DETERMINATION OF COCCIDIOSIS AS A HERD PROBLEM IN RUMINANTS AND CONSEQUENCES FOR ITS CONTROL

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Introduction: Infections with coccidia of the genus Eimeria and resulting diarrhoeal diseases in calves and lambs are common worldwide and are a considerable drain on the profitability of animal husbandry. Both the development and the presentation of coccidial infections are complex and heterogeneous and it is therefore not always easy to recognise the disease and to make recommendations regarding its control. Experience predominantly from own studies in calves and lambs is summarised below.

The course of coccidiosis is influenced by numerous factors relating to the parasite, the host and the environment. However, the relevant pathogenic species of coccidia are always primary pathogens and obligately pathogenic, i.e. it is not vital for other factors to coexist if susceptible animals are infected with a certain dose of infective oocysts. The duration of the prepatent period, the sites of development of the parasites in the intestine and the severity and time of occurrence of clinical symptoms vary from one species of Eimeria to another. With the exception of E. alabamensis, the pathogen of “pasture coccidiosis” in cattle (Gräfner et al 1982), the other species of Eimeria that are pathogenic in cattle (E. bovis, E. zuernii; pathogens of “stable coccidiosis”) and sheep (E. crandallis, E. ovinoidalis) have a long prepatent period of up to nearly three weeks. The subsequent patent period with oocyst excretion in the faeces is when they also become manifest clinically. The variability of the course of coccidiosis, measured primarily by oocyst excretion, is striking even under experimental conditions with identical infection conditions. This variability has been demonstrated clearly in infections with E. zuernii which have been studied more closely (Mundt et al 2003, Mundt et al 2005). An inconsistent course was observed in a group of animals following single experimental infection with E. zuernii. Consequently diarrhoea was evident on different days in different animals and in varying severity. The conditions under which animals are infected in the field differ from those that prevail in experimental infections. As the global prevalence of the coccidia in mammalian livestock is very high it can be assumed that each individual animal will acquire infection sooner or later. A critical factor in all cases of coccidiosis is housing conditions. They determine the problems and, as long as the conditions remain the same, these problems will recur every year or every time when animals develop under the same conditions. If exposure is low, most infections will remain subclinical and will thus remain undetected. In regions and farms/herds with a high density of susceptible animals higher infection pressure increases the risk of infection and subsequent disease. There are, however, considerable differences between cattle and sheep. Infection of young animals generally occurs if they are born or introduced into a highly contaminated environment. In sheep farming, in view of the high animal density, limited sanitation options and considerable potential of coccidia for proliferation, it has to be expected that susceptible lambs will generally be born into a highly contaminated environment and may develop the disease after just one life cycle, i.e. a mere three to four weeks post-partum. This has been shown e.g. in sheep farms in France and Germany (Dittmar et al 2009, Le Sueur et al 2009) where individual oocyst excretion had been monitored several times weekly during the suspected period from two up to seven weeks of age.

![Figure 1. Percentage of lambs excreting oocysts in three farms in central Germany.](image-url)

Under different housing conditions, the disease may develop later, if older animals are introduced into a contaminated environment, e.g. after being turned out to graze. Animals get infected easily if the pasture is used regularly for many years resulting in critical infection pressure. Oocysts remain infective even after longer periods without passages in the target animals (e.g. winter season) because they are very resistant to environmental influences. The course of bovine coccidiosis may differ between farms as a result...
of substantial variation in infection pressure (Daugschies and Najdrowski 2005, Mundt et al. 2007). It can be assumed that the animals in a group will be infected at the same time, or at around the same time, under field conditions.

In comparison to experimental conditions the infectious doses, i.e. the number of oocysts ingested, will vary considerably under field conditions and will be taken up as long as animals remain exposed (“trickle infection”). Where infection pressure is low, prevalence in a group of animals may be only about 20 to 30% or lower, with shedding of 1000 or less oocysts per gram of faeces. Prevalences of approximately 60 to 70% or more and a high E. bovis and/or E. zuernii oocyst count in the faeces are indicative of high infection pressure. Therefore the clinical picture differs between individuals and herd and may be difficult to attribute to infection with coccidia.

Oocyst excretion basically correlates well with the clinical picture. This can be demonstrated clearly under defined experimental conditions in an infection model. Under natural infection conditions the correlation between the clinical and the parasitological picture is stronger the more animals in a herd or group are affected (extent) and the more intense the infection is. However, oocyst excretion fluctuates over time in the individual animal and differs between individuals and thus the extent of excretion in a given sample does not always reflect the severity of the clinical disease. The correlation is generally much weaker if the infection level is low. Moreover other factors (infectious and non-infectious) may have an effect on the clinical picture and obscure the contribution of the coccidia.

In addition to a past history of coccidiosis in a given farm, diagnosis of coccidial infections, whether obvious as clinical disease or not, must address a number of questions. The usual approach is to examine oocyst excretion in the faeces (semiquantitatively or quantitatively) and to differentiate the coccidial species (pathogenic and/or non-pathogenic species). The identification of coccidia oocysts in the faeces or in the bedding shows the general prevalence on a farm or in a section of a stable. If the pathogens are differentiated, this approach shows the prevalence of a certain species. More extensive diagnosis (sampling) is generally necessary in order to correlate oocyst excretion with existing clinical symptoms, or to characterize an infection on the basis of oocyst excretion in a group of animals over time. The lower the extent of the infection and the lower its intensity, the more samples will need to be taken in order to gain a conclusive picture. This applies particularly to stable coccidiosis in cattle since the course of the infection can be very variable. This is the only way to provide a basis for recommendations on optimal control, which in turn includes a recommendation on the optimum time for treatment.

Control strategy has to be based on measures relating to sanitation and management. Since coccidiosis always develops as a result of infection by a contaminated environment, it appears reasonable to strive for control by improved hygiene measures. In practice, however, this is often not feasible. Hygiene measures are not sufficient on their own, although they should always be considered in coccidiosis control. Even when attention to hygiene is rigorous clinical coccidiosis may still develop. This is mainly due to the nature of the parasites and the fact that just a few oocysts are all it takes to initiate the development of an infection with subsequent excretion of up to a million of oocysts per gram of faeces. Given the common housing conditions in ruminant management, the hygiene measures that can realistically be applied are very limited and areas once contaminated with oocysts (e.g. pastures, stables with deep litter) will remain so for weeks, months or even years. If additional control is necessary using anticoccidials, this must take place in the prepatent period, i.e. before the onset of clinical signs (damage). The epidemiological circumstances again need to be known (Dittmar et al 2010, Mundt et al 2007). Examples are given of treatments under different conditions.

Keywords: coccidiosis, control, ruminants.
References:


