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Review Article

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Epidemiology, risk factor and status of bovine Demodecosis in Ethiopia

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Abstract

Demodex mites are microscopic arachnids found in the normal skin of many mammals. In humans, it is well established that *Demodex* mite density is higher in patients with the skin condition rosacea, and treatment with acaricidal agents is effective in resolving symptoms. Demodectic mites are considered normal inhabitants of hair follicles and sebaceous glands of cattle, and seldom cause clinical signs of disease and it has host-specific and require no time off the host to complete their life cycle. Mite infestation of calves is thought to occur naturally through contact with the dam during the first few days of life. Because most cattle with demodectic mites are asymptomatic, those with symptoms may have genetic or immunologic defects allowing the host–parasite relationship to be altered. However, pathophysiology of rosacea is complex and multifactorial. In dogs, demodicosis is a significant veterinary issue, particularly the generalized form of the disease which can be fatal if untreated. In each species, clinical and molecular studies have shown that the host's immunological interactions with *Demodex* mites are an important, but not fully understood, aspect of how *Demodex* can live in the skin either as a harmless commensal organism or as a pathogenic agent. This review outlines the role of *Demodex* mites in humans and dogs, considering morphology, prevalence, symptoms, diagnosis, histology treatment and pathogenesis.

Keywords: Bovine, Ethiopia, Demodecosis, Risk Factors

Introduction

Ethiopia has the largest livestock population in the continent. There are approximately 41.3 million cattle, 46.9 million small ruminants, more than 1 million camels and 4.5 million equines, and 40 million chickens. Despite the large number of livestock, there has been a decline in national and per capita production of livestock and livestock products, export earnings from livestock, and per capita consumption of food from livestock origin since in comparison to other African countries. Various estimates showed that the livestock sub-sector contributes 12 to 16% of the total and 30 to 35% of agricultural GDP, respectively (Nigatu and Teshome, 2012).

The existence of various skin diseases (dermatophilosis, Demodicosis, sarcoptic and psoroptic mange, ticks and lice infestations) affecting cattle is frequently reported from different parts of Ethiopia. These different skin diseases in Ethiopia are accountable for considerable economic losses particularly to the skin and hide export due to various defects, 65% of which occur in the pre slaughter states directly related mostly to skin disease and skin and hides are often rejected because of poor quality. Apart from quality degradation of skin and hides skin diseases induce associated economic losses due to reduction of wool quality, meat and milk yield, losses as a result of culling and occasional mortalities and related with cost of treatment and prevention of the diseases (Yacob *et al*., 2008).

Among the Demodecidae, *Demodex* is the only genus important in domesticated animals. *Demodex* mites are very host specific, and transmission between species, including zoonotic transmission, is very unlikely (CFSPH, 2012). *Demodex* spp. mites belong to the order Prostigmata black-head rashes, and family Demodicidae. These parasites are tiny and a few articles previously reported the Demodectic cigar-shaped. The length of mature *Demodex* is variable mites causing acne rosacea. Segmented legs which appeared short and stump. However, there is a little information on human infectious anterior half of the body (Youssefi *et al*., 2012). Demodicosis in cattle is caused by a microscopic mite, demodex bovis. The parasites live some times in large numbers in the hair follicles and associated skin glands. The disease is well described and quite common in tropical zones, but rare and most likely underestimated in temperate regions, especially in Europe (Martinelle *et al*., 2011).

Demodex bovis occurs in limited numbers on many healthy cattle. This mite rarely causes problems unless the mite population in the hair follicles increases dramatically. When this situation happens, the hides can be damaged. The life cycle of *Demodex* takes from 18 to 24 days to complete. During this time, the mite develops through five stages from egg to adult. *Demodex bovis* cause a variety of clinical signs. Demodectic mange in cattle is known to be usually a chronic and benign disease. Lesions consist in papules and small nodules filled with a creamy-colored caseous material possibly associated with hair loss mainly observed in the periocular region, on the neck, and on the shoulders. Itching is usually absent. Under certain circumstances, such as stress, nutritional deficiencies, concurrent diseases and hot and humid weather the condition can extend to most parts of the body and lead to a loss of body condition (Martinelle *et al*., 2011).

Diagnosis is confirmed by finding the mite during microscopic examination of deep skin scrapings of the affected area. Scrapings must be deep enough to cause oozing or bleeding. Nodules may be cut open and their contents squeezed out. Microscopic examination of this material should reveal thousands of mites in all stages of development. In some cases, the scrapings or nodule contents may not contain mites. The procedure must be repeated three to five times to obtain diagnosis. Therefore, the objective of this review is to determine highlight the epidemiology and risk factors of bovine demodicosis in Ethiopia.

Literature Review

Aetiology

The demodecids comprise more than 150 species of parasitic mites in seven genera from hosts in 11 mammalian orders. *Demodex* is the only genus of importance for domestic hosts, and it contains at least 70 named species plus many more that are unnamed and undescribed. Although other genera display their own unique features, adult *Demodex* are elongate, spindle-shaped, or vermiform mites that live in the host hair follicles, sebaceous glands, Meibomian glands, and occasionally in epidermal pits. They have short anterior mouthparts with two-segmented palps and retractable needle-like stylets used to puncture surrounding host tissues and feed on predigested cellular fluids (OIE, 2013).

Demodectic mange is caused by a microscopic mite, *Demodex bovis*, which lives in hair follicles and associated glands of cattle. Infestation with *Demodex* is common in cattle (Kennedy, 2005). Mites infesting the different host species are considered to be specific and are designated as demodex bovis for cattle, D. ovis for sheep, D.caprae for goats, D.equi for horses and D. phylloides for pigs. Demodicosis may occur in farm animals of any age, especially those in poor condition but most cases in cattle occur in adult dairy cattle in late winter and early spring (Radostits *et al.*, 2007). Demodectic mange is caused by demodex species of mites, D .bovis (eyelids and body, D .ghanesis (eyelids) and un unnamed species (eyelids and body), all of which are thought to be normal skin commonsals (Wall and Shearer, 2001). Species of demodex have an elongated tapering body, up to 0.1-0.4mm in length, with four pair of stumpy legs ending in small blunt claws in the adult. Setae are absent from the legs and body. The legs are located at the front of the body, and as such the striated opisthosoma forms at least half the body length (Taylor *et al*., 2007).

Epidemiology

Demodectic mange in cattle occurs worldwide (Jubb *et al.*, 1992). Probably because of its location deep in the dermis, it is almost impossible to transmit demodex between animals unless there is prolonged contact. Such contact usually only occurs during suckling, and as such it is thought that most infections are acquired in the early weeks of life. The muzzle, neck, withers and back is common site of infestation (Taylor *et al*., 2007). The calves probably become infected during the first few days of nursing from infected cows. Poor nutrition, stress and the presence of other infections may contribute to the susceptibility of cattle to demodex outbreaks. This susceptibility may also be genetically determined (Ravikumar *et al*., 2009).

They are rapidly killed by desiccation on the surface of the skin, but mites move from follicle to follicle and it is probably at this time the transmission to another host takes place (Moxie, 2007). The disease spread slowly and transfer of mites is thought to take place by contact, probably early in life. Calves can acquire mites from an infected dam in half a day (Radostits *et al.*, 2007). *Demodex* species are very host specific, only rarely inhabiting more than one species of congeneric mammal host. However, it is not uncommon for a host species to harbor two to four different species of parasitic *Demodex*. Transfer between hosts occurs only by very close contact between individuals, making transmission between animal species or from animals to humans very unlikely. Their very thin cuticles mean that demodecids cannot survive away from their hosts for more than a few hours (OIE, 2013).

Life Cycle

They live as commensals, embedded head down in the hair follicles, sebaceous and meibomian gland the skin, where they spend their entire lives. Species of demodex are unable to survive off their host. Females lay 20-24 eggs in the hair follicle which give rise to hexapod larvae, in which each short leg ends in a single, three pronged claws. Unusually, a second hexapod larval stage follows', in which each leg ends in a pair of three –pronged claws. Octopod protonymph, tritonymph and adult stages then follow. Immature stages are moved to the edge of the follicle by sebaceous flow and it is here that they mature. One follicle may harbour all life cycle stages concurrently (Wall and Shearer, 2001).

The life cycle of *Demodex* takes from 18 to 24 days to complete. During this time, the mite develops through five stages from egg to adult. The female lays her eggs in the hair follicle. When the egg hatches, it releases a larva that subsequently develops through two nymphal stages before developing into either a male or female mite. The male usually dies three to five days after fertilizing the female (Kennedy, 2005). In each follicle or gland the mites may occurs in large numbers, located in a characteristics head down ward posture. In the new born and very young these sites are simple in structure, but later they become compounded by out growths. The presence of demodex mites much deeper in the

dermis than sarcoptids means that they are much less accessible to surface acting acaricides. Species of demodex are unable to survive off their host (Taylor *et al*., 2007).

Pathogenesis

They are extremely tiny, elongate, annulated mites with a very short, stout, three segmented legs. They lack body setae and posses a pair of tiny, needle like chelicerae which are used to pierce dermal cells, or which the mites feed. Their minute size and strong reduction of most of the external features represent adaptations for living in the close confines of hair follicles and associated ducts and glands (Mullen and Durden, 2002). The disease mainly occurs in young animals which are debilitated due to severe hypo nutritive condition which reduces the immunity. The animals pick up the infections by direct contact. All the initial inflammatory clinical features occur as erythema and swelling etc. the initial phase is called quamous form which is characterized by distension of hair follicle, hyperkeratosis, thickening of the skin, hyperpigmentation, alopecia etc. the color of the skin becomes coppery red. There after formation of the pustules. The crusts which are common characteristic feature is due to the drying of the exudate material. The affected area increase in size gradually leads to afflict whole body (Mandal, 2012).

Demodex bovis occurs in limited numbers on many healthy cattle. This mite rarely causes problems unless the mite population in the hair follicles increases dramatically. When this situation happens, the hide can be damaged (Kennedy, 2005). The most important effect of bovine demodicosis is the formation of many pea sized nodules, each containing caseous material and several thousand mites, which cause hide damage and economic loss. 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 can be caused by demodicosis in cattle are primarily a result of the damage caused to the hides. In some rare cases demodicosis may become generalized and fatal (Taylor *et al*., 2007).

Pathology

In cattle cutaneous nodules consist of follicular cysts lined with squamous epithelium and filled with waxy keratin squames and mites. Eruption of the cysts on to the skin may form a thick crust; rapture within the dermis may form an abscess or granulomatous reaction (Taylor et al., 2007). Lesions are papules approximately 0.5cm in diameter, covered with yellow serous crusts that may matt the fleece. Many of these papules may coalesce to form diffuse lesions over most of the body surface. The characteristically elongated mites are usually easy to find in large numbers in the waxy material which can be expressed from pustular lesions. Lesions in the hide can be detected as dark spot when a fresh hide is viewed against strong light source. However, lesion may not be readily seen until the hair has been removed and the skin has been soaking for sometime (Radostits *et a*l., 2007).

The lesions were confined to certain parts of the body or generalized. Infected cattle had decreased total RBC, PCV and Hb, and their red cell indices showed that they had anaemia of the normocytic normochromic type. Moreover, they had an absolute increase in the WBC, marked eosinophilia and moderate neutrophilia. Demodex bovis mites were isolated from the infected purulent material expressed from skin lesions. The mites and associated primary pathogenic bacteria and secondary invading organisms caused distension of the hair follicles forming bladder-like cysts and resulted in a marked destruction of the hides. Liberation of the contents of the cysts in the surrounding tissue produced a typical granulomatous reaction. The central core of the infection composed of mites, bacteria and purulent exudate was infiltrated by neutrophils and a few eosinophils; surrounded by lymphocytes, plasma cells, macrophages, epithelioid and giant cells, and proliferation of connective tissue. The giant cells destroyed, engulfed and digested the bacteria and the mites, resulting in healing of the lesions as judged by the

progressive proliferation of connective tissue and degeneration of the granulomas (Abusamra and Shuaib, 2014).

Clinical Signs

Demodectic mange causes two types of lesions in cattle: the pustular form and the squamous-scaly form. The pustular form is characterized by formation of papules or small nodules that contain pus. The squamous form, relatively less common, is characterized by loss of hair and thickening or wrinkling of the skin. The prevalence of the disease, on either the raw or the processed skins, has not been determined because it is being considered as" ekek". However, the lesion is not uncommon among the dry hides examined in tanneries (Bayou, 2005).

Demodex bovis cause a variety of clinical signs. These signs range from a few small areas of partial hair loss (localized demodicosis) to extensive regions of hair loss (generalized demodicosis). Lesions first appear on the head and forelimbs and may spread over the entire body. Papules may first appear as flat nodules in the skin and progress to enlargement of the sebaceous glands containing many mites. The nodules can be detected by running your hand over the skin of the cow (Kennedy, 2005). Pea-sized nodules containing caseouse material and mites particularly on the withers, lateral neck, back and flanks (Taylor *et al*., 2007). Five forms of skin lesions were recognized. They were papules, nodules and papules, nodules and few pustules, pustules and few nodules or pustules and crust-covered lesions. The lesions were confined to certain parts of the body or were generalized involving the whole body (Abusamra and Shuaib, 2014).

Concurrent pyoderma may occur, leading to furunculosis with ulceration and crust formation (Wall and Shearer, 2001). Clinical examination revealed scaly, wrinkled, thickened skin, hair fall and a change in skin color from its normal color to red, and bruises on the face and hind limbs (Ravikumar et al., 2009). Demodectic mange has been classified in various ways, depending up on the clinical feature, seen. These categories juvenile demodicosis, adult onset demodicosis, localized demodicosis and generalized demodicosis and pustular demodicosis. Juvenile demodicosis which occurs between 3 and 15 months of age presents non parasitic areas of focal alopecia on head, forelimbs and trunk. Adult onset demodicosis is often associated with concurrent staphylococcal pyoderma and is pustular form. It can be localized or generalized and the clinical features seen are erythematic, pustules and crusts. The skin often becomes hyper pigmented in chronic cases. The localized form is often confined to the feet (Wall and Shearer, 2001). The small lesions can be seen quite readily in short coated animals and on palpation feel like particles of bird-shot in the hide. In sever case, there may be general hair loss and thickening of the skin in the area, but usually there is no pruritus and hair loss is insufficient to attract attention. The content of the pustules are usually whit in color and cheesy in consistency. In large abscesses the pus is more fluid. Larger lesions are easily visible but very small lesions are may only be detected by rolling of skin through the fingers (Radostits *et al*., 2007).

Diagnosis

The disease is characterized by the formation of papules, nodules, pustules and cysts of varying sizes. The predilection sites of the lesions seemed to be the neck, withers, shoulders and forequarters. As the disease progressed, the lesions spread from their original sites to the rest of the body, and in severe infections, most of the skin became involved. Many cattle with demodectic mange might have no visible cutaneous lesions and the disease might pass unnoticed. In such cases, the lesions could only be detected by running the hand over the shoulders, axillae, brisket and neck, and by rolling the loose skin in the axillae and brisket between the thumb and other fingers (Abusamra and Shuaib, 2014).

The clinical signs are suspective, but there is requirement of differential diagnosis. Test of the skin scraping is the confirmative diagnostic test of

the case. The skin scraped by an aseptic scalpel blade and should be continued till blood oozes out. The material is preserved in 5% formalin or 70% alcohol for feature examination (Mandal, 2012). The case was tentatively diagnosed as demodectic mange and was confirmed by finding the mite during microscopic examination of deep skin scrapings of the affected area (Ravikumar *et al*., 2009). This is best achieved by taking a fold of skin, applying, a drop of liquid paraffin and scraping until capillary blood appears (Taylor *et al*., 2007). Examination of the hair bulb and shaft mounted in liquid paraffin reveals large numbers of mites within the hair follicle or free within the dermis if a furunclosis is present. Other histological feature include a perifolliculitis, muralfolliculitis or folliculitis involving mixed inflammatory cells but with numerous mononuclear cells (wall, 1997).

Histopathology of skin biopsy will also reveal large numbers of mites within the hair follicles or free within the dermis if a furunculosis is present. Other histological features include a perifolliculitis, mural folliculitis or folliculitis involving mixed inflammatory cells but with numerous mononuclear cells (Wall and Shearer, 2001). In host of nearly any species, the prevalence of demodex can be determined gently squeezing the skin and looking for mites in the exudates. In humans, they are seen mostly on the face in oily areas, such as around the nose, or in the eyebrows and eyelashes which may be plucked and examined under a microscope (Marquardt *et al*., 2000). A single cattle follicle mite *Demodex bovis* Stiles was found in the hide sample from the dorsal neck of one bullock. An examination of additional hide samples of the same size from the dorsal neck, groin and dorsal tail base of this animal revealed tens of mites at the neck, but no mites were found at the groin and dorsal tail base. No macroscopic skin disorders were observed on the samples from any of the animals in this study which could be associated with *Demodex* mites (Eydal and Richter, 2010).

Economic Significance of Bovine Demodicosis

In Ethiopia hides and skins contribute much to the export earnings from the livestock sector. In addition, it has a large contribution to the leather industry in the country. Ethiopia has been exporting hides and skins in the past 100 years. The country has big potential to develop the sub-sector. In 2002 hides and skins represent major source of foreign exchange earnings for the country accounting for 14-16% of the total export revenue. Ethiopia's leather industry is at the forefront of the leather sector development of the Eastern and Southern African regions. The industry has reached an advanced stage of development and a reputation for excellence in the categorized according to the Ethiopian standard authority international market. The export performance of the sector showed very encouraging trends during 2005-2007. The major export contributor of the manufacturing sector in Ethiopia is the leather and footwear industries, which contributed 70% of the export earnings for the year 2005-, assess the major factors that cause skin defects at Bahir 2007(Zenaw and Mekonnen, 2012).

Economic significance lies largely in the damage that mites' infestation produces in hides (Jubb et al., 1992). Skin damage resulting from these ruptured nodules can cause defects in raw leather and significant economic losses to the tanning industry in the form of diminished quality of processed cow hides (Mullen and Durden, 2002). In some part of Australia 95% of hides are damaged and survey in USA have shown a quarter of the hide to be affected. In Britain 17% of hides have been found to have demodex nodules (Urquhart *et al*., 1996). The foci of infection which cause the small pin holes in the hide which interfere with its industrial processing as well as reducing the value dramatically (Radostits *et al*., 2007). The most important effect of bovine demodicosis is the formation of many pea-sized nodules, each containing caseous material and several thousand mites, which cause hide damage and economic loss (Urquhart *et al.*, 1996).

Demodectic mange infections cause damage on hides and skins and result in one of the most serious defects in leather. This infection involves the corium and epidermis portion of the skin and currently there is no tangible and recognizable cure. In Kenya, at least 25% of the whole output of hides and skins were affected by disease which caused much pecuniary loss. On examining, 1,059 low grade hides, it was found that demodicosis to be the commonest skin disease, followed by streptothricosis, ringworm and mange in order of descending frequency. Demodicsis is a big problem in cattle and goats, but of minor importance in sheep. A prevalence rate of 14% was obtained in 8000 goat skins examined in Kenya. A report from Uganda showed an occurrence rate of 27.6% in goats and only 0.7% in sheep. A survey conducted on cattle in the Sudan, for example, showed streptothricosis and demodicosis prevalence rates of 4.5% and 34.3%, respectively. During the occurrence of slaughter, however, the level demodicosis infection was found to be 38.8% (Tadesse, 2005).

Demodectic mange is one of the most serious parasitic damages occurring in leather. They multiply inside the skin forming pocket or nests; at advanced stages the mass of mites may occupy space equal to half the thickness of the hide. The damage is serious because it involves the corium or the fiber portion of the skin which is transformed in to leather. The lesions are seen on the flesh side of the dried skins and are sharply out lined more or less as circular light colored spots. In advanced states simple like elevations may be seen on the hair side of the living cattle. In leather if follicular mange is in earlier state of development, the damage is confined to the opening of the hair pockets. If it is in later stages the damage is deep in the skin and can easily be located as the nodules are obvious on the surface of the leather, a grain correction cannot remedy this type of mange damage. When such leather is split, cheesy drop out leaving voids in the leather (Teklay, 2010).

Treatment

The choice is between pour-on products and injections. The first are easier and quicker to use and are often cheaper. However, in severely infected animals (as is often seen in burrowing mite problems), the skin reaction can mean that contact between the product and the mite is limited. In such cases, scabs may have to be removed before treatment. If very severe then injectable products are probably a better bet. For very severe surface mite problems, an injection should be followed up by a pour-on treatment when the skin has recovered, as in this species (unlike the burrowing mite) injections only control but do not eliminate. The timing and frequency of treatments depend very much on individual circumstances. In most clinical cases, two treatments will give adequate control of cattle mites for the housing period. Whichever product you use, dose accurately, ensuring that you do not under-dose as under-dosing is the best way of ensuring the development of mites that are resistant to treatment. Treat all cattle on the property at the same time if possible, choosing a time when they are not stressed or in poor condition. If groups have to be treated separately, such groups should be kept apart to ensure there is no contact between treated and untreated groups (Jackson, 2014).

In many cases demodicosis spontaneously resolves and treatment is un necessary. The organophosphate trichlophon, used on three occasions 2 days apart, and systemic macrocyclic lactones may be effective(Taylor *et al.*, 2007). Repeated dipping or spraying with the accaricides recommended for other mange is usually accaricide out but is more to present spread than cure existing lesions (Radostits *et al.*, 2007). The infected area was cleaned with potassium permanganate solution (Venugopalan, 1995) and wiped dry with sterile cotton, SCAVON VET spray was applied twice a day liberally over the surface of the infected area for 15 days. The calf showed recovery in 15 days without any complications. Observations indicated that SCAVON VET spray minimized the demodectic mange in calf by about 60% by 8 days, 80% by 10

days and 100% by 15 days. Recurrence was not seen in a follow-up period of 1 week (Ravikumar *et al*., 2009). Topical application of as cabiol (Benzyl benzoate) in concentration of 10% found to be effective (Mandal, 2012).

Mites are affected by amitraz, some organophosphorus compounds synthetic pyrethroids and the anthehelmintics ivermectin, doramectin, eprinomectin and moxidectin. For topical applications the problem is to ensure that the chemical can come in to contact with the parasite and it may be necessary to remove scab before application. The organophosphorus compounds used frequently are phostmet, propetamphos and diazinon, and they synthetic pyrethroids, flumethrin, delta methrin and cypermethrin. Organophosphorus and ivermectin, doramectin and moxidectin should not be used on dairy cows giving milk for human consumptions unless withdrawal periods are observed. Eprinomectin is safe to use in such cattle (Andrew *et al.,* 2003). Treatment is by acaricides, which may be applied as injectable drugs such as ivermectin, hand sprays or dips (Turton, 2007).

Prevention and Control

Cattle mange is mostly a winter problem in regions with a cold season (e.g. Canada, most of the US and Europe, etc.). Crowding during indoor confinement means closer physical contact between the animals, which makes mite transmission easier. It also means a more humid hair coat, which is also favorable for mite development. Feeding is often deficient during the cold season, and confinement stresses the animals. These factors make the animals less resistant to the disease. For all these reasons, keeping the animals well fed and in good health and hygienic conditions is crucial to reduce the risk of winter outbreaks, or at least to limit the harm that such outbreaks can cause. As soon as the animals go back to pasture in spring symptoms recede quickly. Exposure to sun reduces the humidity in the hair coat, which slows down mite development, and without crowding mite transmission is significantly reduced. For reasons yet unknown, a few mites often survive such unfavorable summer conditions in a few animals within a herd, without showing any clinical signs. Once the herd goes back to the winter quarters in fall, these animals will transmit the mites to the rest of the herd if preventive measures are not taken. Therefore it is highly recommended to preventively treat the herds in late autumn. All animals in a herd must be treated, because it is impossible to know which are the carrier animals (Junquera, 2013).

Control is rarely applied since there is little incentive for farmers to treat their animals as the cost of damage is borne by the hide merchant (Taylor *et al*., 2007). There are no vaccines available for Immuno prophylaxis of these mite infections. Newly purchased animals must be examined, treated with an appropriate drug and maintained in quarantine for at least 14 days. The premise occupied by the infected animals must be left empty for three week at least. All animals must be treated as soon as a clinical case of mange is observed. Hygienic measure (cleaning and disinfection of animal accommodation) must be applied (Lefevre *et al*., 2010).

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If a herd is free of mites, contamination can only come from cattle brought in. Consequently, to avoid contamination treat all incoming animals against mites, especially during the winter months. Two injections with amacrocyclic lactone (e.g. doramectin, ivermectin, moxidectin) with 7 to 10 days interval should do the job, but keep the animals isolated until 10 days after the second injection. Remember that cattle may be infected with mites without showing clinical signs! Topical products (sprays, dips and pour-ons) can be used to treat incoming animals as well: they are cheaper, but less convenient and less reliable than injectables. There are a number of products for dipping or spraying cattle against mites, whereby dipping is more likely to ensure coverage of all body parts that can carriy mites. Such products contain contact acaricides (i.e. non-systemic) effective against most mite and lice species: mainly organophosphates (e.g. chlorfenvinphos, chlorpyrifos, coumaphos, diazinon), amitraz or synthetic pyrethroids (e.g.

deltamethrin, cypermethrin, flumethrin) (Junquera, 2013).

Status of Bovine Demodecosis in Ethiopia

Mange mites are common in Ethiopia and therefore are reported from many regions and different agro climates. Based on the reports so far, mange mites are most prevalent in four national regional states of Ethiopia namely, the Amhara Oromia Tigray and Southern Nation and Nationalities regional states. In all reports, three genera of mites namely, *Sarcoptes*, *Psoroptes* and *Demodex* were reported ruminants in Ethiopia (Yacob, 2013). In the oromia region the prevalence of demodex at a lesser extend was (1.88%) in cattle. Demodicosis was registered at prevalence rate of 1.88% in cattle, 1.33% in sheep and 1.02% in goats. The demodicosis prevalence's previously reported cattle range from 0.42% in the Nekemte region region to 1.63% in the wolaita soddo region. In our previous report in wolaita soddo, 0.98% prevalence of mange in goats and 0% in sheep were reported. The frequency of demodex in sheep and goats were 0.80% and 1.37% respectively in central Ethiopia, 0.84% and 0.99% in eastern Ethiopia. No significant effect of sex, breed, and a on the demodicosis prevalence in cattle and small ruminants (Yacob *et al*., 2008).

Conclusion and Recommendation

Demodectic mange mites of Demodex species infest hair follicles of all species of domestic animals. Demodex live as commensals, embedded head down hair follicle and sebaceous and Meibomian glands of the skin where they spend their entire lives. For the most part they are nonpathogenic and 8 form a normal part of the skin fauna. Species of Demodex are unable to survive off their hosts. The disease cause little concern. But in cattle, there may be significant damage to the hide and rarely death due to gross secondary bacterial invasion. The disease may also be severe in goats. The important signs of the disease in goats are the appearance of small nodules and pustules which may develop into larger abscesses from which large number of Demodex mites may be expressed). The disease spreads slowly and transfer of mite is through contact probably early in life. But factors like backward level of management, poor level of awareness of farmers and weak animal health extension services which were not under this investigation believed to have wide contribution for wide spread and occurrence of mange mites in the study area leading to important economic losses. Based on the above conclusion the following recommendations are forwarded: bovine management practices should be implemented to minimize transmission of the disease, Strategic treatment of bovine with insecticides should be practiced in the study area to minimize the impact of mange mite on the health of animals and Appropriate extension programs should be launched to create public awareness about the economic importance, treatments and its impact on skin quality.

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