Bovine Mange in the Great Britain

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ABSTRACT

Bovine mange is a form of allergic dermatitis initiated by the feeding or excreta of mites of the genus Chorioptes, Psoroptes or Sarcoptes. In Great Britain bovine mange is generally sub-clinical but generalised chorioptic or psoroptic mange can occur on Continental beef breeds. Between 1962 and 1997 64.1% of bovine gathered and kept tightly packed together.

TRANSMISSION

Psoroptes ovis (and Chorioptes spp) can live for over 30 days off the host, given the correct environment, but will only be infestive for 15 to 16 days (1) after which time it will slowly die from malnutrition and/or dehydration. Sarcoptes scabiei can survive off the host for 3 weeks under optimum conditions (2). In hot climates mites may only survive for 3 days and in cold climates they may not survive longer than 12 days off the host (3, 4). Mange can be contracted by contact with mites in the environment, particularly at housing. Psoroptes ovis can infest sheep and vice versa, but this is unlikely under field conditions. Chorioptes bovis, Psoroptes natalensis and Sarcoptes scabiei var bovis are host specific.

INTRODUCTION

Cattle can be infested with the non burrowing, astigmatid mites, Chorioptes bovis, Chorioptes texanus, Psoroptes ovis or Psoroptes natalensis or the burrowing mites Sarcoptes scabiei (astigma), Psorobia (Psorergates) bos or Demodex bovis (both prostigmata).

LIFE CYCLE OF MANGE MITES

The life cycle of Psoroptes, Chorioptes and Sarcoptes takes 14 days in ideal conditions from egg to adult, and consists of the egg, six legged larvae (which are not sexually dimorphic), eight legged male or female protonyms, male or female tritonymphs and adult males or females. Moulting (ecdysis) occurs between instars, where the mite enters a resting or quiescent phase (in Psoroptes this period can last 12 to 48 hours). Moulting mites are immobile and do not feed. During mating the adult male Chorioptes or Psoroptes attach to the female protonymph, "dragging" her around for 12 to 24 hours while she moults, fertilising her as she enters the adult instar. Once fertilised the adult female will not mate again, and will live for an average of 40 days, laying 1 or 2 eggs daily. The male will then seek out another female protonymph. The life cycle of Sarcoptes, being a burrowing mite, is slightly different to Chorioptes and Psoroptes. Female Sarcoptes burrow into the horny layer of the skin. The burrows contain faeces and relatively large eggs that are laid singly. Eggs hatch 50 to 53 hours into the hexapod larvae, which rapidly migrate to the skin, sheltering in the hair follicles. In 2 to 3 days the larvae moult into protonymphs, also found in the hair follicles, followed by the tritonymphal stage, giving rise to adult males or females, about 250 μm in length. Both sexes make short burrows (< 1.0 mm) into the skin. Pairing occurs on the surface of the skin, the fertilised female then takes about an hour to construct a permanent tunnel using her chelicerae and the “elbows” of the first pair of legs. As the ovaries develop the female increases in size, eventually becoming 300 to 500 μm in length. The female never voluntarily leaves the burrow but, if removed undamaged, will construct another. The female takes 3 to 4 days to become mature and lays 1 to 3 eggs a day during a reproductive period of approximately 2 months.

MANGE

Mange is a form of allergic dermatitis. The burrowing or feeding of mite mites in or on the skin and the allergens contained in their faecal pellets cause irritation and consequential scratching, leading to inflammation and exudation forming crusts and scabs on the skin. If sarcoptic mange remains untreated the skin wrinkles and thickens with a proliferation of connective tissue, followed by
depilation. Mange is a disease associated with animals in poor condition and therefore commoner at the end of the winter or in the early spring (5).

**SARCOPTIC MANGE**

*Sarcoptes scabiei* is a globose mite with the ventral surface flattened and the cuticle finely striated. Female *Sarcoptes* burrow into the horny layer of the skin and have been isolated from 17 families belonging to 7 orders of carnivorous and herbivorous mammals (6). The mite used to be classified according to the host species: eg *Sarcoptes bovis* (cow), *S equi* (horse), *S ovis* (sheep) etc. Fain (7) made a detailed study of *Sarcoptes* mites from a wide range of hosts and found that some morphological characters used in taxonomy (ie. the arrangement of pegs and spines on the ventral surfaces) were plastic and unreliable in differentiating species. He found intra-species and inter-species variation and variation between populations on the same host species but in geographically different localities. He concluded that there was only one type species, *Sarcoptes scabiei* infesting a wide range of mammalian hosts. Sarcoptic mange in cattle generally occurs on the inner thigh, the under side of the neck and the brisket, and around the root of the tail. Small foci of sarcoptic mange do not appear to affect the health of the animal adversely but under certain conditions infestation may spread all over the body and can cause death. *Sarcoptes scabiei* var *bovis* is host specific.

**CHORIOPTIC MANGE**

*Chorioptes* mites do not pierce the skin but feed on skin debris. Studies by Sweatman (8, 9) defined two species of *Chorioptes* infesting cattle: *C bovis* a cosmopolitan parasite of cattle (horses, sheep, goats and llamas) found worldwide and *C texanus*, originally isolated from reindeer (9), but has been described infesting cattle in Brazil (10) and Israel (11). *C bovis* and *C texanus* are morphologically identical in all stages except for the adult male, in which differences occur in the lengths of the opisthosomal setae.

Damage caused by chorioptic mange is generally aesthetic, but under certain conditions can be generalised. Lesions appear at the base of the tail, on the perineum and the back of the udder. Generalised chorioptic mange, strongly resembling psoroptic mange, has been recorded in a Limousin bull in Cumbria and on Highland Cattle on the Isle of Mull (Holliman pers comm, Wilson pers comm). Continental breeds of cattle are more susceptible to mange, possibly due to a more severe allergic reaction to mite faeces. The matting of the long coat of Highland Cattle generates the ideal microclimate for mite survival and reproduction. Chorioptic mange is largely a winter disease and in summer the mites are found on the area above the hooves on the hind legs. In 1987 a case of lameness was investigated in a friesian calf at the CVL. There was a thick, yellow scab between the digits of both hind feet and skin scrapings revealed large numbers of *Chorioptes* mites. *Chorioptes bovis* isolated from cattle are generally host specific.

**PSOROPTIC MANGE**

Cattle can be infested with two species of *Psoroptes*: *Psoroptes ovis* and *Psoroptes natalensis*. The sheep scab mite, *P ovis* (Hering 1838) and *P natalensis* (Hirst 1922). Sweatman (12) considered the body mite of sheep (*Psoroptes ovis*) to be synonymous with the body mite of cattle, previously known as *Psoroptes bovis*. *Psoroptes natalensis* was originally described by Hirst in 1922 (13) from domestic cattle in Natal Province, South Africa and has since been recorded in Brazil (12), India (14), New Zealand (12), Uruguay (12) and probably France (12). *Psoroptes ovis* can be differentiated morphologically from *Psoroptes natalensis* by the comparative morphology and lengths of the adult male L4 outer opisthosomal setae (L4 OOS).

Bovine psoroptic mange is present on mainland Europe. In Belgium an estimated 400,000 cattle are treated each year (15). Belgian White and Blue cattle (B.W.B) represent around 50% of the Belgian national herd and are highly susceptible to *Psoroptes*, with infestations being generalised and chronic (16). Dairy breeds (eg. Holstein) are more resistant: Experimental infestations are difficult to perform and self cure is the rule. In general beef breeds are more susceptible than dairy breeds (16). This phenomena may also apply to infestation by *Chorioptes* sp. Bovine psoroptic mange was once notifiable in the USA and is still considered to be a major parasite of cattle.

*Psoroptes* was once considered the main cause of bovine mange in Great Britain. At the beginning of the First World War all but a small percentage of bovine mange was due to *Psoroptes* sp. Bovine psoroptic mange then became rarer, with sarcoptic mange becoming more prevalent (13). Since 1979 psoroptic mange has only been reported in 1979, 1980 and 1983 (17). Evidence suggests that on all occasions the disease was imported from mainland Europe and although difficult to eradicate did not pass to other animals. The last cases of bovine psoroptic mange in the Great Britain occurred in the Scottish Borders in 1980 and 1983 (18). Early disease begins as moist plaques of hair over the withers, followed by intense pruritus with active rubbing against fixed equipment, leading to loss of hair, serum exudation, ulceration, bleeding and eventually thickened, scabby lesions, oozing blood and serum, progressing over the withers and tailhead, before extending along the back and down the flanks and legs (18). Pyodermatitis is common due to secondary bacterial infections. Psoroptic mange of cattle can be life threatening to calves under one year old but deaths rarely occur in older animals, although Losson (16) stated that infested cattle are predisposed.
to pulmonary infections and may die. The sheep scab mite (Psoroptes ovis) can infest cattle and *vice versa*. Natural cross infestations are unlikely in the field due to epidemiological factors and the fact that cattle have to be restrained from grooming for infestations to be established (19). At the CVL, Psoroptes ovis has been passed 7 times between sheep and cattle (Bates in preparation) with no loss in virulence to either host. Evans and Kirkwood (20) failed to establish cross transmission of the Borders mites in either direction and recorded that psoroptic mange in cattle and sheep (sheep scab) in Great Britain were epidemiologically distinct. Recent morphological studies of this mite however, has shown it to be Psoroptes natalensis (not infestive to sheep) and not the sheep scab mite (Psoroptes ovis) as reported. Cattle mange can spread rapidly within confined situations of a feedlot but transmission at pasture is slower, especially in the summer when there is no close body contact and mites are in the quiescent phase (21). Like chorioptic mange, psoroptic mange is considered a winter disease, but clinical outbreaks are sometimes observed in July - August (13, 16). As in the prevalence of sheep scab, heavily infested cattle are readily detected, but lightly infested cattle are difficult to detect, especially during the early stages of disease or summer latency, when lesions are very small (22, 23). Mixed infestations with *Chorioptes bovis* or *Sarcopites scabiei var bovis* are common, complicating control measures (16).

DIFFERENCES BETWEEN CATTLE MANGE AND SHEEP SCAB.

Losson (16) documented five differences between bovine psoroptic mange and ovine psoroptic mange (sheep scab).  

1. Hyperkeratosis and pyodermitis is a rule in *Psoroptes* infested cattle (24).  
2. In cattle parasitic burdens are very high and mites are found everywhere on affected skin.  
3. On cattle *Psoroptes ovis* feeds mainly on exudate and red blood cells whereas on sheep *Psoroptes ovis* ingests lipid globules (25, 26).  
4. Treatment of sheep *Psoroptes ovis* with systemic drugs usually requires a higher dosage and/or repeated administrations (27, 28, 29, 30, 31, 32).  
5. In sheep there is no breed difference in susceptibility; moreover, licking and scratching are not efficient in this species and experimental infestations are usually easy to maintain.

DEMODECTIC AND PSOROBIC (PSOREGATIC) MANGE

Two further burrowing mange mites can be encountered in the Great Britain, *Demodex bovis* and *Psorobia* (*Psorergates*) bos. *Demodex* (Demodicidae) are minute, annulate, worm like parasites, living in the hair follicles and in the sebacious and meibomian glands of the skin and have been described in a wide range of wild and domestic mammals (but are extremely host specific: (33)). The appearance of small nodules and pustules on the brisket, lower neck, forearm, shoulders and withers is a sign of infestation by *Demodex bovis* (demodicosis). In East Africa demodicosis can manifest a more severe, often fatal form (34). Transmission occurs early in life while the young are suckling (35, 36). Bovine psorogotic mange (*Psorobia* (*Psorergates*) *bos*) has been recorded in USA and South Africa, where its effect is so slight as to be undetectable (37, 38). Recently the first case of bovine psorogetic mange has been described in Great Britain (39).

EPIDEMIOLOGY OF MANGE IN GREAT BRITAIN

The epidemiology of bovine mange in Great Britain was investigated by; 1. examination of diagnosis reports filed at the CVL from 1962 to 1974; 2. Examination of the Veterinary Investigation Data Analysis (VIDA) returns from seventeen English V1 Centres, between 1986 and 1990 and 3. A veterinary practitioner survey sponsored by Pfizer Animal Health 1996 to 1997. Results of the surveys showed that between 1962 and 1997, 64.1% of bovine mange in Great Britain was caused by *Chorioptes bovis* and 31.3% caused by *Sarcoptes scabiei var bovis*. The remaining 4.6% of cases were due to isolated outbreaks of *Psoroptes spp* imported from mainland Europe (18, 17). The results for all the individual surveys are shown in Table One.

<table>
<thead>
<tr>
<th>Source</th>
<th><em>Chorioptes</em> sp</th>
<th><em>Psoroptes</em> sp</th>
<th><em>Sarcoptes</em> sp</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.CVL Records 1962 - 1974</td>
<td>10/13 (76.9%)</td>
<td>0/13</td>
<td>3/13 (23.0%)</td>
</tr>
<tr>
<td>2. Investigated cases 1979 - 1980</td>
<td>0/3</td>
<td>3/3 (100.0%)</td>
<td>0/3</td>
</tr>
<tr>
<td>3. VIDA Returns 1986 - 1990</td>
<td>23/39 (59.0%)</td>
<td>0/39</td>
<td>16/39 (41.0%)</td>
</tr>
<tr>
<td>4. Pfizer Survey 1996 - 1997</td>
<td>10/12 (83.0%)</td>
<td>0/12</td>
<td>2/12 (17.0%)</td>
</tr>
<tr>
<td>Total (1962 - 1997)</td>
<td>43/67 (64.1%)</td>
<td>3/67 (4.6%)</td>
<td>21/67 (31.3%)</td>
</tr>
</tbody>
</table>

The Pfizer survey demonstrated that chorioptic mange was found in both dairy and beef herds. Prevalence within dairy herds ranged between 1.0% and 10.0% and the prevalence within beef herds ranged between 1.0% and 52.2% with all age groups and sexes affected. Concomitant chewing louse (*Bovicola bovis*) infestations were seen in 3/10 (30%) of herds, all beef enterprises. Housing was an important method of spread with 8/10 (80%) of the infested herds housed, 1/10 (10.0%) housed only at...
night and only one (beef herd of highland cattle) was permanently at grass. In a large proportion of cases infestations appeared sub-clinical with 6/10 (60.0%) of bovine choriopathic mange found during routine veterinary visits and 4/10 (40.0%) of infestations diagnosed because of itching or pruritus. Lesions of choriopathic mange ranged from small, red pustules to crusty and pruritic lesions, with accompanied hair loss. The tailhead was the most frequent site of infestation accounting for 5/10 (50.0%) of lesions, 1/10 (10.0%) were infested simultaneously on the tailhead and the shoulder, 1/10 (10.0%) on the neck, 1/10 (10.0%) on the hocks and axilla and 1/10 (10.0%) on the hocks and thigh. Foot mange or lameness due to foot mange was not recorded in any herd. Sarcoptic mange was recorded on adult animals in one dairy and one beef herd (one housed and one at grass), both only after routine visits. In the dairy herd lesions were located over the tailhead and the udder. In the beef herd 12/140 (8.6%) cows manifested pruritic, discrete lesions over the hind quarters. There was no concomitant louse infestation or symptoms of lameness in either herd. The low prevalence of bovine mange in Great Britain may be associated with treatment for other ectoparasites (eg. warble fly, initially using systemic organophosphates and latterly ivermectin based formulations). In addition the current increase in the use of endectocides (doramectin, ivermectin, and immunity in experimental Psoroptes ovis (Acari: Psoroptidae) on stanchioned cattle during the summer. Journal of Veterinary Parasitology. 1985, 212.

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CONCLUSIONS
Correct diagnosis of any bovine ectoparasite is essential in order to advise the most effective treatment and prevent the selection of resistance in non target species. Diagnosis is based upon recovery and identification of the mite in skin scrapings examined according to the methods described by MAFF (40). When diagnosed all animals in the herd should be treated, as some animals could be asymptomatic carriers.

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