

Sheep Scab Controls

Ovine psoroptic mange or sheep scab (also known by the descriptive names of belt, shab, tag or rubbers) is said to be one of the earliest known ectoparasitic infections. Sheep scab has been known since ancient times. It was known to Moses and has been documented by Cato, Virgil, Pleno and Columnella and (apparently) is referred to in the Bible (Leviticus XXII, 22). Although the Arabs were aware of the mite as long ago as 1174, they did not recognise it as the cause of the disease (Stockman, 1912). It was not until the early 19th Century that the mite was positively identified as the causative agent (Walz, 1809), given the name *Psoroptes ovis* by Hering in 1835, and its life cycle deduced in 1857 (Gerlach, 1857). *P. ovis* is a cosmopolitan, obligate ectoparasite occurring, with the exception of Australia and New Zealand, in all the sheep rearing countries of the world.

3.1 Sheep Scab in Great Britain

An overview of the history of sheep scab in Great Britain.

3.1.1 Years 940 to 1809

The first recorded legislation for a sheep disease in Great Britain with a description similar to scab was by King Hywel Dda in 949 AD, who prohibited the sale of scab affected sheep between the months of November and April. Furthermore, sheep would not be allowed to graze land previously occupied by infested sheep during the previous seven years.

Hywel Dda's edict was unsuccessful, and by 1297 the English chronicler Hemingburgh stated that Flanders, dependent on English wool for its economic prosperity, was almost bankrupted due to the sheep scab epidemic in England. In 1298, another chronicler reported an incident where over 500 sheep from a flock of 645 died of scab - or a similar disease, as differential diagnosis was not possible at the time (Urquart, 1983).

3.1.2 Statutory Control - Phase 1 (1869 to 1952)

In 1869, sheep scab was made notifiable in Great Britain and records began to be made of outbreaks and their distribution. By 1890, there was a marked increase in cases, with outbreaks fluctuating between 1207 and 3536 per year (Watson, 1976). This increase was only to be expected as the Government and the sheep industry were positively looking for the disease. The position in Great Britain was further complicated by large numbers of infested sheep being imported from Ireland, North America and the Argentine (Page, 1969). In 1895, scab was detected in 370 cargoes, totalling 420,000 live sheep arriving from North America and Argentina. Of these 83,000 (19.8%) were shown to be scab infested (Page, 1969). The Sheep Scab Order (1898) required local authorities to employ veterinary surgeons for expert diagnosis and led to a (probably coincidental) fall in cases, from 2514 in 1898 to 1379 by 1901 (Page, 1969). Following a need to introduce dipping as a means of eradicating the disease, a Scab Order was made in 1905, culminating in the Sheep Scab Order of 1907. The Order required the compulsory dipping of all infested sheep, empowering local authorities to stipulate a single, double or triple annual compulsory dip. Under the 1907 Order, the legal immersion time for sheep was only 30 seconds. In 1914, and again in 1920, double dipping orders resulted in a progressive reduction in cases. In 1926, the statutory immersion time was increased to one minute.

The Sheep Scab Order of 1928 required the notification of disease, compulsory treatment or destruction of infested animals, use of ministry approved dip formulations, isolation and treatment of other animals in infested and neighbouring flocks, and controls over the movement of animals out of infested areas. Four active ingredients were approved for use as dips: tar acid/tar oil, arsenic, lime-sulphur and tobacco. All of these required a second dip within 14 days in order to kill emerging eggs (Spence, 1951). The 1928 Sheep Scab Order was amended in 1948 to allow the organochlorine acaricide, γ BHC (γ HCH, lindane), to be officially approved for use as a statutory single dipping formulation, but allowed the continued use of the old double dipping formulations (Page, 1969 and Spence, 1951). γ BHC dips, together with rigid official enforcement, good sheep husbandry and restricted animal movement were responsible for the (apparent) total eradication of sheep scab from Britain in 1952. It was thought that the disease had been eradicated from lowland flocks as early as 1940 (Bates, 2006). Kirkwood (1985a) postulated that eradication was achieved, not because every sheep had been dipped, but because every infested sheep had been dipped. The continued presence of chewing lice (*Bovicola (Damalinia) ovis*) supported this view.

3.1.3 Statutory Control - Phase 2 (1973 to 1992)

Scab re-appeared in Britain in 1973, and during the intervening 20 years a whole generation of farmers and veterinary surgeons had never seen the disease (Loxam, 1974), routine precautions against scab were neglected, and familiarity with its signs and symptoms were lost (Anon, 1975). The primary outbreak in 1973 was identified as a dealer handling large numbers of sheep, including several recently imported consignments from the Irish Republic. Initially, the condition was diagnosed as mycotic dermatitis (*Dermatophilus congolensis*). Delay in confirming disease was due primarily to inexperience (Loxam, 1974), inefficient dipping at lairage (Watson, 1976) or possibly due to an avirulent mite strain. However, the information available indicates that the strain imported from Ireland was extremely low in virulence.

γ BHC based dips continued to be used until 31 December 1984, when they were voluntarily withdrawn from the UK, following pressure from France over possible residues in lamb exported from Britain (Henderson, 1991). Up to the mid 1980s, lindane was the major acaricide in control of sheep scab worldwide, and continues to be used in many countries, including France.

The organophosphate (OP) formulations containing diazinon or propetamphos were the next generation of insecticides to appear on the market. Diazinon was approved for sheep scab control in 1981 (Kirkwood and Quick, 1981), although it had been licensed for blowfly and lice control since the early 1970's. Propetamphos was approved for scab, lice and blowfly control in 1982 (Kirkwood and Quick, 1982). OP dip formulations began to be incriminated in post-dipping illness in stock, owners and contractors (Anon, 1989), consequently alternative insecticides were investigated for their efficacy against scab, lice and blowfly strike. In 1987 the first non-OP dip, containing the synthetic pyrethroid (SP), flumethrin, was licensed for scab and lice control (Kirkwood and Bates, 1987).

Since the re-introduction of scab in 1973, a variety of policy measures were used with the objective of eradicating the disease for a second time. The incidence of the disease continued to increase and between 1984 and 1989 a regime of two supervised compulsory dippings was implemented: one in the summer and one in the autumn. Through this concentrated period of bi-annual dipping it was hoped that it would be possible to totally eradicate sheep scab from

Great Britain. Eradication was not achieved, but the regime succeeded in reducing the incidence of scab to an historic low of just 36 cases in a total of 17 counties. In 1983, when scab was at its peak, there were 32 million sheep in Britain managed in approximately 92,000 flocks. Statistically this represented 0.2% of UK flocks, and 1:10,000 sheep infested.

In 1989, a working party was set up by MAFF to discuss future policies in relation to scab control. The debate centred round a number of issues - whether scab should remain notifiable, given that it appeared to be easily controllable on farm, and had no zoonotic implications; concerns over the potential health risks associated with OP's; concerns over the environmental impact of SP- based dip formulations; the adequacy of existing animal health legislation; and the lack of specific measures for sheep scab under EC council directives on conditions governing intra-community trade.

In 1989, compulsory dipping was reduced to the autumn only, and between 1990 and 1991 there was one "self certificated" (i.e. unsupervised) compulsory dip in the autumn. Autumn dipping saw outbreaks treble to 31 counties. In 1984, 1987 and 1992 scab was recorded in 0.14%, 0.03% and 0.1% of flocks in Great Britain respectively. French et al (1999) analysed patterns in 1480 outbreaks occurring over a 20-year period to June 1992. Most cases were reported in the winter months, however, after the removal of the summer dip in 1988 there was evidence of a change in the seasonal pattern, with more cases being reported in the autumn months. The spatial pattern of cases appeared to expand and contract on a roughly four-year cycle, reflecting oscillating periods of success and failure. Examination of the spatial and temporal pattern revealed strong evidence of a space-time clustering, and a major contribution to the pattern from a very local (<12 km) spread within five months of an arbitrary outbreak.

MAFF, deciding that total eradication was untenable, as well as expensive, took the view that sheep scab should be deregulated. Dipping should no longer be compulsory, with the responsibility for scab control resting directly with the sheep keeper. Sheep scab was deregulated in June 1992 (MAFF, 1992), despite protests from the British Veterinary Association (BVA), Sheep Veterinary Society (SVS), the National Office for Animal Health (NOAH) and the National Sheep Association (NSA).

MAFF involvement was restricted to the prosecution of farmers on animal welfare grounds, under the Agriculture (Miscellaneous Provisions) Act 1968 (MAFF 1992, Sargison et al., 1995).

3.1.4 Current Status

In 1994, two years from deregulation, a State Veterinary Service (SVS) survey showed that 177 batches of sheep suspected of scab were presented at market, of which 13 were serious welfare cases. In addition, 53 further cases of scab were identified by the SVS, which together with 254 investigated by private veterinary surgeons, brought the total estimated for that year to 484 cases. Similarly in 1995, the estimated number of cases was 676 (47 at market, 24 further cases investigated by SVS, and 595 by private vets). Some care is required in interpreting these data. There was no compulsory identification of the scab mite, and consequently a percentage of cases could be attributed to chewing lice (*Bovicola ovis*), which also increased in prevalence post deregulation (Bates, 1999^a). On the other hand, there was no requirement to inspect contiguous premises, or carry out tracings of animals moved

onto or off the premises, so that for every known case of sheep scab there could have been many associated and unrecorded cases.

In 2000, a postal survey (Corke and Broom, 2000) was distributed to 2000 farmers in England and 1000 in each of Scotland and Wales. In England, 5.6% of respondents had experienced scab in the year October 1998 to September 1999. Corresponding figures were 11.7% for Scotland, and 10.8% in Wales. From these figures, it was inferred that approximately 5,000 farms in Great Britain were affected by sheep scab during this 12 month period. The highest incidence in England was indicated in Cornwall and Cumbria, in Scotland, Highland, Central, Strathclyde and the Western Isles, and in Wales, Dyfed and Powys.

An anonymous scrapie postal questionnaire survey, conducted in 2002 (Sivam et al, 2003), included a question on whether sheep scab had been a problem in the previous 12 months. The regional response rates ranged from 44% in the West Midlands to 62% in the Highlands and Islands. The number of responders who answered the sheep scab question varied from 61% in the North West to 78% in the Shetlands. From 4587 replies, scab had been a problem for 8.7% of respondents. The reported incidence of scab ranged from 13.7% (Highland and Islands) to 0 (Shetland). Other high incidences were reported for North Wales (11.8%), Central and South Wales (11.5%), North West England (9.2%) and South West (8.4%). Given that there may be response biases associated with the primary purpose of the survey, and with the sheep scab question itself, care should be taken not to over-interpret these estimates for the occurrence of the disease nationally.

By 2003, Sargison et al (2006a) claimed that 50% flocks served by the Royal Dick large animal practice in South East Scotland had scab. This was not a stratified sample, and therefore care is also required in extrapolation.

Davies (2005) reported that sheep scab was commonly seen in North Wales. During a period (Dec 2003 to Feb 2004) of free Defra-funded ectoparasite testing carried out by Veterinary Laboratories Agency (VLA), approximately 60% of samples were from Wales. Of these, approximately 70% of diagnoses were sheep scab, and 30% lice.

Using a stratified sampling approach, on a regional basis, a survey of NSA members assessed the incidence of sheep scab between March 2003 and February 2004 (Bisdorff et al, 2006). A further 500 questionnaires were sent to farmers from a group last contacted in 1992. The total number of completed returns was 1067 (30.2%). Overall, 9% of farmers reported at least one outbreak of scab during the reference period. The highest percentage of farmers reporting at least one outbreak of scab was in Wales (17%), followed by Scotland (14%), and the North of England (11%). Other English regions varied from 3% to 6%. From the repeat 1992 survey, 12% of respondents had experienced scab. Extrapolating from these data, suggested that there were around 6750 cases nationally in 2003-2004.

From a survey conducted by SEERAD in 2006, 14.7% of respondents had experienced sheep scab during the previous five years, and of these, the route of infection was thought to be known in 74.9% of cases. In 45.3% of cases, seasonal grazings were either occasionally or regularly used. Approximately 7% of respondents were organic farmers, reporting a marginally higher incidence (18.1%) than other farmers.

More recently, three surveys of sheep producers and vets were conducted in Wales during the winter of 2006/07 (Armstrong and Evans, 2007). The response rate from farmers was 16.7%, with almost 12% reporting scab, which was somewhat lower than in previous studies. When the analysis was restricted to producers having had scab, the proportion of hill farms, hill breeds represented, and common grazings increased. All large animal vets participated in the survey, estimating that 1% to 10% of their clients were affected by scab.

In absolute terms, the level of incidence reported above can be questioned in some or all of the data presented. However, the inexorable spread since 1992 is clear, and sheep scab is now endemic in hill and lowland flocks in all areas of the British Isles (Huntley, et al 2005). The data concur with the experience of vets in the field. In the list of differential diagnoses for pruritic sheep, sheep scab was close to the bottom in 1992, but it would now be considered one of the top contenders (Dun et al, 2005).

Since compulsory annual dipping was abandoned in Britain (and the Republic of Ireland) the problem of sheep scab has received much attention (O'Brien, 1996a). The infrastructure involved in these schemes, that accompanied the relevant treatment regime, has mainly disappeared. It is now impossible to quantify the extent of spread. However it is unquestionable that there has been an increase geographically and numerically in outbreaks of the disease (O'Brien, 1996^a).

from Scottish Gov website in 2008