



Lamb eimeriosis: Applied treatment protocols in dairy sheep production systems



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ARTICLE INFO

Article history:

Received 7 August 2012

Received in revised form 19 January 2013

Accepted 24 January 2013

Keywords:

Eimeria

Lamb

Coccidiosis

Diclazuril

Toltrazuril

Treatment

ABSTRACT

The effect of different treatment protocols using the triazinone compounds diclazuril and toltrazuril on *Eimeria* oocyst excretion, diarrhoea and weight gain was evaluated in the present study. The protocols were designed in order to best fit to common management practices in dairy production systems as applied in Greece. During the first two trials comparative preventive (11 days after birth) and therapeutic (18 days after birth) single treatments using either drug were performed on an intensive farm. In Trial 3 the efficacy of a repeated diclazuril treatment after weaning (at the start and 4 weeks later) of the animals in a semi-intensive farm was tested. The last trial was performed in order to assess the effect of a single oral dose of toltrazuril after weaning of the animals on the same farm. During an observation period of 6–7 weeks after treatment animals in all trials were clinically examined for diarrhoea and faecal samples were regularly monitored for *Eimeria* oocysts at weekly intervals. Body weight was also determined at the start and end of each trial. A single treatment with toltrazuril resulted in a significant reduction of oocyst excretion over the study period compared to the control, with very high efficacy values during the first 2–3 weeks after treatment, irrespective of the treatment protocol and the management system applied. This in general could not be confirmed in the protocols using diclazuril, which showed a much lower and mostly variable efficacy pattern.

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1. Introduction

By invading and destroying the intestinal epithelial cells coccidia of the genus *Eimeria* are a major contributor to enteric disease, especially in intensively reared lambs. Of the 15 species described to infect sheep worldwide (Pellérdy, 1974), *Eimeria crandallis* and *E. ovinoidallis* are the most pathogenic (Taylor et al., 2007).

Typically, lambs between 3 and 8 weeks of age are at particular risk of getting infected (Taylor and Catchpole, 1994). In heavily infected lambs the mucosa becomes completely denuded, resulting in severe haemorrhage and impaired water reabsorption, leading to diarrhoea, dehydration and occasionally death (Taylor et al., 2007).

Animals acquire immunity as a result of infection, which protects against clinical disease and which is maintained by repeated exposure to oocysts. However, immunity does not lead to total prevention of parasite shedding (Catchpole et al., 1993).

Resistance to coccidial infection can be reduced by stress factors such as weaning, high stocking densities, multiple lambing with lower colostrum/milk intake,

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Table 1
Study design.

Trial	Farm	Management system	Age at the start of trial (days)	Treated with	Age at treatment (days)	Treatment
1	1	Intensive	11	Diclazuril Toltrazuril	11	Before oocyst excretion
2			18	Diclazuril Toltrazuril	18	At the beginning of oocyst excretion
3	2	Semi-intensive	27	Diclazuril (double treatment)	30 and 58	At the beginning of oocyst excretion
4			45	Toltrazuril	45	At the beginning of oocyst excretion

adverse conditions such as dietary changes, prolonged transport, rapid weather changes, or concurrent infections (Gregory, 1990; Catchpole et al., 1993; Taylor, 1995; Alzieu et al., 1999). When lambs are weaned during the first month of their life and then reared indoors, as in Mediterranean dairy systems, coccidiosis is seen 2–3 weeks post-weaning (Yvoré and Esnault, 1987; Saratsis et al., 2011).

Although hygienic measures can in principle reduce infection pressure, they are difficult to implement once susceptible animals are housed together, especially indoors where oocysts rapidly accumulate. Therefore, control with anticoccidial drugs is frequently necessary to prevent clinical outbreaks and production losses. Toltrazuril and diclazuril have previously been applied and evaluated for this purpose (Gjerde and Helle, 1986, 1991; Taylor and Kenny, 1988; Le Sueur et al., 2009; Platzer et al., 2005; Mundt et al., 2009; Taylor et al., 2011). The majority of the studies dealing with the efficacy of chemical treatments have so far mainly focused on lamb fattening systems, either pasture or indoor based (Gjerde and Helle, 1986, 1991; Taylor and Kenny, 1988; Alzieu et al., 1999; Mundt et al., 2009; Taylor et al., 2011). The purpose of the present study was to determine the effects of chemical treatment against coccidiosis in lambs kept under dairy husbandry systems applied in the Southern Mediterranean region. Trials included several possible application schemes under the most common practices and were performed in lambs naturally infected with *Eimeria* spp., comparing the effect of treated to untreated control groups on clinical and parasitological parameters.

2. Materials and methods

2.1. Study animals and management systems

Trials were performed on farms where the presence of *Eimeria* was previously confirmed to ensure natural infection. Earlier studies in the area showed that animals acquire infection within the first 3 weeks after birth with a prevalence of 61.7%. The overall cumulative prevalence of *E. ovinoidallis* and *E. crandallis* from birth until weaning ranged between 20.7% and 47.1%, depending on the lambing period (Saratsis et al., 2011).

In dairy husbandry two different systems in terms of lamb management exist; the intensive system, where the lambs are separated from their dams just after birth and reared on milk supplement, and the more common semi-intensive system where the lambs stay with their mothers

mostly indoors and are weaned at 4–8 weeks after birth (Zervas et al., 1999; Zygoiannis et al., 1999; Stefanakis et al., 2007; Volanis et al., 2007). Due to the more industrial farming type, stocking densities are almost always much higher in the intensively managed farms than in the semi-intensive ones. The trials in the current study were performed on two commercial farms belonging to either one of the mentioned systems as follows:

Farm 1 applied an intensive management system with lambings all year round (every two months). Lambs were separated from their dams one day after birth and offered a commercially available milk replacer. The farm had in total 400 ewes of the local Chios breed. The animals were kept on straw.

Farm 2 applied a semi-intensive husbandry system, with lambs reared with the ewes for 4–6 weeks before being weaned. Lambing took place twice a year, which is a common practice for the majority of such farms. The farm had in total 300 ewes of the local Sfakia breed and the animals were also kept on straw.

No anticoccidials were used on these farms for at least one year before our first visit.

2.2. Study design

Efficacy of treatment with toltrazuril (BAYCOX[®] 5% suspension, Bayer Animal Health) and diclazuril (VECOXAN[®] 2.5% suspension, Elanco) was assessed on both farms, as described below. Both products were orally administered according to the manufacturer's recommendations (dose rate of 20 mg/kg for BAYCOX[®] and 1 mg/kg for VECOXAN[®]). Animals were randomly assigned to the respective experimental group before the start of each trial based on their sex, weight and presence of twins. An additional group of animals receiving no treatment served as a negative control. In each trial animals were kept per group in a different pen. Animals were weighed at the start and the end of each trial (Table 1).

The study design included separate trials per farm for which different protocols were strategically planned according to the management system.

2.2.1. Farm 1: intensive management

Under such a management system, where the expected infection pressure was high, two strategic treatments were designed; one to treat the lambs during prepatency

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