

## Peri-Parturient Nematode Egg Rise in Indonesian Ewes

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**ABSTRACT** : Studies were designed to study the peri-parturient rise in strongyle faecal egg counts (FEC) in ewes grazing in a rubber plantation in North Sumatra, Indonesia. In three consecutive lambing seasons strongyle FEC of peri-parturient ewes and dry ewes were monitored from 2 to 3 weeks before lambing until 7 to 9 weeks post lambing to measure the magnitude and duration of the peri-parturient rise. A significant rise in FEC was observed during the post-parturient period in two of the three studies. FEC increased in the three studies from

lambing day, and were elevated until 5 to 9 weeks following lambing. Lactating ewes shed on average 3 times more eggs than dry ewes. Lactating ewes were therefore considered as an important source of pasture infection. These findings are discussed in relation to the epidemiology and control of gastrointestinal nematodes in the humid tropics.

(**Key Words**: Sheep, Strongyles, Peri-Parturient Rise, Epidemiology, Control, Indonesia)

### INTRODUCTION

The great demand for mutton, the importance of sheep as a side income for smallholders and the possibility of integrating sheep with rubber plantations, have sustained interest in sheep farming in the Asian humid tropics. In order to increase the productivity, research is being dedicated to improve genetics and breeding, nutrition, animal health and management of sheep. Parasitic diseases have been identified among the major constraints to sheep production. *Haemonchus contortus*, the abomasal nematode of small ruminants, is generally considered as the most common and the most pathogenic parasite in the region (Carmichael, 1993; Daud-Ahmad et al., 1991; Dorny et al., 1995, 1996; Kochapakdee et al., 1991). This voracious blood sucking strongyle causes high mortality in young stock and mortality and production losses in adult animals. It has been demonstrated that control of this parasite can dramatically increase small ruminant production in the humid tropics (Handayani and Gatenby, 1988), but control is difficult in this environment where pre-parasitic stages thrive well year round. Currently, control relies almost exclusively on suppressive anthelmintic treatments. However, the high treatment

frequency, together with underdosing and the lack of alternation between drugs with different mode of action, has led to the development of anthelmintic resistant strains of *H. contortus*. Anthelmintic resistance has been demonstrated in Thailand, Fiji and Malaysia (Dorny et al., 1993, 1994; Kochapakdee et al., 1995; Pandey and Sivaraj, 1994; Rahman, 1993; Sivaraj and Pandey, 1994; Sivaraj et al., 1994; Walkden-Brown and Banks, 1986). In the latter country anthelmintic resistance is widespread and involves drugs of different mode of action as well as several species. In order to reduce the frequency of anthelmintic treatments and subsequently diminish further selection for resistant populations of nematodes, alternative nematode control strategies need to be developed. Among these are, strategic anthelmintic dosing, clean grazing strategies, the introduction or selection of breeds or lines which display a higher resistance towards nematodes, and vaccination (Carmichael, 1993; Pandey et al., 1994). To yield maximum benefits from these strategies a thorough knowledge of the epidemiology of nematodes in the humid tropics is required. This includes studies on the bionomics of the pre-parasitic stages on pasture and on the parasite-host interactions. An increasing number of studies on the bionomics of free living stages of parasitic nematodes have revealed that infective stages on pasture have a shorter longevity in the humid tropics than in temperate regions (Banks et al., 1990; Carmichael, 1993; Sani et al., 1995). This important finding was exploited in designing a "treat and

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move" control system, with 3-monthly intervals, which proved to be feasible and effective in sheep grazing under rubber in Indonesia (Carmichael, 1993). But also the parasite-host interactions need to be further explored in this particular tropical environment. Dorny et al. (1995) demonstrated an age-related decrease as well as a peri-parturient rise of faecal egg counts in Malaysian sheep on traditional farms. The importance of these findings both in terms of epidemiology and pathology was stressed. It was suggested that control should be more selective in particular age groups or lactating animals and that this would help in reducing the treatment frequency.

The occurrence of a peri-parturient rise in sheep in a large breeding farm in North Sumatra, Indonesia was demonstrated by Romjali et al. (1997). It was also shown in this study that this rise was affected by both the genotype of sheep and the litter size. The objective of the present study was to assess the epidemiological impact of a peri-parturient rise by measuring its magnitude and duration.

## MATERIALS AND METHODS

### Site

The study was carried out at the Sei Putih sheep breeding farm (3° 24' N, 98° 53' E, altitude 24 m), in North Sumatra, Indonesia. This area has a hot humid climate characterized by year-round high humidity and only minor variations in temperatures (yearly averages: 23°C minimum and 33°C maximum). The annual rainfall is about 1,700 mm. The driest period (< 100 mm rainfall/month) is from January till April.

### Animals and management

The flock comprises about 500 ewes of various tropical breeds. The breeding is controlled and the lambs are born in four months of the year, namely January, April, July and September. The animals graze each day from 08:00 to 16:00 h in a rubber plantation, and at night are confined in a wooden sheep house with a raised slatted floor. During the two weeks following lambing, the ewes are confined and fed with grass cut from an ungrazed area. Data pertaining to mating and lambing are recorded routinely. All sheep in the flock are given anthelmintic treatments every 3 months and moved to a pasture that has been spelled for three months. A drench containing levamisole (7.5 mg kg<sup>-1</sup> BW) was used as the anthelmintic in 1994 and 1995.

### Experimental design

Studies were designed in three consecutive lambing

seasons to measure the magnitude and duration of the rise in strongyle faecal egg counts during the peri-parturient period. The first study was done from 20 June 1994 till 5 September 1994, the second from 20 September 1994 till 29 November 1994 and the fourth from 20 December 1994 until 21 February 1995. Before each lambing season, groups of ewes due to lamb and dry ewes were selected. In each of these studies 19 ewes born in 1992 and 1993, of St Croix × Sumatra (F1 and F2) crosses and Barbados Blackbelly × Sumatra F1 cross, were monitored from 3 weeks before lambing until 7 (study 3) or 9 (studies 1 & 2) weeks post-lambing. Groups of 7 (study 1), 20 (study 2) and 18 (study 3) dry ewes were taken as control. No anthelmintic treatments were administered during the course of these experiments. In each experiment faecal samples were taken weekly from each ewe.

### Parameters

Strongyle egg counts were performed on the faecal samples by means of a modified McMaster technique with a precision of 30 eggs per gram of faeces and expressed as eggs per gram of faeces (EPG).

### Data processing

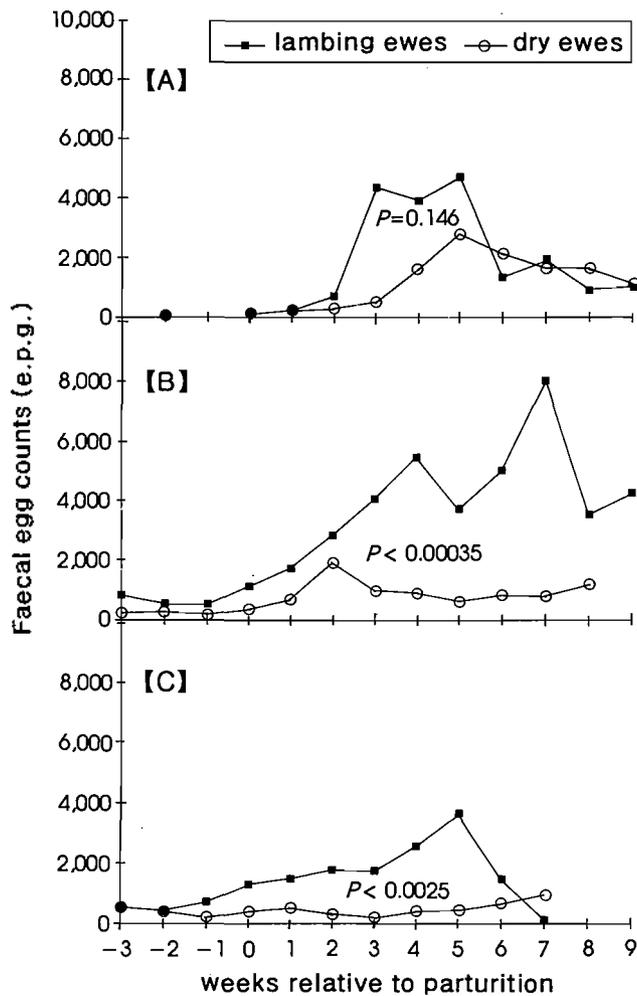
Data on faecal egg counts are presented as geometric means. Cumulative egg counts were calculated for the ewes of each group in order to estimate the total egg production during the peri-parturient period. The egg output between each pair of sampling days was calculated, for each animal, using the trapezium rule, i.e. the average faecal egg count of two sequential sampling dates and was multiplied by the number of days between the sampling dates. The cumulative egg count from 2 weeks before until 7 weeks post lambing was then calculated by adding together the period egg counts. The arithmetic mean cumulative egg count at each sampling day was then calculated for the dry and the lambing ewes of each study (Vercruyse et al., 1993).

Data analysis was done with SYSTAT statistics version 5.2. Profile analysis was done to compare egg counts of ewes during their lactation period and those of non-lambing ewes.

## RESULTS

The mean strongyle faecal egg counts of the lambing ewes and the dry ewes during the peri-parturient period are shown in figure 1 A, B and C for studies 1, 2 and 3 respectively. Faecal egg counts increased in the three studies from lambing day, and were elevated until 5 to 9 weeks following lambing. Profile analysis failed to show

a significant effect ( $p=0.146$ ) of lambing on faecal strongyle egg counts in study 1. In contrast, very significant effects of lambing on faecal egg counts were found in studies 2 ( $p=0.00035$ ) and 3 ( $p=0.0025$ ).



**Figure 1.** Geometric mean faecal egg counts of lambing ewes and of dry ewes during the same period, for studies 1 (A), 2 (B) and 3 (C);  $P$ -values of the profile analysis are given for each study.

Comparison of the cumulative egg counts of lambing and dry ewes demonstrated that the faecal egg output of lambing ewes during their peri-parturient period was 3.0, 3.47 and 3.67 times higher than that of dry ewes in the same period in studies 1, 2 and 3 respectively.

## DISCUSSION

The results of the present studies confirm the occurrence of a peri-parturient rise in strongyle faecal egg counts in sheep in the humid tropics of Asia. It was

shown that *H. contortus* is mainly responsible for the elevated egg counts in lactating ewes (Dorny et al., 1995; Romjali et al., 1997). Since hypobiosis seems not to be a marked feature of the life cycle of trichostrongyles in the Asian humid tropics (Ikeme et al., 1987), the peri-parturient rise is believed to be the result of increased susceptibility to new infection, increased prolificacy of female parasites and suspension of the normal mortality of adult worms (Gibbs and Barger, 1986). It is suggested that peri-parturient rise is related to changes in host resistance and a temporary depression of the immune response during late pregnancy and lactation (Connan, 1976; Jansen, 1987; O'Sullivan and Donald, 1973).

The peri-parturient rise has been studied mainly in sheep of temperate regions, where it has a great epidemiological importance. Lambing is seasonal in temperate climates and it generally coincides with early spring, when the overwintered larval population on pasture has declined to negligible levels. As a result, larvae hatched from the eggs deposited by the peri-parturient ewes, constitute the main source of infection for the lambs. Therefore, a strategic anthelmintic treatment of the ewe in the peri-parturient period reduces drastically the nematode infections of the lambs. In humid tropical conditions, the epidemiological situation is different. Lambing is not seasonal, unless it is controlled, and infective larvae are available on pasture at any time of the year. In these conditions, the epidemiological consequences of a peri-parturient rise are considered to be of less importance. On the other hand the pathological effects of the impaired immunity on the peri-parturient ewe may be more important in the humid tropics, given the generally higher infection level and the lower plane of nutrition. Thomas and Ali (1983) observed a significant depression in haematocrit, haemoglobin and serum-albumin concentration in post-parturient ewes that had been experimentally infected with *H. contortus*. These ewes gave 23 percent less milk than non-parasitised ewes. A significant depression of the haematocrit was observed in the post-parturient period of naturally infected ewes (Dorny et al., 1995; Taylor et al., 1990). The lower milk production may have a negative effect on the survival and the growth of the lambs. Darvill et al. (1978) reported an increased weight gain in lambs from ewes which received anthelmintics, which was interpreted as indicating an increase in milk yield.

The present studies show that lactating ewes shed more than 3 times more strongyle eggs with their faeces than dry ewes. They should therefore be considered as an important source of pasture infection, especially when taking into account the larger amount of faeces they

produce compared to the lambs. It is concluded that when designing parasite control programmes in sheep in the humid tropics, strategic dosing of ewes around parturition should be considered.

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