Effect of lameness on milk production in a flock of dairy sheep

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Lameness in sheep has been the subject of scientific investigations because of its effects on production and animal welfare. Lameness is a clinical sign, not a disease in itself, and the causes can be broadly classified as genetic, physical injury and infection (Coulon and others 1996, Warnick and others 2001, Green and others 2002, Winter 2004). Lameness is considered to be one of the most important health problems in sheep, and is associated with weight loss, reproductive failure and reduced milk yield (Stewart and others 1984, Marshall and others 1991, Eze 2002). Although the condition has been studied in meat breeds of sheep, there are very few reported data on lameness in dairy sheep. In Greece, the highest-producing and most prolific local breed of sheep is the Chios breed. The aim of this study was to quantify the impact of lameness on the milk yield of Chios ewes.

The study was conducted in a commercial flock of Chios dairy sheep, consisting of 170 multiparous ewes, between January and July 2008. The farm was visited once a week by a veterinarian, who examined all the animals, and the milk production of individual ewes was electronically recorded every day (Afimilk; SAE Afikim). A passageway that allowed the ewes to enter the milking parlour in single file was constructed to allow the gait of individual ewes to be observed. When a ewe was observed to be lame, a healthy ewe of the same age, same number of lactations and stage of lactation, and similar average milk yield before the development of lameness was chosen as a matched control. The case and control ewes were examined clinically, locomotion scored (Hill and others 1997), body condition scored (Russel and others 1969), and their feet were examined and lesions were recorded. Milk samples were taken to be tested for subclinical mastitis by the California mastitis test (Bovivet CMT -Test; Kruuse) and bacteriological examination (Fthenakis and others 1991).

All statistical analyses were performed using SPSS v 16.0 for Windows. A *t* test was used for comparisons between lame and control animals for total milk production, average milk yield before the occurrence of lameness, changes in body condition score and body temperature.

Thereafter, in order to assess the effect of lameness on milk production at flock level, a general linear model was developed considering other explanatory factors, as:

$$Y_{hijk} = e + L_h + A_i + M_j + D_k$$

Where e=Intercept, Y_{hijk} = Total milk yield (l/lactation), L_h = Lameness status (two levels, lame and non-lame), A_i = Age at lambing (four levels, I = three, four, five, six years),

L_j=Lactation (four levels, j=two, three, four, five) and D_k = Duration of lactation (k = 61 to 304 days).

Twenty-one ewes (12.4 per cent) showed signs of lameness due to foot lesions, but only 17 cases were used for statistical analysis, because three lame ewes were found to have subclinical mastitis and one control had clinical mastitis. The aetiology and duration of lameness are shown in Table 1; the dominant cause of lameness, in 12 of 17 cases (70.6 per cent), was white line abscess.

When comparisons were made at flock level, it was found that lame ewes had significantly ($P<0.01$) lower milk production than non-lame ones (approximately 47 kg less milk per ewe per lactation). This result is adjusted for all other effects in the model (age, number of lactations and duration of lactation). The effect of number of lactations, age at lambing and their interaction was statistically not different from 0 ($P>0.05$).

The results of pairwise comparisons are shown in Table 2. Total milk production, standardised to a 210-day milking period, was significantly higher (approximately 65 kg) in the controls compared with the lame ewes ($P<0.05$).

In the present study, a significant decrease in the milk production of lame ewes was observed when the comparison was made at flock level (11.3 per cent) using the linear model, and also at individual ewe level using the pairwise comparison (24.4 per cent). The comparison at individual ewe level showed a higher decrease in milk production for lame ewes compared with the controls; this might have been be due to a higher overall milk production potential of the lame ewes and the controls that were selected in comparison with the average for the whole flock. Thus, it may be that high-yielding ewes are more likely to suffer from lameness. These results underline the need for further research in order to provide evidence for any relationship between high milk yield and the occurrence of lameness, and to investigate the mechanisms via which lameness causes a decrease in milk production.

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Legends

Tab.1

Causes of lameness in dairy sheep in relation to the locomotion score, the duration of lameness and the month in which lameness was observed.

Tab.2

Pairwise comparisons between lame ewes and matched controls.

Tab.1

		LS			Days		Months						
Aetiology	Number of cases	2	3	4	<7	>7	Jan	Feb	Mar	Apr	May	Jun	Jul
White line abscess	12	8	3	1	6	6	4	3	2	2	0	1	0
Footrot	3	0	1	2	2	1	0	0	1	2	0	0	0
Pedal joint abscess	1	0	0	1	0	1	1	0	0	0	0	0	0
Injury	1	0	1	0	1	0	0	1	0	0	0	0	0
Total	17	8	5	4	9	8	5	4	3	4	0	1	0

- LS = Locomotion score (LS) scale: 2 No obvious lameness when standing, abnormal gait when walking, 3 Shifting stance and obvious lameness when walking, 4 Unwilling to bear weight on one foot when standing or walking.
- Days = Duration of lameness

Tab.2

Variable	Lame ewes n=17 Mean (sd)	Control ewes (n=17) Mean (sd)	P
Total milk production per lactation (litres)	200.7 (68.80)	265.6 (76.30)	<0.05
Average milk yield before lameness was observed (l/day)	1.3 (0.45)	1.5 (0.50)	NS
BCS change	-0.2(0.26)	-0.1 (0.17)	NS
Body temperature (°C)	39.1 (0.62)	38.8 (0.27)	<0.05

BCS Body condition score, NS Not significant