Control of ectoparasites and insect pests of cattle

This document is part of the COWS Technical Manual aiming to provide a sound basis for advice to industry. The manual also comprises chapters on controlling liver and rumen fluke, parasitic gastroenteritis, lungworm, and integrated parasite control

COWS
Control Of Worms Sustainably

COWS is an industry initiative promoting sustainable control strategies for parasites in cattle

Section 1: Introduction

Cattle are affected by a range of arthropod ectoparasites and nuisance pests, which can cause significant productivity losses and severely compromised animal welfare.

Parasitic mites or lice inhabit the hair, the surface and outer layers of the skin and feed on host tissue or associated secretions. Both lice and mites are permanent residents on the host, have populations that increase over winter and can survive for only relatively short periods in the environment. Their presence often provokes an inflammatory response which results in intense itchiness and this in turn can lead to further tissue damage and inflammation. The clinical manifestations of mange are therefore readily observed through the presence of inflamed skin, hair loss, inflammatory discharges, scratching and self-inflicted trauma.

Ticks feed on blood but are only present on the host for short periods in the life cycle. When not feeding they leave the host and remain hidden in vegetation on the ground. Although the numbers of ticks on UK cattle are usually relatively low, compared with tropical or sub-tropical regions, they can still cause tissue damage at sites of attachment, occasionally complicated by secondary infections. Tick bites can also cause irritation, inflammation and hypersensitivity. More critically, ticks can transmit a number of protozoal, bacterial and viral infections, which in turn can lead to severe, sometimes fatal, disease.

A wide range of adult flies may feed on the blood, sweat, skin secretions, tears, saliva, urine or faeces of cattle to which they are attracted. They may do this either by puncturing the skin directly or by scavenging at the skin surface, wounds or body orifices. During this activity, they may act as vectors for a range of disease pathogens and the irritation they cause may lead to disturbance and loss of productivity, through reduced weight gain or milk yield. Biting and nuisance flies can also induce avoidance behaviours in hosts which disrupt normal grazing and resting patterns. Flies may also be of importance because of the infestation by their larvae, a condition known as myiasis, but this is relatively rare in cattle and is usually only seen where there is a predisposing wound or skin lesion.

Key UK ectoparasites

- Lice – severe infestations may indicate underlying disease
- Mites – cause mange with itching and scratching
- Ticks – transmit infectious diseases
- Flies – spread disease and disrupt behaviour to reduce productivity

The clinical response and irritation caused by these arthropods will vary widely between individual animals depending on genetic predisposition, age, general health and nutritional status; the latter will also be affected by season and stage in the reproductive cycle.

Heavy infestations are usually associated with young animals or older animals in poor health. Furthermore, because of individual differences in the chemical odours that attract insects, some cattle attract more flies and they also vary markedly in their tolerance to infestation, with some individuals showing more pronounced behavioural changes at the same intensities of biting insects than others.

The selection of appropriate measures for the control of these parasites requires:

- careful assessment of the nature of the clinical problems they cause
- correct identification of the parasite
- an understanding of the epidemiology, phenology and life cycle of the parasites
- an assessment of the cost/benefit of the intended outcome
- a careful assessment of the current resistance status of the parasite in question to the insecticides and acaricides available.

In addition, ectoparasite control needs to fit alongside the concurrent control of endoparasites and with the general husbandry routines of the farm, detailed in the COWS Integrated Parasite Control on Cattle Farms chapter.

Section 2: Lice

Lice are parasites that complete their entire life-cycle on a host. They are very common parasites of UK cattle. All life cycle stages are found simultaneously on the host. A nymph, which closely resembles the adult, hatches from an egg and its size increases through a succession of nymphal moults until the adult stage is reached.

Lice are conveniently divided into two functional groups: chewing lice and sucking lice. Chewing lice feed on skin and hair, while sucking lice have piercing mouthparts and feed on blood. These two groups of lice are easily distinguished, based on the shape of the head and correct differentiation between them is important when selecting the product and form of application that is likely to be most effective in achieving control.

Low burdens of lice are very common and should not necessarily be considered to be of any immediate pathogenic importance, lice being almost normal inhabitants of the dermis and coat of cattle, especially in winter. However, louse populations can increase very rapidly. Moderate infestations are associated only with a mild chronic dermatitis and are usually well tolerated. However, in heavier infestations there is intense itching, with rubbing and licking, but if sucking lice are present in large numbers there may be anaemia.

It is important to remember that a heavy louse infestation may itself be a sign of another underlying condition, such as malnutrition or chronic disease, as debilitated animals may not groom themselves effectively. It has been suggested that lice should largely be considered primarily as indicators of ill thrift rather than being of pathogenic significance themselves.

Transfer of lice between animals or herds is usually by direct physical contact. Because lice do not survive for long off their host, usually about three to five days depending on weather, the potential for animals to pick up infestations from dirty housing is limited, although it cannot be ignored.

Resting a warm hand on the animal's coat for a minute or so will often encourage lice to move to the surface where they can be easily observed, particularly on light-coloured cattle.

A chewing louse of cattle, *Bovicola bovis*

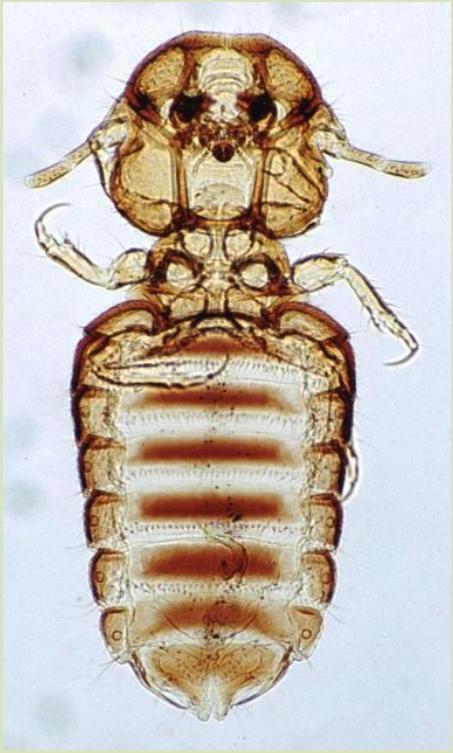

Photo courtesy of Alan Walker, University of Edinburgh

Lice and eggs are easily found by parting the hair, especially along the midline. The lice are present next to the skin and the eggs are scattered like coarse powder throughout the hair.

In the UK, the heaviest infestations are seen in late winter and early spring, when the coat is at its thickest, giving a sheltered, bulky and humid habitat for optimal multiplication. The most rapid annual increase in louse populations is seen when cattle are winter-housed and lice numbers can build up quickly. In late spring, there is usually an abrupt fall in the numbers of lice as most of the parasites and eggs are shed with the winter coat. Numbers generally remain low throughout the summer, partly because the thinness of the coat provides a restricted habitat, but partly because high skin surface temperatures and direct sunlight limit multiplication and may even be lethal.

UK lice species

Four species of lice have been recorded in British cattle, one species of chewing louse and three species of sucking lice.

Bovicola bovis (see photo on page 3) is a chewing louse; it is one of the commonest cattle parasites and is usually found on the head, especially the curly hair of the poll and forehead, the neck, shoulders, back, and rump, and occasionally the tail switch.

If infestations reach high levels, the lice may spread down the sides and may cover the rest of the body. This louse is a reddish-brown in colour with dark transverse bands on the abdomen. An adult measures up to 2mm in length and 0.35-0.55mm in width. The head is relatively large, as wide as the body and is rounded anteriorly, with the mouthparts adapted for chewing. The legs are slender and for moving amongst the hair, with small claws, on each leg.

This louse causes considerable irritation to the host animal. The skin reaction can cause hair to loosen and the cattle react to the irritation by rubbing or scratching, which results in patches of hair being pulled or rubbed off. Scratching may produce wounds or bruises and a roughness to the skin. This may lead to secondary skin infections and skin trauma which can appear as defects in the hide (light spots, flecks and grain loss), reducing its value.

Linognathus vituli (see photo above right) is a blood-feeding sucking louse, known as the long-nosed cattle louse. It is often found around the head, neck and dewlap. It is medium-sized with an elongated, pointed head and body, approximately 2.5mm in length.

Unfed, they appear reddish-brown, but after feeding they darken to a blue-black colour. These lice form dense, isolated clusters on the host. This species is capable of transmitting bovine anaplasmosis (tick-borne fever) and dermatomycosis (ringworm).

A sucking louse of cattle, *Linognathus vituli*

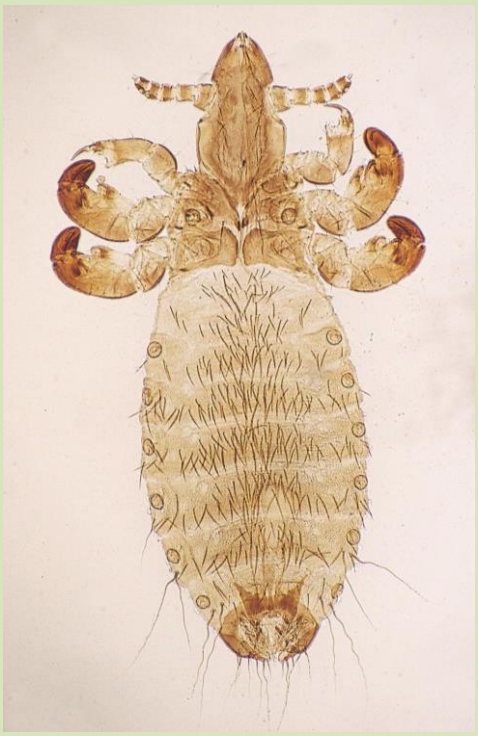

Photo courtesy of Alan Walker, University of Edinburgh

Haematopinus eurysternus**,** known as the short-nosed louse, is a sucking louse commonly found on the skin of the poll, at the base of the horns, in the ears, and around the eyes and nostrils and even in mild infestations it is found in the tail switch.

In severe infestations, the entire region from the base of the horns, over the face to the base of the tail can be infested. It is one of the largest lice of domestic mammals, measuring 3.5–5mm in length. The louse is broad in shape with a short, pointed head.

Solenopotes capillatus, commonly known as the little blue cattle louse, it is a small bluish louse which tends to occur in clusters on the face, neck, head, under the jaw, but may spread over the shoulders, back and tail in heavy infestations. At 1–1.5mm in length *Solenopotes capillatus* is the smallest of the sucking lice found on cattle.

Louse control

A range of pour-on or spot-on synthetic pyrethroids (e.g. deltamethrin, alpha-cypermethrin or permethrin) is available for louse control, with pour-on and injectable macrocyclic lactones (MLs) also commonly used (e.g. ivermectin, eprinomectin, moxidectin and doramectin). Injectables may have only limited activity against chewing lice and are more effective against sucking lice.

Most insecticides registered for use on cattle are not active against louse eggs. This means that after treatment eggs can still hatch and these newly hatched nymphs must be killed by the residual effects of the treatment. If, however, the residual efficacy of the product applied is short, less than two weeks, the newly hatched nymphs can continue the infestation. Where this is the case, a second treatment will be required.

The timing and frequency of treatments depends on individual circumstances. In many cases treatment in late autumn or early winter will give adequate control of cattle lice. Louse control is usually undertaken when cattle are housed for the winter and may be achieved alongside treatment for other parasites.

Treatment of all stock on farm and subsequent initial quarantine and treatment of all newly introduced animals will allow a good degree of louse control to be maintained.

Nevertheless, resistance is a growing problem and reduced susceptibility to pyrethroids has already been reported from herds throughout the UK. Two treatments of an aqueous (5% v/v) suspension of tea tree oil applied topically to the skin, two-weeks apart, has also been demonstrated to be effective in the management of equine lice and may be a useful alternative in organic cattle husbandry or where resistance is suspected.

Use the product most suitable for the time of year and management of the cattle involved.
See www.cattleparasites.org.uk for products available

Section 3: Mange mites

Infestation by mites (acariasis) can result in severe dermatitis, known as mange. The ectoparasitic mites of cattle feed on lymph, blood and or sebaceous secretions, which they scavenge from the skin surface or obtain from epidermal lesions. Eggs hatch into a six legged larva, which then moult through eight-legged protonymph, tritonymph and adult stages.

This may be completed in only 14 days. All life cycle stages are found simultaneously on the host and spend their entire lives in intimate contact with their host.

Mange types

- Chorioptic – commonest in UK
- Psoroptic mange – rare in UK, found in Europe
- Sarcoptic mange – increasingly seen in UK and in UK goats and pigs

Transmission from host to host is primarily by physical contact, but may also occur through contact with a contaminated environment (bedding, housing, trailers, etc).

Chorioptic mange

Chorioptic mange on the tail head

Photo courtesy of A Forbes

The commonest mange affecting UK cattle is caused by the mite *Chorioptes bovis*. *Chorioptes texanus* is also present in the UK, but the difference between *C. bovis* and *C. texanus* is of no clinical consequence. The names *Chorioptes ovis*, *Chorioptes equi*, *Chorioptes caprae* and *Chorioptes cuniculi* have been used to describe the chorioptic mites found on sheep, horses, goats and rabbits respectively, but are now all thought to be synonyms of *C. bovis/C. texanus.*

In cattle, chorioptic mange occurs most often in housed animals, particularly dairy animals. Mite populations are highest in the winter and may regress over summer. Chorioptic mange is most commonly seen on the feet, legs and base of the tail and udder (photo above). It is usually considered to be only mildly pathogenic and lesions tend to remain localised, with slow spread.

Hosts can be asymptomatic with low densities of mites present and thus act as carriers which transfer the mite to other animals. However, if mite numbers reach high densities clinical pathology may be observed. Clinically affected animals may have pustular, crusted, scaly and thickened patches of skin with hair loss. This is usually confined to the tail head, legs and lower body (photo below) but in some cases this may spread to other areas and cause disease.

However, the pathology is highly variable depending on the intensity and duration of

Chorioptic mange on the leg

Photo courtesy of A Forbes

infection; there is also considerable individual variation in clinical response to infestation and this is may be exacerbated by ill thrift and underlying disease. The itching caused by the mites results in rubbing and scratching, with damage to the hide. High infestations have been associated with decreased milk production.

Control of chorioptic mange

Only a relatively small number of products are authorised for use against mange. Permethrin is the only pyrethroid with a claim in the UK against chorioptic and sarcoptic mange mites in cattle. Ivermectin, doramectin, eprinomectin and moxidectin applied topically as a pour-on are also effective. MLs applied by subcutaneous injection are generally less effective. The treatment of all animals in a herd and any in-contact animals is essential to eradicate this parasite.

Treatment should ideally be followed by immediate removal of treated animals to an area which has been free of potentially *Chorioptes* infested stock; this is particularly important when using products with low levels of residual activity. The precise off host survival of *Chorioptes* mites is not definitively known, but is likely to be at least three weeks, depending on temperature and humidity. As yet, no acaricidal resistance has been recorded in *Chorioptes* mites in Europe.

Severe chorioptic mange

Photo courtesy of A Forbes

Distinguishing *Chorioptes* from *Psoroptes* mites

The pre-tarsus and pullvilus (sucker) of (a) *Chorioptes* and (b) *Psoroptes* mites assist with visual identification.

Chorioptes bovis are about 300µm in length and therefore are considerably smaller than *Psoroptes ovis* (500-750µm). *Chorioptes* do not have jointed pretarsi; their pretarsi are shorter than in *Psoroptes* and the sucker-like pulvillus is more cup-shaped (Fig a). The mouthparts of *Chorioptes* are distinctly rounder, and the abdominal tubercles of the male are noticeably more truncate than those of *Psoroptes*. *Psoroptes* mites, in contrast have a characteristic three-jointed pretarsus on the anterior legs which bears a trumpet-shaped sucker (Fig b).

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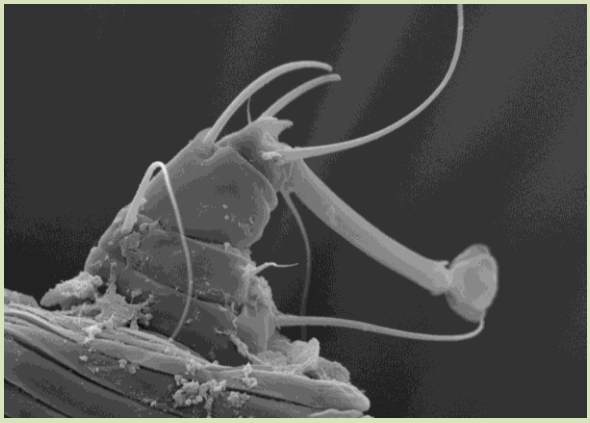
(a)



(b)

Psoroptic mange

Psoroptic mange has only rarely been reported in cattle in the UK, although it is common in parts of mainland Europe, particularly in breeds such as the Belgian Blue. However, the disease was diagnosed in South West Wales in 2006 and has since been diagnosed on more than 20 premises, the majority in Wales but also one farm in England and one in Scotland. Most animals infested were beef cattle. It appears probable that this outbreak has now been controlled, but there is a continuing threat of importing the disease from abroad.

Psoroptes mites may cause intense itching, papules, crusts, skin damage and hair loss (see photos right and below) and the pathology is generally considered to be more severe than most cases of infestation with *Chorioptes*. The skin below the crusts may be moist and bleeding may occur. Lesions are most common along the dorsum, particularly over the shoulders and tail head.

Where treatment has been unsuccessful, it has been reported that clinical signs declined at spring turn out, only to reappear at housing in a larger number of animals over the following winter. Weight loss, decreased milk production and increased susceptibility to other infections can occur as a result of psoroptic mange. On gross pathology, it can be extremely difficult to distinguish psoroptic from a severe case of chorioptic mange and identification of mites from skin scrapings is essential.

Severe psoroptic mange

British Crown Copyright courtesy of S Mitchell

Severe psoroptic mange

Photo British Crown Copyright courtesy of S Mitchell

Control of psoroptic mange

The control of psoroptic mange in cattle is challenging and there appears to be considerable variation between populations in their response to different acaricides; elements of tolerance, resistance and host-adaptation may all be involved in creating this variable response to treatment in different mite populations. However, it is also often difficult to disentangle poor treatment efficacy from poor administration practice, particularly where only clinically affected animals are treated.

The *Psoroptes* imported recently into the UK proved difficult to control adequately. In some cases administration of moxidectin and ivermectin (injection) appeared to be unsuccessful, but two treatments of doramectin four weeks apart was effective; repeated treatment with 4% permethrin was also effective, although it does not have a marketing authorisation for treatment of *Psoroptes*.

As with chorioptc mange, the simultaneous treatment of all animals on infected premises is essential where this mite is diagnosed. Treatment should ideally be followed by immediate removal to an area which has been free of potentially infested animals, particularly for products with low levels of residual activity. The off host survival of *Psoroptes* mites is about 18 days, depending on prevailing weather conditions.

Recent studies have shown that *Psoroptes* mites from cattle show slight morphological differences to *Psoroptes* from sheep, but no discernible genetic differences; experimental studies suggest cross-infection is possible. While this is probably a low risk in a farm environment, the possibility cannot be ruled out and minimising potential contact between infected and uninfected cattle and sheep would be a sensible precaution.

Other mange

Sarcoptic mange is caused by *Sarcoptes scabiei* (see photos below). This is a small, round-bodied, burrowing species, quite different in appearance and behaviour to *Chorioptes* or *Psoroptes*. The dorsal surface is covered with transverse ridges, but also bears a central patch of triangular scales.

Sarcoptic mange can be severe, although many cases are mild. Anecdotal reports suggest that it is being increasingly diagnosed in UK cattle, although there is little survey data to quantify this.

Mild infections merely show scaly skin with little hair loss, usually on the neck, face and tail head, but in severe cases the skin becomes thickened, there is marked loss of hair and crusts form (below right). There is intense itching leading to loss of production and to hides being downgraded because of damage by scratching and rubbing. There are a number of host adapted varieties of *S. scabiei* that differ subtly in their morphology and sarcoptic mange is common in goats and pigs, so the potential for cross-transmission cannot be ignored. Treatment of all potential in-contact animals with systemic macrocyclic lactones (MLs) may give good results.

Clinical mange caused by *Demodex bovis* is very rare in the UK. Where present it results in the formation of many pea-sized nodules, each containing soft white material and several thousand mites, which cause hide damage. Though these nodules can be easily seen in smooth-coated animals, they are often undetected in rough-coated cattle until the hide has been dressed. Problems caused by infestation with demodex mites in cattle are primarily a result of the damage caused to the hides and are usually only seen after slaughter, although in some cases infection may become generalised and fatal. The muzzles, neck, withers and back are common sites of infestation.

Sarcoptes *scabei*

© R Wall.

Chronic sarcoptic mange

Photo courtesy of A Forbes

Section 4: Ticks

Ticks are blood-feeding ectoparasites that are only present on the host during a short (several days) blood-feeding period.

In northerly European countries such as the UK, intensities of infection in cattle are usually low, averaging between one and three ticks per infested animal. Nevertheless, they may cause tissue damage at the sites of attachment, occasionally complicated by secondary infections, and cause irritation and inflammation. Perhaps more importantly, ticks can transmit a number of infections, which in turn can lead to severe, sometimes fatal, disease. The most important pathogens transmitted to cattle by ticks in the UK are *Babesia divergens* and *Anaplasma phagocytophilum*.

Babesia divergens is a protozoan parasite, usually transmitted by the tick *Ixodes ricinus* (see photo). It is the main agent of bovine babesiosis, known as redwater fever. Calves up to one year old, although fully susceptible to infection, are relatively resistant to disease. Hence, in areas of high tick infection pressure, most animals become infected when young and acquire immunity without showing clinical signs. In older cattle, immunity is reinforced by repeated tick challenge. Thus, in areas where babesiosis is endemic, clinical cases tend to be rare, although the parasite may be detectable in most animals.

Outbreaks of clinical babesiosis are most commonly observed when this state of enzootic stability breaks down, for example when naïve cattle are introduced into an area of endemic babesiosis with high tick infestation pressure. As a result, babesiosis is often seen where one to two year old beef animals are introduced to marginal, tick-infested grazing, until ready to be sold for finishing.

The tick *Ixodes ricinus*

© A Jennett/ R Wall.

Anaplasma phagocytophilum (formerly *Ehrlichia phagocytophila*) is a gram-negative bacterium, again transmitted largely by *I. ricinus* in the UK. It is the causative agent of tick-borne fever (TBF) in cattle. Infection may be characterized by fever and general immunosuppression, occasionally resulting in more severe secondary infections. However, in the UK, infection with *Anaplasma* in cattle is usually mild, the main losses being due to abortion when pregnant cows become infected.

Louping ill virus causes an acute encephalomyelitis particularly in sheep and it is frequently fatal. It is particularly prevalent in Scotland and south west England. The main vector is the sheep tick, *I. ricinus*. A wide variety of other animals are susceptible to the virus, including cattle and occasionally humans.

Tick control

Tick control is difficult because the ticks spend most of their life-cycle away from the host, sheltered at the base of thick damp vegetation. Ticks become active and start to feed in early spring, but the start and duration of the tick season is difficult to predict precisely, as it is dependent on the weather.

A reduction in the tick population can be achieved through pasture improvement, drainage and scrub clearance, although this is a long term exercise requiring sustained effort and when alternative hosts such as deer are present population management is even more problematic.

Attempts to reduce tick populations by environmental treatment with acaricide would be unacceptable because of effects on other invertebrates. Where required, for example with beef cattle about to be moved to a known tick area, prophylactic protection may be attempted.

A range of pour on pyrethroids or MLs may give protection, although none in the UK have a label claim for cattle against ticks at present, so must be used under the cascade system. Products will need to be reapplied at regular intervals during the tick season to achieve sustained protection.

Use the product most suitable for the time of year and management of the cattle involved.
See www.cattleparasites.org.uk for products available

Section 5: Flies

Blood-feeding and nuisance flies are one of the most economically important groups of arthropods affecting cattle.

In the UK there are at least 20 common species of flies which feed on cattle. These flies may feed on blood, sweat, skin secretions, tears, saliva, urine or faeces by puncturing the skin directly, known as biting flies, or by scavenging at the surface of the skin, wounds or body orifices, classified as non-biting or nuisance flies.

Fly activity may directly cause dramatic escape behaviour, in which self-injury can occur, or more commonly movement into shade, restlessness, skin rippling or simply stamping and tail switching. However, all these changes in behaviour result in reduced time spent feeding and decreased performance. For example, each horn fly takes 20 to 30 blood meals per day and more than 200 biting flies per cow has been shown to have a significant economic impact on performance. US Studies demonstrated that calf weaning weights were on average 5 - 10kg higher when flies were controlled on their mother.

Cattle-visiting flies are also biological and mechanical vectors of a number of bacterial and viral diseases and nematode infections. Mechanical transmission may be exacerbated by the fact that some fly species, such as tabanids, inflict extremely painful bites, so are frequently disturbed by the host while blood-feeding. As a result, the flies are forced to move from host to host over a short period, thereby increasing their potential for pathogen transmission. The biting activities of blood-feeding flies may also provoke hypersensitivity reactions.

Amongst the biting flies *Stomoxys calcitrans*, *Haematobia stimulans*, *Haematobia irritans* and a range of species of horseflies (Tabanidae), midges (*Culicoides*) and blackflies (*Simuium*) may all be all be locally important. In cattle, large numbers of *Hydrotaea irritans* often cluster on the ventral abdomen and udder and since the bacteria involved in summer mastitis, *Arcanobacterium pyogenes*, *Streptococcus dysgalactiae* and *Peptococcus indolicus*, have been isolated from these flies, there is strong presumption that they may transmit the disease. In addition, this species is believed to transmit infectious bovine keratoconjunctivitis.

Flies clustering on the leg of a cow

Photo courtesy of A Giangaspero

Amongst the non-biting flies, *Musca autumnalis* is often the most numerous fly worrying cattle on pasture. The eggs of *M. autumnalis* are usually laid in bovine faeces, and if conditions are suitable the resultant large fly populations can cause serious annoyance contributing to reduced production rates. In addition to summer mastitis and bovine keratoconjunctivitis, these flies have been implicated as mechanical vectors of and viral diseases such as bovine virus diarrhoea virus (BVDV).

Fly control

Insecticide impregnated ear tags and tail bands mainly containing pyrethroids, together with pyrethroid pour-on, spot-on and spray preparations, are widely used to reduce fly annoyance in cattle.

Various types of screens and electrocution traps for buildings are available to reduce fly nuisance. Improved farm hygiene will also help to reduce breeding places, since manure heaps are a primary breeding site for many species of fly such as *S. calcitrans*.

Aerosol space sprays, residual insecticides applied to walls and ceilings and insecticide-impregnated cards and strips may reduce fly numbers indoors. Insecticides may also be incorporated in solid or liquid fly baits, using attractants such as various sugary syrups or hydrolyzed yeast and animal proteins.

However, given the high rates of reproduction, high rates of dispersal and multiple generations per year, area wide control of most fly populations is generally impractical. Generalised environmental treatment with insecticides is not usually recommended because of effects on non-target invertebrates.

Use the product most suitable for the time of year and management of the cattle involved.
See www.cattleparasites.org.uk for products available

Section 6: Combining ectoparasite control

Animals are likely to be infected with a range of both endoparasites and ectoparasites simultaneously and it is important to consider strategies that integrate treatment for individual farms, to minimise treatment costs and optimise impact. These are detailed in Integrated Parasite Control on Cattle Farms chapter.

Low intensities of infection with some ectoparasites, for example lice, may have little clinical significance and eradication from a herd is likely to be difficult and may be unnecessary. Monitoring burdens in winter-housed animals and spot treatment of heavily infested individuals (Targeted Selective Treatment) may be sufficient to prevent infestations building up over winter and reduce unnecessary treatments of individuals with low burdens. It may also delay the onset of resistance by retaining populations of unexposed lice on untreated cattle. Farmer tolerance of low parasite burdens on stock and effective monitoring systems which allow specific individuals to be identified for treatment are also issues to be considered for a TST approach.

Ectoparasite control options

	Lice	Mites			Ticks	Flies***
		Chorioptic mange	**Psoroptic mange**	**Sarcoptic and other mange**		
Synthetic Pyrethroids (SP)*	Pour-ons and spot-ons effective. Resistance issues found in the UK	Permethrin only SP with mange claim	Permethrin may be effective but it does not have a marketing authorisation	Permethrin only SP with mange claim	May give protection, but no label claim and regular reapplication needed	Pour-ons, spot-ons and sprays, ear tags and tail bands available. Also as space, wall and ceiling sprays, strips and baits
Macrocyclic lactones (MLs)**	Pour-ons and injectibles effective, but injections more effective against sucking than biting lice	Pour-ons effective. Injectibles less effective	Injectibles effective	Good results possible with both injectable and pour-on products	May give protection, but no label claim and regular reapplication needed	

Notes: *Synthetic pyrethroids include: permethrin, deltamethrin, cypermethrin, alpha-cypermethrin
**MLs include: ivermectin, eprinomectin, moxidectin and doramectin
***Fly screens and electrocution traps may also help control flies

Information on individual products is available in the NOAH Compendium of Data Sheets for Animal Medicines at www.noahcompendium.co.uk or from the product manufacturer. Duration of activity of products can vary widely. Always check the latest product data sheet and/or product label before advising or administering products.

Further reading

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