were 18-23 by 8-10 microns with a mean of 21.4 by 8.7 microns. Their length width ratios ranged from 2.25-2.30 with a mean of 2.27. Stieda body and sporocyst residuum are present. Sporocyst residuum is composed of scattered granule. Sporozoites are elongate, rather comma shaped, lying head to tail in sporocyst with one large globule in the large end and one small globule in elsewhere.

As discussed in the conclusion of the report, this species of *Eimeria* does not fit any previous description. It is, therefore, considered as a new species and named *Eimeria ankarensis*, because of its first occurrence around Ankara.

Eimeria alabamensis Christensen, 1941

The oocysts of *E. alabamensis* (fig. 2 and 3) are ovoid and small. Oocyst wall is thin, smooth, transparent, pale yellow in color and composed of a single layer. It is lined with a membrane. Twenty five sporulated oocysts from 5 buffalo measured 16.12 to 26.1 microns in length and 13.2 to 17.1 microns in width (average 15.3 microns). Their length-width ratios ranged from 1.4 to 1.9 with a mean of 1.6. Micropyle and oocyst polar granule are absent. Sporulation of oocysts is completed in about 5 days at room temperature. Oocyst residuum and sporocyst residuum are not present.

Sporocysts are elongate and have a stieda body. The sporocysts were 12.9–17.6 by 5.2–6.8 microns with a mean of 17.7 by 5.8 microns. Their length width ratios ranged from 2.5 to 4.3 with a mean of 2.9. Each sporozoite has 2 clear globules and they lie head to tail in sporocyst.

Eimeria auburnensis Christensen and Porter, 1939.

The oocysts of *E. auburnensis* (fig. 2 and 3) are elongate ovoid in shape, though ellipsoidal and tapering form also occur. Oocyst wall is either smooth, homogenous and transparent or has a coarsely granular surface. It is yellowish brown in color and composed of a single layer and lined by a thin membrane. Micropyle is present at the small end of oocyst. Twenty five oocysts from 5 animals measured 34.6 to 42.5 by 22 to 28 microns (average 41 by 25 microns). Their length-width ratios ranged from 1.4 to 1.9 with a mean of 1.7. Micropylar cap is absent, but polar granule present. Sporulation of oocyst is completed in about 3 days at room temperature. Sporulated oocyst does not have oocyst residuum. Sporocysts are elongate ovoid and have both stieda body and sporocyst residuum. The measurements of sporocysts varied from 15 to 20 microns in length and from 7 to 10 microns in width (average 17 by 8 microns). Their length-width ratios ranged from 2.0 to 2.2 with a mean of 2.2. Sporozoites are elongate with one end broader than the other and lying head to tail in sporocysts. They have one large globule in the large end and one small globule elsewhere.

Eimeria bovis (Zublin, 1908) Fiebiger, 1912.

The oocysts of *E. bovis* (fig. 2 and 3) are broadly ovoid and becoming narrower at micropylar end. Oocyst wall is smooth (rarely roughened) and composed of two layers. Outer layer is colorless and inner one orange brown in color. There is a micropyle at the small end of oocyst. Twenty five oocysts from 5 animals were 25–32 by 18–21 microns (average 20 by 27 microns). Their length-width ratios ranged from 1.1 to 1.5 with a mean of 1.3. The oocysts required 2–3 days to complete their sporulations. Oocyst residuum and polar granules are absent. Sporocysts are elongate ovoid and have stieda body at their small ends. Sporocyst residuum is present. Sporocysts were 14–17 by 6–8 microns (average 16.5 by 7.4 microns). Their length width ratios ranged from 1.9 to 2.3 with a mean of 2.1. Sporozoites are typically banana shaped and lying head to tail in sporocysts. They have two refractile globules of which large

one situated near the posterior end and small one near the anterior end.

Eimeria brasiliensis Torres and Ramos, 1939

The oocysts of *E. brasiliensis* (fig. 2 and 3) are ellipsoidal with the relatively straight sides curving sharply near the poles. Oocyst wall is of a brownish yellow or greenish appearance. It is smooth and somewhat thicker at the micropylar end. Micropyle and polar cap are present. The size of polar cap ranged from 3.9 to 7.8 by 1.2 to 2.1 microns (average 1.7 by 6.9 microns). Twenty five oocysts from 2 animals were 32-40 by 23-26 microns with a mean of 36.6 by 24.8 microns. Their length width ratios ranged from 1.2 to 1.4 with a mean of 1.3. A subpolar body which is a characteristic of this species was present. Sporulation of oocyst is completed in about 6 days at room temperature. Oocyst residuum was absent. Sporocyst residuum present. Sporocysts measured 17 to 20 microns in length and 7 to 9 microns in width (average 7.8 by 18.5 microns). Their length-width ratios ranged from 1.9 to 2.4 with a mean of 2.1. Sporozoites are elongate and lie head to tail in sporocysts. They have one large globule at each end.

Eimeria canadensis Bruce, 1921.

The oocysts of *Eimeria canadensis* (fig. 2 and 3) are oval or ellipsoidal in shape. Oocyst wall is smooth and composed of two layers. The outer one is colorless and thicker over the micropyle, while inner one yellowish brown and thinner over the micropyle. The wall measured 1.25 microns in thickness. Twenty five oocysts from 5 animals were 27-36 by 20-28 microns. Their length width ratios ranged from 1.1 to 1.4 with a mean of 1.2. Micropyle is present at the small end of oocyst, but oocyst residuum and polar granule absent. Sporulation of oocyst is completed in 3-4 days at room temperature. Sporocysts are spindle shaped and measure 14 to 20 microns in length and 5-8 microns in width (average 16 by 7 microns). Their length width ratios ranged from 2.1 to 2.6 with a mean of 2.4. They contain a sporocyst residuum. Sporozoites are elongate and lie head to tail in sporocyst. They have refractile globules at their each end.

Eimeria cylindrica Wilson, 1931.

The oocysts of *E. cylindrica* (fig. 2 and 3) are typically cylindrical. Oocyst wall is thin, smooth, transparent or yellowish in color and comp-

osed of single layer. Micropyle is imperceptible. Twenty five oocysts from 5 animals measured 18 to 29 (average 24) microns long and 11 to 15 (average 13) microns wide. Their length width ratios ranged from 1.8 to 2.5 with a mean of. 2.2. Sporulation of oocyst is completed in 2 days at room temperature. Oocyst residuum and polar granule are not present. Sporocysts are elongate and do not have stieda body. They measure 12 to 18 (average 14.2) microns long and 4 to 7 (average 6.2) microns wide. Their length-width ratios ranged from 2.1 to 3.4 with a mean of 2.7. Sporocyst residuum is present. Sporozoites are banana shaped, lie head to tail in sporocyst and have two refractile globules.

Eimeria ellipsoidalis Becker and Frye, 1929

The oocysts of *Eimeria ellipsoidalis* (fig. 2 and 3) are ellipsoidal to slight ovoid. Oocyst wall is thin, homogeneous and transparent. It is composed of a single layer and lined with a fine membrane which is wrinkled at micropyle and micropylar cap are not present. Twenty five oocysts from five animals were 17-27 by 12-18 microns with a mean of 15 by 22 microns. Their length width ratios ranged from 1.3 to 1.9 with a mean of 1.5. Sporulation is completed in about 2-3 days at room temperature. Oocyst residuum is absent. Sporocysts are elongate ovoid with flattened and inconspicuous stieda body. They were 11 - 16 (average 13) microns long and 5-6 (average 5.1) microns wide. Their length-width ratios range from 2.3 to 2.6 with a mean of 2.4. Sporocyst residuum is present. Sporozoites are elongate with one broad end and lie head to tail in sporocyst.

Eimeria subspherica Christensen, 1941.

The oocysts of *E. subspherica* (fig. 2 and 3) are subspherical (rarely spherical). Oocyst wall is thin, colorless, transparent and composed of a single layer. Micropyle is absent. Twenty five oocysts from 5 animals measured 12 to 14 (average 12.8) microns long and 11 to 13 (average 11.17) microns wide. Their length - width ratios ranged from 1.0 to 1.3 with a mean of 1.2. Sporulation of oocyst is completed in 4 days at room temperature. Oocyst residuum and polar granule are not present. Sporocysts are spindle shaped with small stieda body. They were 7-9 (average 7.2) microns in length and 3-4 (average 3.4) microns in width. Their length width ratios ranged from 1.6 to 3.1 with a mean of 2.4. Sporocyst residuum is not present. Sporozoites which are wider at one end than the other, lie head to tail in sporocyst and have a refractile globule at their large end.

Eimeria wyomingensis Huizinga and Winger, 1942.

The oocysts of *E. wyomingensis* (fig. 2 and 3) are ovoid. Oocyst wall is yellowish brown in color, smooth, 3 microns thick and composed of a single layer. It is lined with a fine membrane. Micropyle is present at the small end, it is 4 microns in diameter and generally sunken. Twenty five oocysts from 2 animals were 36 - 40 (average 39) microns long and 25 - 29 (average 27) microns wide. Their length width ratios ranged from 1.1 - 1.3 with a mean of 1.2. The oocysts required 4 to 5 days to complete their sporulations at room temperature. Oocyst residuum and polar granule are not present. The sporocysts are elongate with one end which is narrower than the other and have a small stieda body. Sporocysts were 16 - 20 by 8 - 11 microns with a mean of 18.9 by 9.2 microns. Their length-width ratios ranged from 1.9 to 2.3 with a mean of 2.1. Sporocyst residuum is not present. Sporozoites are banana shaped and lie head to tail in sporocyst. They have a large globule at their broad ends.

Eimeria zurnii (Rivolta, 1878) and Martin, 1909.

The oocysts of *E. zurnii* (fig. 2 and 3) are spherical, subspherical or bluntly ellipsoidal. Oocyst wall is smooth, colorless and composed of a single layer. Micropyle, oocyst residuum and polar granule are not present. Twenty five oocysts from 5 animals measured 17 - 22 (average 18) microns long and 14 - 10 (average 17) microns wide. Their length width ratios ranged from 1.2 to 1.3 with a mean of 1.22. The oocysts required 3 days to complete their sporulations at room temperature. Sporocysts are elongate - ovoid with a small stieda body. They were 9 - 12 (average 10.3) microns in length and 5 - 6 (average 5.4) microns in width. Sporocyst residuum is present. Sporozoites are banana shaped and lie head to tail in sporocyst. They have a refractile globule at their broad ends.

Coccidia infection was nearly observed in all buffalo which were clinically healthy and varying in age from two months to ten years. An analysis of the incidence of the different species (table 1) indicates that multiple infections were common, but these usually consisted of two or three species only. The incidence of infections which consisted of more than three species was not considerable level. Pure or nearly pure infections were also observed in many cases.

E. ellipsoidalis and *E. zurnii* occurred most frequently and they were followed by *E. auburnensis*, *E. bovis*, *E. canadensis*, *E. subspherica*,

TABLE 1
The number of species of Eimeria occurring in individual buffalo fecal specimens

Number of species present in specimens	1	2	3	4	5	6	7
Percentage of 124 specimens	16.1	26.9	20.7	10.7	7.6	3.1	2.3

E. alabamensis, *E. ankarensis*, *E. cylindrica*, *E. brasiliensis* and *E. wyomingensis* respectively (table 2). The oocysts of *Eimeria auburnensis* were rarely numerous enough for the species to be predominant in the specimens in which they occurred. On the other hand the oocysts of *E. ellipsoidalis*, *E. zurnii* and *E. bovis* were mostly predominant in the specimens, while those of *E. ankarensis*, *E. brasiliensis* occurred rarely.

TABLE 2
The percentage occurrence of 11 species of Eimeria and percentage predominance of each species in 124 buffalo fecal specimens

Species	Percentage of samples in which the species occurred	Percentage of samples in which the species were the most numerous
<i>E. ellipsoidalis</i>	53.0	38.7
<i>E. zurnii</i>	48.8	34.7
<i>E. bovis</i>	34.4	26.9
<i>E. auburnensis</i>	43.8	7.7
<i>E. canadensis</i>	20.0	1.4
<i>E. subspherica</i>	15.3	2.3
<i>E. alabamensis</i>	10.3	1.4
<i>E. ankarensis</i>	9.9	0
<i>E. cylindrica</i>	4.6	2.3
<i>E. brasiliensis</i>	1.6	0
<i>E. wyomingensis</i>	0.7	0

The table 3 shows that 6 out of 11 species occur in all provinces where fecal specimens came from. It means these species are common while the others are not in Turkey.

TABLE 3
The prevalence of 11 species of Eimeria in different provinces .

Species	Prevalence					
	Ankara	Adapazarı	Bolu	Çorum	Kayseri	Samsun
<i>E. ankarensis</i>	14.2	3.3	12.5	16.6	10.0	0
<i>E. alabamensis</i>	3.5	16.6	4.1	0	15.0	7.6
<i>E. auburnensis</i>	42.8	26.6	54.1	100.0	50.0	92.3
<i>E. brasiliensis</i>	0	6.6	4.1	0	0	0
<i>E. bovis</i>	17.8	66.6	12.0	75.0	30.0	38.4
<i>E. canadensis</i>	25.0	10.0	33.3	8.3	20.0	38.4
<i>E. cylindrica</i>	7.1	3.1	0	0	10.0	7.6
<i>E. ellipsoidalis</i>	39.2	40.0	50.0	100.0	50.0	92.3
<i>E. subspherica</i>	14.2	16.6	16.6	8.3	30.0	15.3
<i>E. wyomingensis</i>	3.3	0	0	0	0	0
<i>E. zurnii</i>	35.6	70.0	87.5	75.0	35.0	38.0

The experiments concerning with the transmission of coccidia from buffalo to three cow calves resulted in a success. The inoculated calves began to discharge *E. ellipsoidalis*, *E. zurnii*, *E. bovis* and *E. auburnensis* oocysts on 10th, 13th, 18th and 21 st days of inoculation respectively. They discharged a number of oocysts from each species for 1 to 3 days and did not show any clinical sign concerning with pathogenicity of these species. The oocysts of *E. ankarensis* did not appear in the feces of any inoculated calves at all.

Discussion

Ten out of 13 bovine *Eimeria* species which are presently considered valid were recorded from buffalo in Turkey. In addition a new species was discovered and named as *Eimeria ankarensis* n. sp.

Eimeria ankarensis may be confused with *E. thianethi*, *E. bukidnonensis*, *E. wyomingensis* and *E. pelita*. *E. thianethi* was described from cattle and buffalo in Russia and India (9, 10, 24). It was listed as synonym of *E. bovis* (19) or *E. bukidnonensis* (26), but is presently considered as valid species (18,24) on account of its large ellipsoidal oocyst which has double layered and striated wall (10, 24). *E. ankarensis* differs from *E. thianethi*, because it has elongate ovoid oocysts which posses a wide micropyle without micropylar cap, a surface with punctuated appearance and a wall of which outer layer leaves the oocyst small end uncovered and inner one does not exhibit horizontal striation. In addition oocyst wall is lined by a thin membrane and a small stieda body present in its sporocysts.

Eimeria bukidnonensis was originally described from cattle (35) in Philippine and subsequently obtained both from cattle (6, 16, 17, 13, 9, 18, 33, 39) and buffalo (24, 39). Our own observation showed that *E. ankarensis* and *E. bukidnonensis* were quite distinct. The oocyst of *E. bukidnonensis* is larger than that of *E. ankarensis* and has a striated single - rather than a double - layered wall. It is priform in shape and does not have a punctuated appearance and a sporocyst residuum.

Eimeria wyomingensis was reported from cattle (15, 16, 17, 18) and from buffalo (24). It was first synonymized with *E. bukidnonensis* (19), but presently considered as a valid species, because of its large ovoidal oocysts which have thick, single layered wall without radial striation (16, 17, 18). The oocysts of *E. ankarensis* can be distinguished from that of *E. wyomingensis* in which the wall is smooth and

has a single layer. Besides the oocyst surface of *E. wyomingensis* does not have punctuated appearance

E. pellita was described from ox (16, 33) and established on account of its oocysts which have a relatively thick, dark brown wall with numerous small uniformly distributed protuberances in the form of small blunt points which give the wall a velvety appearance. *E. ankarensis* differs from *E. pellita*, because it has an oocyst with double layered wall which has rough surface without velvety appearance.

E. bukidnonensis was not present in buffalo, but is found in cattle in Turkey (32). *E. thianethi* and *E. pellita* were observed neither in buffalo nor in cattle.

According to Becker (1) *E. zurnii* and *E. bovis* were first reported from cattle and subsequently held valid as separate species. The name of *E. zurnii* was restricted for the round forms and *E. bovis* (synonym of *E. smithi*) for the oval forms. These species were recognized as being present not only in cattle but also in zebu and buffalo (24, 39).

E. cylindrica and *E. ellipsoidalis* were created by Wilson (37) and by Becker and Frye(3) respectively. The occurrence of former was reported in cattle (9, 12, 13, 16, 22) and in buffalo (24) only, but *E. ellipsoidalis* was obtained from cattle (4, 6, 12, 13, 18, 22, 23, 39), zebu (38) and buffalo (24). *E. alabamensis*, *E. subspherica* and *E. auburnensis* were established from the feces of cattle in Alabama (6, 7) and have been maintained as valid species (2, 11, 19, 26, 27, 8). They were also reported from buffalo (24). *E. brasiliensis* and *E. canadensis* were originally obtained from cattle (5, 34) and subsequently found in buffalo (24).

The sporulated oocysts of all these species were described in detail by many workers (6, 16, 17, 18, 23, 24). The oocysts figured by these workers were essentially similar to those which we obtained from buffalo.

In addition some more Eimeria species have been described from bovine, but they are not presently considered valid. These species are: *E. boehmi* (33), *E. orlovi* (26), *E. helene* (26), *E. gogaki* and *E. aereyi* (29), *E. khurodensis* (30) *E. ildefonsi* (34), *E. bombayensis* (30), *E. mundaragi* (14), *E. ovoidalis* (31), *E. azerbaijanica* and *E. zurnabadensis* (38, 39).

E. boehmi, *E. orlovi*, *E. helenae* (19, 26) and *E. gogaki* (24) were synonymized with *E. brasiliensis*. On the other hand *E. khurodensis*

(19), *E. ildofonsi* (19, 26). *E. bombayensis* (26) and *E. mundaragi* (24) were listed as being synonymous with *E. auburnensis*, and *E. bombayensis* (24), *E. zurnabadensis* (19, 26) with *E. canadensis*. Patnaik (24) thinks that *E. ovoidalis* and *E. azerbaijanica* are synonym with *E. wyomingensis*.

There are two more species which were reported recently from buffalo (26) and cattle (18). They are *E. braillyii* and *E. illinoisensis* and have been presently accepted as valid.

Of all these species, *E. ovoidalis* (31), *E. braillyii* (26) and *E. azerbaijanica* (39) were reported from buffalo; *E. thianethi* both from cattle and buffalo (24) and the other species from cattle only.

Summary

A survey has been made to determine the species of *Eimeria* in buffalo (*Bubalis bubalis*) from Turkey. 124 out of 130 clinically healthy animals were found to be infected with 11 *Eimeria* species. They were 53 % *E. ellipsoidalis*, 48.8 % *E. zurnii*, 43.8 % *E. auburnensis*, 34.8 % *E. bovis*, 20 % *E. canadensis*, 15.3 % *E. subspherica*, 10.3 % *E. alabamensis*, 4.6 % *E. cylindrica*, 1.6 % *E. brasiliensis*, 0.7 % *E. wyomingensis*, 9.9 % *E. ankarensis* n. sp.

The sporulated oocysts of *Eimeria ankarensis* n. sp. are elongate ovoid, 32-43 by 25-29 microns with a mean of 39.2 by 26.4 microns. Oocyst wall is thick, dark brown in color and composed of two layers. Outer layer is rough and its surface has punctuated appearance, inner layer thick and dark brown in color.

The transmissions of four *Eimeria* species (*E. zurnii*, *E. bovis*, *E. ellipsoidalis* and *E. auburnensis*) from buffalo to cow calves were experimentally succeeded. but the trial which concerned the infections of cow calves with *Eimeria ankarensis* failed.

Özet

Türkiye'de mandalarda bulunan Eimeria türlerinin tesbiti ve bunlardan bazılarının deneysel olarak danalara nakli üzerinde araştırmalar

Bu güne kadar manda (*Bubalus bubalis*) coccidiosisi üzerinde önemli bir araştırma yapılmamıştır. Bununla beraber coccidiosisin mandalarda zuhur ettiği ve sığırlarda bulunan türlerin bunlarda da görüldüğü Hindistan'da bildirilmiştir. Bu hususlar göz önüne alınarak

Türkiye'deki mandalarda coccidiosisin incelenmesi uygun görülmüştür. İlk olarak mandalarda bulunan Eimeria türleri ve bunların deneysel olarak sığırlara nakli konuları araştırılmıştır.

Eimeria türlerini tesbit maksadiyle 1966 ve 1968 yılları arasında yaşları 2 ay ile 10 yıl arasında değişen 130 manda muayene edilmiştir. Bunlar görünüşte sağlam hayvanlar olup Ankara, Kayseri, Çorum, Samsun, Sakarya ve Bolu gibi vilayetlerden gelmişlerdir.

Hayvanların enfekte olup olmadığını anlamak maksadiyle doğrudan doğruya rektumdan alınan dışkıları santrifugal flatasyon metodu ile muayene edilmiştir. Bu maksat için Sheather'ın doymuş şekerli su solusyonu kullanılmıştır. Mevcut Eimeria türlerini idantifiye etmek için, içinde oocyst bulunan dışkı bir petri kutusuna konarak % 2.5 Potassium Dichromate ile karıştırılmış ve laboratuvara terk edilmiştir. Böylece oocystlerin sporlanması temin edilmiştir. Sporlu oocystlerin çeşitli özellikleri mikroskop altında incelenerek tür tayini yapılmıştır.

Muayene edilen 130 mandadan 124 nün (% 95.38) Eimeria ile enfekte olduğu anlaşılmıştır. Bu mandalarda total olarak 11 Eimeria türü tesbit edilmiştir. Bunlar *E. alabamensis* (% 10.3), *E. auburnensis* (% 43.8), *E. bovis* (% 34.4), *E. brasiliensis* (% 1.6), *E. canadensis* (% 20), *E. cylindrica* (% 4.6), *E. ellipsoidalis* (% 53), *E. subspherica* (% 15.3), *E. zurnii* (% 48.8), *E. wyomingensis* (% 0.7). *E. ankarensis* n. sp. (% 9.9) dir. Bunlardan ilk 10 tansı daha önce keşfedilmiş ve fakat Türkiye'de mandalarda varlığı henüz bilinmeyen Eimeria türleridir. Metinde sporlu oocystlerinin özellikleri ayrı ayrı anlatılmıştır. Sonuncusu olan *Eimeria ankarensis* n. sp. ise ilk defa tarafımızdan keşfedilip tarif edilmiştir. İlk defa Ankara'nın Çubuk ilçesinden gelen bir mandada bulunduğu için bu isim verilmiştir. *E. ankarensis* bu güne kadar sığır ve mandalardan tarif edilen türlerin hiç birisine uymamaktadır. Metinde bütün ayrıntıları tartışılan bu türün sporlanmış oocystlerinin genel özellikleri aşağıdaki gibidir.

Oocystler uzun tavuk yumurtasına benzer (şekil 1,3) ve sarımsı koyu kahve rengindedir. Oocystin kabuğu kalın olup (3-3.5 micron) iki tabakadan yapılmıştır. İçteki tabaka kalın ve koyu renktedir. Dıştaki tabaka da kalın ve pürüzlüdür. Dış tabaka oocyst'in ince kutbunu tamamen örtmez. İç tabaka da mikropilin kenarına erişir, fakat onun üzerini kaplamaz. Mikroskopta immersionla bakıldığı zaman oocyst satınının homojen bir şekilde noktalarla bezendiği görülür. Oocystin ince kutbunda geniş bir mikropil vardır (takriben 6 mikron). Oocystlerin uzunluğu 32 - 43 (ortalama 39.2), genişliği 25 - 29 (ortalama 26.4) mikrondur. Uzunluğunun genişliğine oranı 1.28 - 1.45

(ortalama 1.44) dir. Oocystlerin sporlanma süresi oda derecesinde 3-4 gündür. Oocyste ait kutup granülü ve protoplazma artığı yoktur. Sporocystler uzun, cliptik şekilde, fakat bir uç diğerinden kısmen incedir. Sporocystlerin uzunluğu 18-23 (ortalama 21.4), genişliği 8-10 (ortalama 8.7) mikrondur. Uzunluğunun genişliğine oranı 2.25 -2.30 (ortalama 2.27) dir. Stieda cismi ve sporocyste ait protoplazma artığı vardır. Sporozoite'ler kama şeklinde olup birinin ince tarafı diğerinin kalın tarafına gelecek şekilde sporocyst içinde yer alırlar.

E. ankarensis daha önce keşfedilen türlerden *E. thianethi*, *E. bukidnonensis*, *E. wyomingensis* ve *E. pellita* ile karıştırılabilir. Fakat oocyst kabuğunun dış cidarının oocyst'in ince kutbunu örtmemesi, stieda cisimciğinin bulunması, mikroskopta oocystinin sathının noktalı görünmesi ve kabuğunun iç cidarının çizgili olmaması ile *E. thianethi*'den; oocystinin iki cidarlı olup armut biçiminde olmaması ile *E. bukidnonensis*'den ve *E. wyomingensis*'den; keza oocystinin çift cidarlı oluşu ve kadife manzarası teşkil eden çıkıntılarının bulunmaması ile *E. pellita*'dan ayrılır.

Yukarda adı geçen Eimeria türleri genellikle mandalarda karışık enfeksiyon şeklinde bulunmuşlardır. Saf enfeksiyon şekline de rastlanmıştır. Enfekte her hayvanda tesbit edilen tür sayısının 1 - 7 arasında değiştiği görülmüştür.

Mandalardan izole edilen *E. zurnii*, *E. auburnensis*, *E. ellipsoidalis*, *E. bovis* ve *E. ankarensis*'in sporlu oocystleri ile 1 haftalık 3 buzağı (sığır buzağısı) deneysel olarak inoküle edilmiştir. Danaların her birine 6550 adet oocyst (3500 *E. zurnii*, 1500 *E. ellipsoidalis*, 1000 *E. bovis*, 500 *E. auburnensis*, 50 *E. ankarensis*) verilmiştir. İnokülasyonda 10, 13, 18, 21 gün sonra danaların dışkıında sıra ile *E. ellipsoidalis*, *E. zurnii*, *E. bovis*, *E. auburnensis*'in oocystleri görülmüştür. Fakat enfeksiyondan 30 gün sonra dahi danalardan hiç biri *E. ankarensis*'in oocystlerini çıkarmamıştır. Netice olarak yukarda adı geçen bazı türlerin mandalardan sığırlara intikal ettiği anlaşılmıştır.

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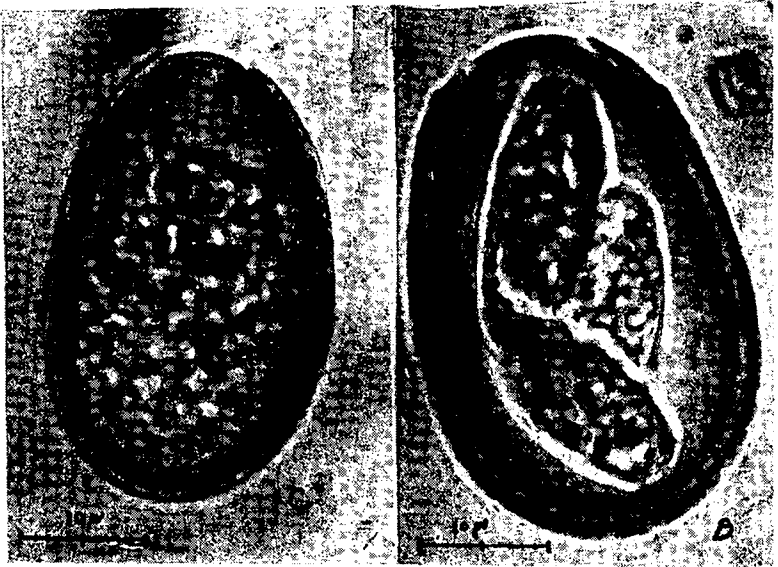
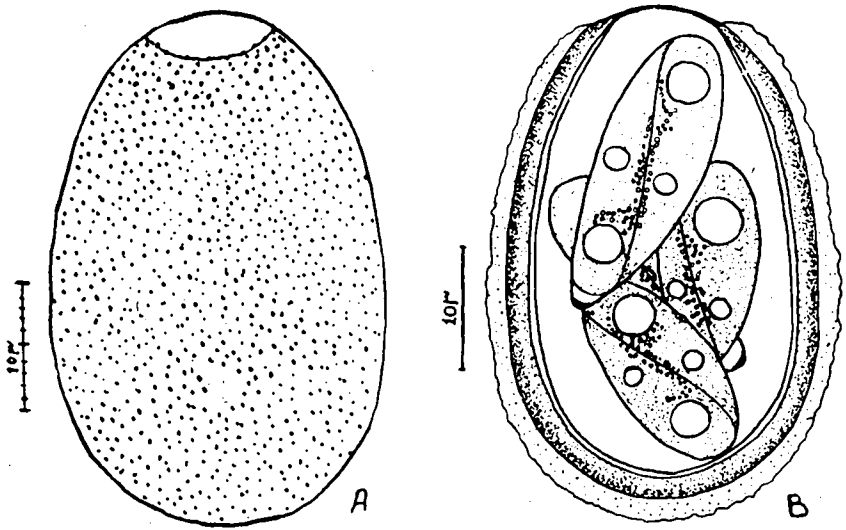


Figure 1. Sporulated and unsporulated oocysts of *Eimeria ankarensis* n. sp. in feces of buffalo (*Bubalus bubalis*) from Turkey

- A) The view of oocyst surface under high power microscope
- B) The hand drawn picture of sporulated oocyst
- C) The microphotography of unsporulated oocyst
- D) The microphotography of sporulated oocyst

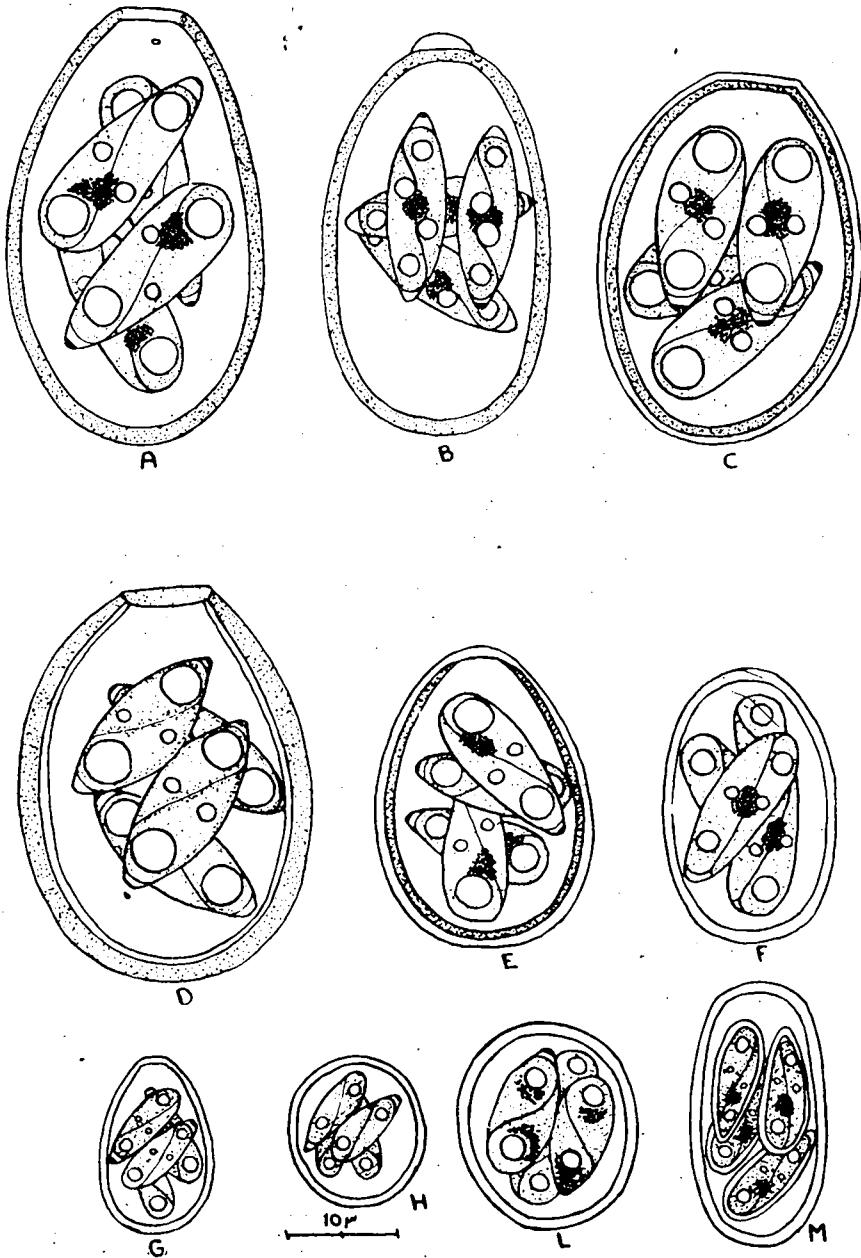


Figure 2. Sporulated oocysts of ten species of *Eimeria* identified in feces of buffalo (*Bubalus bubalis*) from Turkey

- A) *E. auburnensis*; B) *E. brasiliensis*; C) *E. canadensis*; D) *E. wyomingensis*; E) *E. bovis*;
 F) *E. ellipsoidalis*; G) *E. alabamensis*; H) *E. subspherica*; L) *E. zurnii*;
 M) *E. cylindrica*

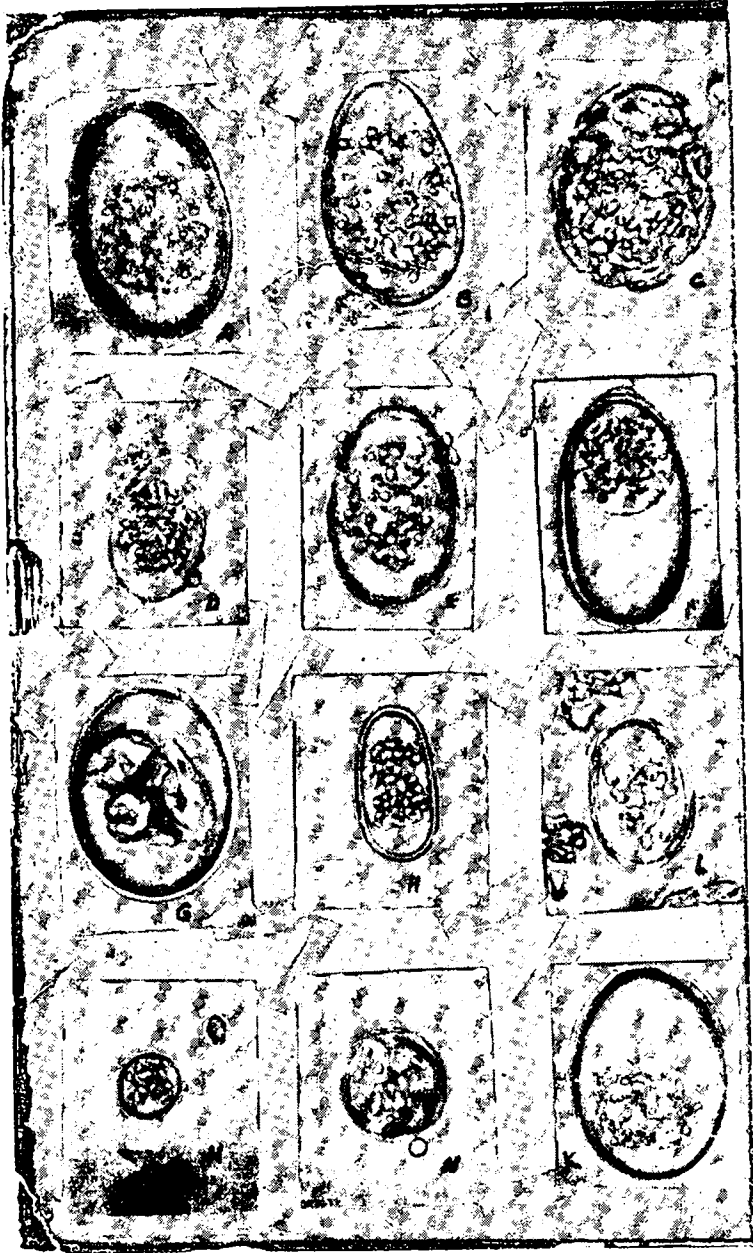


Figure 3. The microphotography of the oocysts of *Eimeria* species in the feces of buffalo (*Bubalus bubalis*) from Turkey

- A) *E. ankarensis* n. sp.; B) *E. auburnensis*; C) *E. auburnensis* (scabreous type); D) *E. alabamensis*;
 E) *E. bovis*; F) *E. brasiliensis*; G) *E. canadensis*; H) *E. cylindrica*; L) *E. ellipsoidal*;
 M) *E. subspherica*; N) *E. zurnii*; K) *E. wyomingensis*. x 875