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Control and management of sheep mange and pediculosis in Great Britain

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Abstract

The patterns of insecticide use for the prevention and control of sheep lice and *Psoroptes* mites, in England, Wales and Scotland, in 2003–2004, were examined using data from a retrospective questionnaire. Overall, 375 of the 966 (39%) farmers who responded said that they treated at least once to prevent louse infestation. For scab, 426 of the 966 (44%) farmers who responded said that they had treated prophylactically to prevent the disease. There were no significant differences between regions in the number of times farmers treated to prevent lice ($\chi^2 = 0.54$, $P > 0.1$) or scab ($\chi^2 = 0.16$, $P > 0.1$). Among the farmers who applied prophylactic treatment 23% had a subsequent outbreak of lice and 17% had an outbreak of scab. The majority of sheep farmers who used preventative treatment did so in June and July. Where a second treatment was given it was largely in October. For lice, 52% of farmers used pyrethroids to prevent and 70% to treat louse infestation. For scab prophylaxis, most farmers said that they used either the macrocyclic lactones (41%) or organophosphates (36%) as a preventative. For the therapeutic treatment of scab outbreaks, macrocyclic lactones (largely doramectin) were used on 58% of sheep farms.

The high national prevalence of sheep scab and pediculosis indicates that current control methods are failing to contain these ectoparasites. The results of this study suggest that a large proportion of insecticide applications take place at times of year when they might expect to be relatively ineffective, and the use of inappropriate compounds for the parasites in question is common. The widespread use of macrocyclic lactones in particular for scab prevention and control is of concern, because of the additional use of these compounds in parasitic worm control and the potential that their overuse will hasten the development of resistance.

Keywords: Control; Ectoparasite; Insecticide; Lice; Mites; Myiasis; Pediculosis; Prophylaxis; Scab; Sheep

1. Introduction

In the UK, since the deregulation of sheep scab (psoroptic mange) in 1992 and the abolition of the national compulsory treatment of sheep in insecticidal plunge-dips, the prevalence of scab and louse infestation has increased significantly (Bisdorff et al., 2006). Under the national dipping programme, guidelines on animal treatment for the control of *Psoroptic* mange were straightforward: farmers were obliged to dip all sheep in approved insecticides in a specified summer and/or autumn time-window. This treatment also served to reduce the prevalence of lice. The approved dips included, at various times, the organophosphates diazinon and propetamphos and the pyrethroids high *cis*-cypermethrin and flumethrin (Bates, 2004). However concerns about the unnecessary insecticide use for uninfected animals, environmental contamination, operator safety, residues and resistance of the parasite to the active ingredients, led to a series of changes in

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legislation resulting in deregulation of sheep scab and removal of the compulsory dipping regime in November 1991. Subsequently, UK farmers have had the freedom to choose to apply insecticides, or not, to prevent disease, although the treatment of confirmed outbreaks of scab remains compulsory. However, propetamphos, flumethrin and high *cis*-cypermethrin have all been withdrawn for the control of psoroptic mange in the UK (Taylor, 2005). Injectable macrocyclic lactones are highly effective in the treatment of established outbreaks of psoroptic mange or sucking lice, but their short (moxidectin and doramectin) or negligible (ivermectin) period of residual activity (O'Brien, 1999; Parker et al., 1999), gives them little application in prevention of disease, nor are they thought to be effective against chewing lice (Bates, 2004).

The choice of appropriate ectoparasiticides and their timely application is important, since inappropriate use can result in wasted time, effort and expense. The problems are further compounded if treatments need to be repeated because they were inadequate (Sargison et al., 2007). Measures to control ectoparasites of sheep therefore must be planned carefully to maximize benefit (French et al., 1994) and it is important that farmers are up-to-date with current legislation and use the right products, at the right doses and at the right time to treat and prevent ectoparasitic disease. Studies have suggested that the inappropriate use of insecticides by sheep farmers may be widespread (Armstrong and Davies, 2007). The aim of the study reported here, therefore, was to examine the measures used by farmers to prevent and treat scab and louse infestation and the efficacy of these measures.

2. Materials and methods

2.1. Study population

The prevalence of psoroptic mange (sheep scab) and louse infestation in sheep in England, Wales and Scotland, between March 2003 and February 2004, was investigated using a retrospective postal survey, stratified by region. Three thousand and three hundred questionnaires were sent out to members of the National Sheep Association, of which 966 were returned completed, giving a response rate of 32%. These data were extracted from an Access database and imported into Excel (Microsoft Corp., Redmond, WA, USA) and then SPSS 11.0.0 (SPSS Inc., Chicago, IL, USA), for statistical analysis. The questionnaire returns were stratified by region into: Wales, Scotland, Northern England, Central England, South East and South West England. The headline disease prevalence results obtained from this questionnaire have been reported elsewhere (Bisdorff et al., 2006).

The first question on the questionnaire, relating to scab and lice, asked farmers "In the last 12 months, did you treat your sheep to prevent either of the following?" The question aimed to ask farmers about the prophylactic application of insecticide to their flock rather than the therapeutic treatment of infestation, which was covered by subsequent questions. However, some farmers reported having treated to prevent disease but also reported having treated therapeutically to control an outbreak of disease in the same month: 28 did so for lice, 27 for scab and 2 for both groups of parasite. For these farmers, since it was suspected that they may have misunderstood the initial question, their entire questionnaire return was omitted from subsequent analysis.

Not all farmers completed the questionnaire entirely, some simply left particular questions blank (for example, if they were unable to remember the product with which they had treated their sheep) or gave ambiguous answers, hence, the response rate to individual questions varied.

3. Results

3.1. Treatment frequency

Overall, 375 of the 966 (39%) farmers who responded said that they treated at least once to prevent louse infestation. Of these 375 farmers, the majority (61%) treated only once to prevent lice, 28.8% treated twice and 9.96% of farmers said that they had treated their sheep more than three times to prevent lice. There were no significant differences between regions in the number of times farmers treated to prevent lice ($\chi^2 = 0.54, P > 0.1$).

For scab, 426 of the 966 (44%) farmers who responded said that they had treated prophylactically to prevent the disease. Among these 426, the majority (62%) treated only once, 30% treated twice and 7.8% treated more than three times. There were no significant regional differences in the number of times farmers treated to prevent scab ($\chi^2 = 0.16, P > 0.1$).

3.2. Prevention and disease outbreaks

Among the 375 farmers who applied prophylactic treatment to prevent lice, 289 (77%) subsequently remained louse free for the study period from March 2003 to February 2004 (Fig. 1). In total, 86 (23%) of those who said that they had treated to prevent lice, indicated that they had had a subsequent outbreak of the