Update on sheep scab

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What is new about sheep scab? Unfortunately not very much. This unpleasant disease is still endemic in the UK, it has extremely serious impact on animal welfare and production and control strategies still heavily rely upon chemotherapy. On the other hand, ELISA tests for sub-clinical detection of the disease are on the horizon and researchers are actively involved in the development of a sheep scab vaccine, with promising future for the control of sheep scab.

The disease

Sheep scab is an allergic dermatitis caused by the non-burrowing mite *Psoroptes ovis*. The faecal deposition of P. ovis on the skin of the animal causes an intense inflammatory reaction in the skin, with marked pruritus resulting in self-trauma, extensive pyodermatitis, severe alopecia and considerable loss of weight (Kirkwood, 1986). The lesions are distributed primarily along the trunk, but if left untreated can quickly spread over the entire body (Fig. 1). The disease is transmitted by direct contact and its host specific, with the parasite spending its entire life-cycle on the sheep.

Diagnosis

Sheep scab is a highly contagious disease so an accurate diagnosis, by demonstration of live mites (Fig. 2), is essential as inappropriate treatments will prove expensive and ineffective. The traditional diagnosis of *P. ovis* infestation is based on clinical observations and microscopical detection of mites in skin scrapings. Skin scrapings can be taken by using a scalpel drawn at right angles over the skin surface at the periphery of active lesions and observed microscopically under x50 magnification. However, examinations of skin scrapings only detect sheep scab in animals with visible skin lesions, so are unreliable to diagnose early infections. As a consequence, when *P. ovis* is detected, the mites have often already spread out into the flock.

Treatment

As the scab mites can survive in the environment for up to 17 days, it is essential that all animals within the holding will be treated. This can be a particular problem in common grazing, when securing co-operation from all users could be difficult. Also timing for treatment may be problematic, especially in case of heavily pregnant ewes or animals with young lambs.

The currently available options for whole flock treatment are: organophosphate dips and injectable avermectins. In the first case, the only plunge dip available in the UK is diazinon, which has environmental and health implications and a very prolonged meat withdrawal period (70 days). Moreover, dip solutions need to be correctly diluted and replenished, since organic material can bind the dip chemical, reducing its effective concentration and sheep need to be immersed for one minute, with their heads submerged twice. The advantages are the extended residual protection, with persistence up to several weeks and the direct effect on mites, by killing them within 24 hours.

In the case of injectable avermectins there are different options available, in relation to residual protection against re-infestation. Ivermectin at the dose rate of 200 µg/kg affords only 7 days protection, therefore unless uninfected premises are available a second injection 7 days apart is needed to control the disease. Doramectin (at 300 µg/kg) shows persistence of activity for marginally less than 17 days, therefore a single intramuscular injection is sufficient. Finally, two injections of moxidectin (at 200 µg/kg dose rate) 10 days apart are recommended for treatment of sheep scab. The recently launched long-acting moxidectin 2%,

with 60 days persistence after a single injection, affords an extended period of protection, with a better chance of co-ordinated treatments between neighbouring farms.

Controlling sheep scab

Until 1992 statuary control of sheep scab in the UK was based on compulsory plunge dipping at specific time of the year. After deregulation of compulsory dipping, the national prevalence of sheep scab has shown a progressive increase, reaching levels between 10% and 15% in recent years. One of the main reasons behind this is the approach to treatment, which is now mainly done by farmer on a case by case basis. Effective control of sheep scab, thought, can only be achieved by strategic and co-ordinated approach.

On this matter, the Scottish Government has recently put in place the Sheep Scab (Scotland) Order 2010, which reinstated scab as notifiable disease, restricting any movement off or onto the premises of a possibly infected holding. The order also enables enforcement action to be taken against those owners and keepers whose sheep are suspected of having scab, but who fail to take the necessary action to treat, undermining the efforts of the majority to prevent the spread of the disease. Even if there are different opinions wherever this approach should be taken at a national level, it shows clear interest from the wider industry to tackle the disease more effectively.

What's new?

Since demonstration of specific antibodies against *P. ovis* in infected animals, several assays have been developed for antibody detection in sheep. Recently the Moredun Research Institute has developed an ELISA test for the detection of antibodies specific to the sheep scab antigen, which will aid in the diagnosis of sub-clinical infestation (Nunn et al., 2011). The test is not commercailly available yet, but the SAC is currently providing veterinary surgeons in Scotland with free ectoparasitic examinations of sheep skin scrapings combined with clotted blood samples. All sheep from which skin scrapings were collected should be bled together with others that appear unaffected (up to 10 bloos samples). Further research is also looking at a sheep side dipstick test for scab, which would provide a much more rapid test.

Ongoing research is also trying to elucidate the mechanisms of natural immunity to the sheep scab mite, with a view to developing effective vaccines (Smith et al., 2001). Previously infected sheep seem to acquire strong immunity to *P. ovis*, but studies on potential recombinant vaccine candidates are still in progress.

Biological methods to control sheep scab currently under consideration include the use of the entomopathogenic fungi (*Metarhizium anisopliae* and *Beauveria bassiana)*, where in vitro studies have shown positive results (Abolins et al., 2007) and the use of the bacteria *Bacillus thuringiensis,* which produce protein crystals that are toxic to ectoparasites (Pinnock, 1994).

Finally, as different breeds of sheep are known to exhibit different degrees of susceptibility to infection, breeding for genetic resistance to sheep scab is another potential, long term solution.

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