

STUDIES ON MORPHOLOGICAL CHARACTERISTICS OF *EIMERIA* SPECIES OOCYSTS

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ABSTRACT

Morphologically, nine different species of bovine *Eimeria* were recognised from the faeces of naturally infected calves in North Wales, UK. Various species encountered were *E. subspherica*, *E. zuernii*, *E. ellipsoidalis/alabamensis* (grouped together as a species complex), *E. bovis*, *E. cylindrica*, *E. canadensis*, *E. auburnensis*, *E. brasiliensis*, *E. wyomingensis* and *E. pellira*. The largest oocyst measured was of *E. brasiliensis* and the smallest *E. subspherica*.

Keywords: *Eimeria* spp., oocysts, morphological characteristics

INTRODUCTION

The morphological characteristics of all the bovine species of the genus *Eimeria* are described by Soulsby (1986) and the MAFF (1986). In addition many workers have described the oocyst morphology of different bovine species throughout the world indicating that there is little geographical difference in the oocyst morphology (Courtney *et al.*, 1976; Parker, 1991; Kasim and Al-Shawa, 1985 and Soulsby, 1986). This means that morphological characteristics should form a reliable basis for the separation of species independent of their geographical origins. The size, and shape presented in this work, however, is based on the examination of naturally infected cattle in Britain (North Wales). With the exception of *E. bukidnonensis* and *E. pellita* all species were regularly encountered.

MATERIALS AND METHODS

Faecal samples were collected *per rectum* cattle and oocysts were separated using the modified McMaster and Clayton Lane methods (MAFF, 1986). A simple culture for sporulation was prepared by emulsifying a small sample of faeces with 4% potassium dichromate (MAFF, 1986). This was then strained through a 0.15µm aperture nylon mesh to form a shallow layer in a Petri dish. The oocysts of mixed species were then allowed to sporulate at 30°C for 3-4 days. The measurements taken were based on the means of 50 oocysts with the help of micrometer slide under 10X40 magnification.

RESULTS AND DISCUSSION

The size and other morphological characteristics are basic criteria for the identification of *Eimeria* species. The size, shape, colour and wall thickness of all the species encountered are presented in Table 1 and

2. The largest oocyst measured in this study was of *E. brasiliensis* and the smallest *E. subspherica*. The mean length and breadth of *E. brasiliensis* and the smallest species *E. subspherica* were 39.3±1.41, 11.89±0.78 and 29.89±2.59, 10.85±0.71µm respectively in diameter. The photographs of all nine unsporulated and sporulated species of *Eimeria* separated and identified from faecal samples of naturally infected cattle are given in Plates 1 and 2.

Nine species of bovine *Eimeria* were recognised from the faeces of calves in North Wales during the present survey. Of these, *E. bovis*, *E. auburnensis*, *E. ellipsoidalis/alabamensis* (grouped together as a species complex), *E. canadensis*, *E. brasiliensis*, *E. cylindrica*, *E. zuernii*, *E. subspherica*, and *E. wyomingensis* were also identified from cattle previously by Wade (1990) and Oakley (1990). The species identified in this study were also identified by Joyner *et al.* (1966) from South West England. The shape, size and other morphological characteristics of the above species recognized in the present study agree closely with those given in the MAFF (1986) guide. Furthermore, the shape and colour of the various species noted in the present investigation are similar to those described by Soulsby (1986). The polar cap of *E. brasiliensis*, found in this survey, was previously described by Parker (1991).

The species of *E. ellipsoidalis/alabamensis* which were not separated from each other but treated as a species complex showed the morphological characteristics as those described previously by Soulsby (1986) and Parker (1991). The mean sizes of the different species (Table 1) measured during this survey coincided with the those given by Courtney *et al.* (1976), Jones and Parker (1985), Soulsby (1986) and Parker (1991).

In short very few differences in the morphology and dimensions of the species encountered in this study were seen compared with the descriptions of previous workers.

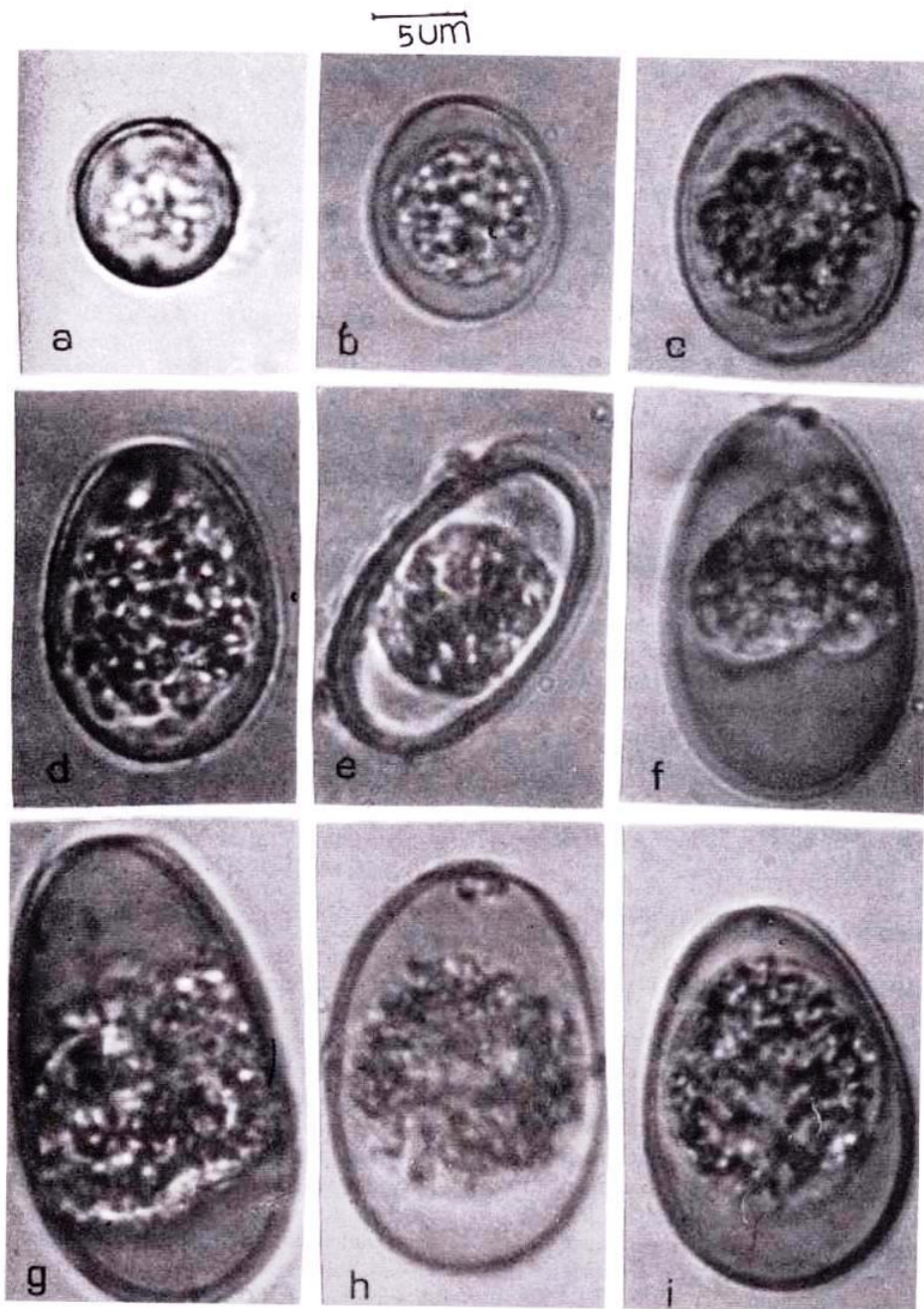


Plate 1: Photographs of unsporulated oocysts of *Eimeria* (*E.*) species isolated from faecal samples of calves by the clayton lane method X 250 (Bright field P.C).

a = *E. subspherica*; b = *E. zurenii*; c = *E. ellipsoidalis/alabamensis*; d = *E. bovis*; e = *E. cylindrica*; f = *E. canadensis*; g = *E. auburnensis*; h = *E. brasiliensis*; i = *E. wyomingensis*; Scale bar represents 5 µm.

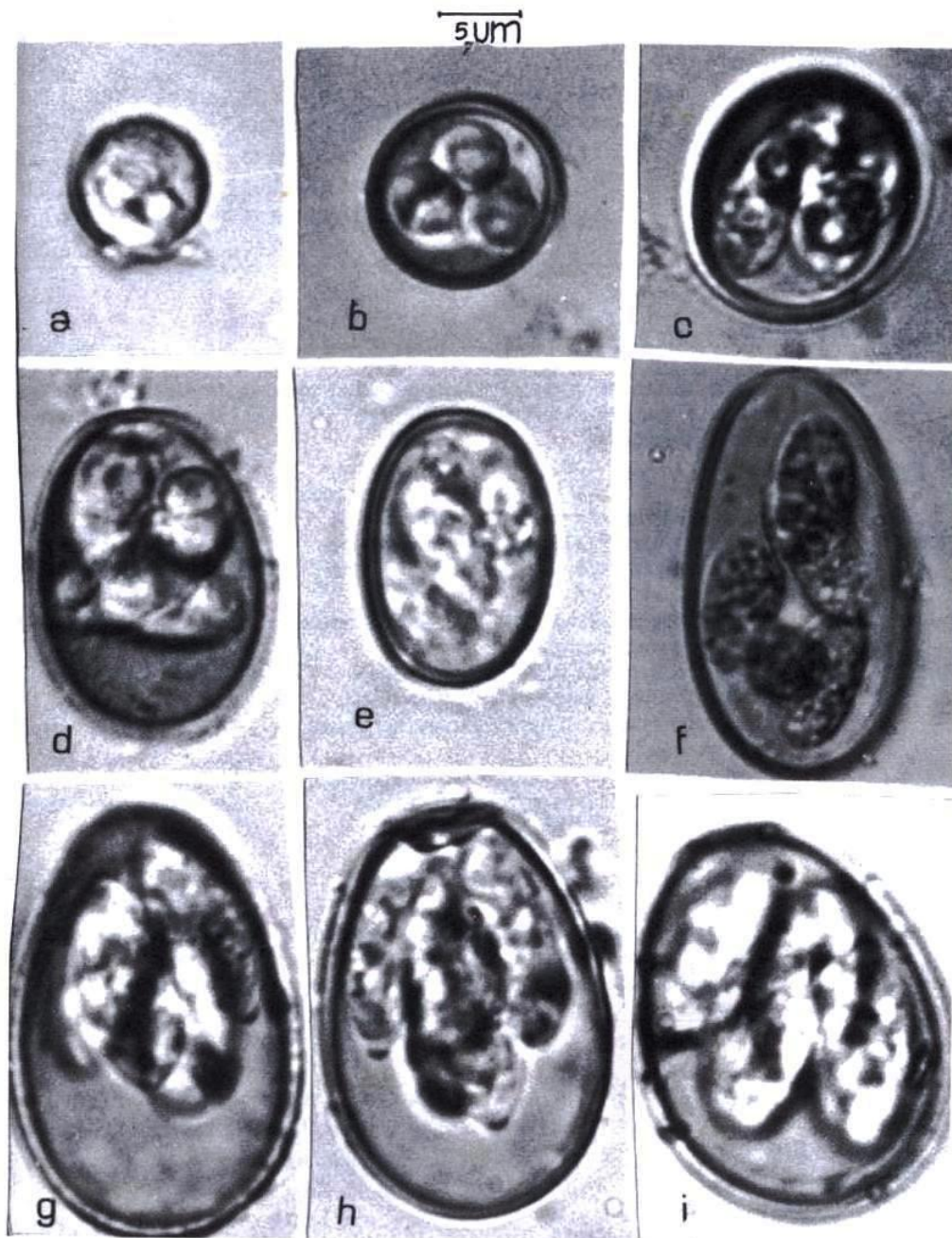


Plate 2: Photographs of sporulated oocysts of Eimeria (E) species isolated from faecal samples of calves by the clayton lane method X 250 (Bright field P.C).

a = *E. subspherica*; b = *E. zurenii*; c = *E. ellipsoidalis/alabamensis*; d = *E. bovis*; e = *E. cylindrica*; f = *E. canadensis*; g = *E. auburnensis*; h = *E. brasiliensis*; i = *E. wyomingensis*; Scale bar represents 5 µm.

Table 1: The mean length, breadth and wall thickness of the oocysts of Eimeria species.

Species	Length (μm)	Breadth (μm)	Wall thickness (μm)
<i>E. bovis</i>	28.70 \pm 0.97	21.00 \pm 1.16	1.68 \pm 0.13
<i>E. auburnensis</i>	38.95 \pm 1.34	24.04 \pm 1.06	1.81 \pm 0.07
<i>E. canadensis</i>	33.24 \pm 0.86	23.49 \pm 0.77	1.77 \pm 0.08
<i>E. ellipsoidalis/alabamensis</i>	19.00 \pm 0.80	13.44 \pm 0.99	1.43 \pm 0.10
<i>E. brasiliensis</i>	39.69 \pm 1.41	29.89 \pm 2.59	1.82 \pm 0.07
<i>E. cylindrica</i>	24.31 \pm 0.99	15.85 \pm 0.99	1.48 \pm 0.10
<i>E. zuernii</i>	17.80 \pm 0.96	15.50 \pm 0.75	1.39 \pm 0.1
<i>E. wyomingensis</i>	39.34 \pm 0.79	29.17 \pm 1.64	1.81 \pm 0.07
<i>E. subspherica</i>	11.89 \pm 0.78	10.85 \pm 0.71	1.40 \pm 0.10
<i>E. pellita</i>	39.60 \pm 0.64	30.75 \pm 2.77	2.27 \pm 0.22

\pm = standard deviation

Table 2: Shape and colour of oocysts of Eimeria species

Species	Shape	Colour
<i>E. bovis</i>	Ovoidal, blunt across narrow end at micropyle, wall smooth, transparent medium thick and micropyle appearing as lighter at narrow end	Oocyst itself pale yellow, wall yellow in colour
<i>E. auburnensis</i>	Ovoidal to elongate-ovoid, regular ovoidal, sometimes narrower near micropyle, and broader at base, wall smooth transparent but sometimes rough in appearance	Pale yellow, sometimes yellowish-brown
<i>E. canadensis</i>	Ovoidal, occasionally cylindrical ovoid, with a micropyle which looks wider as compared to the oocysts of other species and smooth wall	Yellow, sometimes colourless and yellowish brown wall
<i>E. ellipsoidalis/alabamensis</i>	These two species grouped together as species complex, ellipsoidal, sometimes appear cone shaped.	Colourless, sometimes take faecal colour
<i>E. brasiliensis</i>	Regular broadly ovoidal, thicker wall at micropyle. A prominent micropyle with polar cap. In presporulated condition polar cap sometimes invisible but easy to see when sporulated.	Brownish in colour
<i>E. cylindrica</i>	Regular cylindrical, thin wall and oocysts without micropyle	Colourless
<i>E. zuernii</i>	Spherical or circular in form sometimes spherical or ellipsoidal, wall thin and transparent, oocysts without micropyle.	Colourless, sometimes take faecal colour
<i>E. wyomingensis</i>	Broadly ovoid and oocyst with micropyle oocysts wall speckled, striated and rough	Pale yellow, yellowish brown to greenish brown
<i>E. subspherica</i>	Small in size compared with other species, subspherical in shape and thin wall, oocysts without micropyle	Colourless, oocysts sometimes take faecal colour
<i>E. pellita</i>	Ovoidal in shape, very thick and rough wall with velvet appearance	Dark brown colour

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