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Viral diseases of sheep and goats

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Small ruminants are an important source of meat, milk or wool throughout the world. Sheep and goats are both small ruminants with cosmopolitan distributions due to their being kept as grazers both individually and in herds in return for their production of milk, wool, and meat. As such the diseases of these animals are of great economic importance to humans. This article describes the diseases of sheep and goats in India in brief with special reference to their etiology, clinical signs, treatment, prevention and control.

1. Contagious ecthyma (orf)

Orf is an exanthemous and highly contagious disease caused by a parapox virus and occurring primarily in sheep and goats. It is also known as contagious pustular dermatitis, infectious labial dermatitis, ecthyma contagiosum, thistle disease and scabby mouth. *Orf virus* is zoonotic, it can also infect humans. The disease is manifested by the occurrence of the pustular and scabby lesions on the lips, muzzle and udder. The disease is endemic worldwide. Incubation period of the disease is 2 - 3 days.

Symptoms include papules and pustules on the lips and muzzle, and less commonly in the mouth of young lambs and on the eyelids, feet, and teats of ewes. The lesions progress to thick crusts which may bleed. Orf in the mouths of lambs may prevent suckling and cause weight loss, and can infect the udder of the mother ewe, thus potentially leading to mastitis. Sheep are prone to reinfection. Occasionally the infection can be extensive and persistent if the animal does not produce an immune response.

The disease is transmitted by direct contact between animals and indirect contact with dry scabs in pens. The virus is resistant to drying and may be viable in scabs for months and years in empty feedlots and pens. Farm workers may disseminate the virus among animals of different pens with contaminated equipment, feed and farm vehicles.

More typically the infected animal will become free of orf within a week or so as the disease runs its course. Sheep custodians can assist by ensuring infected lambs receive sufficient milk and separating out the infected stock to slow down cross-transmission to healthy animals. The topical application of antiseptics, may reduce bacterial contamination of the lesions and help prevent secondary complications. Live attenuated orf vaccine can be used to prevent the disease. Bluetongue, foot and mouth disease, sheep and goat pox, ulcerative dermatosis, cutaneous anthrax and vesicular diseases are some of the diseases to be considered in differential diagnosis.

2. Bluetongue (BT)

Blue tongue is a non-contagious, insect-borne, viral disease of ruminants, mainly sheep and less frequently cattle, goats, buffalo, deer, dromedaries, and antelope. It is caused by the Bluetongue virus (BTV). The virus is transmitted by the midge *Culicoides imicola, Culicoides variipennis*, and other culicoids. The disease is manifested by fever, oral lesions, lameness and emaciation. The disease is also known as catarrhal fever of sheep or soremuzzle disease. The disease occurs mostly in the African region, in Asia and the Pacific and in the Western hemisphere.

In sheep, BTV causes an acute disease with high morbidity and mortality. Major signs are high fever, excessive salivation, swelling of the face and tongue and cyanosis of the tongue. Swelling of the lips and tongue gives the tongue its typical blue appearance, though this sign is confined to a minority of the animals. Nasal signs may be prominent, with nasal discharge and stertorous respiration. Some animals also develop foot lesions, beginning with coronitis, with consequent lameness. In sheep, this can lead to knee-walking. Torsion of the neck (opisthotonos or torticollis) is observed in severely affected animals. Not all animals develop signs, but all those that do lose condition rapidly, and the sickest die within a week. For affected animals which do not die, recovery is very slow, lasting several months. The incubation period is 5–20 days, and all signs usually develop within a month. In goats and wild ruminants infection is usually asymptomatic despite high virus levels in blood.

Treatment and prevention is effected via quarantine, vaccination and control of the midge vector. Simple husbandry changes and practical midge control measures may help break the livestock infection cycle. Housing livestock during times of maximum midge activity (from dusk to dawn) may lead to significantly reduced biting rates. Similarly, protecting livestock shelters with fine mesh netting or coarser material impregnated with insecticide will reduce contact with the midges. The culicoides midges that carry the virus usually breed on animal dung and moist soils, either bare or covered in short grass. Identifying breeding grounds and breaking the breeding cycle will significantly reduce the local midge population. Turning off taps, mending leaks and filling in or draining damp areas will also help dry up breeding sites. There are no medications available to treat the disease, but supportive treatment may decrease mortality.

Even though there are more than 24 serotypes reported only 5 serotypes are more prevelant. Therefore bluetongue multivalent inactivated vaccine is introduced

with BTV serotypes 1, 2, 10, 16 and 23 which are prevalent in India. The vaccination of sheep needs to be done one month before the onset of monsoon.

3. Peste des petits ruminants

Peste des petits ruminants (PPR), also known as 'goat plague', is a viral disease of goats and sheep characterized by fever, sores in the mouth, diarrhea, pneumonia, and sometimes death. It is caused by a morbillivirus in the family of paramyxoviruses, that is related to rinderpest, measles and canine distemper. Cattle and several wild ruminants have been infected most often experimentally, but goats and sheep are the usual targets.

The virus is secreted in tears, nasal discharge, secretions from coughing, and in the faeces of infected animals. Therefore, close contact between animals, especially through inhalation of fine droplets that are released into the air when affected animals cough and sneeze will spread the disease. Water, feed troughs, and bedding can also be contaminated with secretions and become additional sources of infection, however the virus does not survive for a long time outside the body of a host animal. Since animals excrete the virus before showing signs of the disease, it can spread by movement of infected animals.

After an incubation period of 3-6 days, there is a sudden onset of fever, severe depression, loss of appetite, and clear nasal discharge. The nasal discharge becomes thicker and yellow, often becoming so profuse that it forms a crust that blocks the nostrils causing respiratory distress. The eyes may also become infected, causing eyelids to mat together with discharge. Tissues in the mouth can swell and ulcers form on the lower gums, dental pad, hard palate, cheeks and tongue. Severe diarrhoea develops in some animals, resulting in dehydration and weight loss. Pneumonia is common in later stages. Pregnant animals may abort. The prognosis of peste des petits ruminants is poor and death can occur within five to ten days of the onset of fever. Young animals are most severely affected, goats more than sheep. In its most severe form (peracute) animals are found dead. However, the disease can be mild or unapparent and circulate in a country causing little or no illness until susceptible goats are exposed.

When the disease appears, the standard disease control measures consisting of quarantine, movement control, sanitary slaughter, and cleaning and disinfection are applied. The virus is susceptible to most disinfectants. There are no medications available to treat the disease, but supportive treatment may decrease mortality. A live attenuated homologous vaccine is used through out India and it provides good immunity.

4. Sheep and goat pox

Sheeppox and goatpox are serious, often fatal, diseases characterized by widespread skin eruption. The poxviruses of sheep and goats (capripoxviruses) are closely related, both antigenically and physicochemically. Reports on the natural susceptibility of sheep to the virus of goatpox and vice versa are conflicting; at least some strains seem capable of infecting both species.

The incubation period of sheeppox is 4–8 days and that of goat pox is 5–14 days. The clinical picture is similar in the two diseases but is generally less severe in goats. Fever and a variable degree of systemic disturbance develop. Eyelids become swollen, and mucopurulent discharge crusts the nostrils. Widespread skin lesions develop and are most readily seen on the muzzle, ears, and areas free of wool or long hair. Palpation can detect lesions not readily seen. Lesions start as erythematous areas on the skin and progress rapidly to raised, circular plaques with congested borders caused by local inflammation, edema, and epithelial hyperplasia. Although microvesicles are present histologically, vesicles and pustules are not evident clinically. Virus is abundant in skin lesions at this stage. As lesions start to regress, necrosis of the dermis occurs and dark, hard scabs form, which are sharply separated from the surrounding skin. Regeneration of the epithelium beneath the scabs takes several weeks. When scabs are removed, a star-shaped scar, free of hair or wool, remains. In severe cases, lesions can develop in the lungs. In some sheep and in certain breeds, the disease may be mild or the infection inapparent.

The disease is often transmitted by the respiratory route during close contact, but they may also enter the body through other mucous membranes or abraded skin. These viruses can be found in saliva, nasal and conjunctival secretions, milk, urine and feces, as well as in skin lesions and their scabs. Ulcers on the mucous membranes are important sources of virus. The virus can also be spread on fomites or transmitted mechanically by insects such as stable flies (*Stomoxys calcitrans*), although the latter route may be uncommon. These viruses can remain infectious for up to six months in shaded sheep pens. They may also be found on the wool or hair for as long as three months after infection, and possibly longer in scabs.

Outbreaks can be controlled by quarantines, movement controls, and depopulation of infected and exposed animals, followed by stringent cleaning and disinfection of farms and equipment. Proper disposal of infected carcasses is important; burning or burial is often used. Capripoxviruses may persist for up to 6 months in shaded, uncleaned pens and for at least a few months in dry scabs on skin, fleece and hair.

In endemic area systematic vaccination programs have provided the most effective control over the disease. Cell cultured attenuated vaccines which give good immunity are used to prevent the disease.

5. Foot and mouth disease

Foot and Mouth Disease (FMD) is a severe, highly contagious viral disease of livestock with significant economic impact. The disease affects cattle and swine as well as sheep, goats, and other cloven-hoofed ruminants. Sheep and goats play an important role in the epidemiology and transmission of FMD. Typical clinical signs of FMD in sheep and goats include pyrexia, lameness and oral lesions, which are often mild, foot lesions along the coronary band or interdigital spaces, and lesions on the dental pad, which may go unrecognised, agalactia in milking sheep and goats and death of young stock without clinical signs. FMD is difficult to diagnose in small ruminants as infected sheep not

always show typical clinical symptoms or as the cardinal signs mimicked other diseases. Sheep and goats may be carriers. Infected herds which practice transhumance or are nomadic can spread the infection to other herds long before diagnose of the disease is established. Shipping and trade with live sheep and goats is much more common world wide than in other FMD susceptible species. Lack of identification of all sheep and goat herds and lack of individual identifications signs may result in incomplete control measurements under FMD conditions.

In a susceptible population, morbidity approaches 100%. Intensively reared animals are more susceptible to the disease than traditional breeds. The organism which causes FMD is an aphthovirus of the family Picornaviridae. There are seven strains (A, O, C, SAT1, SAT2, SAT3, Asia1) each one requiring a specific vaccine strain to provide immunity to a vaccinated animal.

FMD viruses can be spread by animals, people, or materials that bring the virus into physical contact with susceptible animals. FMD is found in all excretions and secretions from an infected animal. Infected animals notably breathe out a large amount of aerosolized virus, which can infect other animals via the respiratory or oral routes.

The disease can be treated for secondary bacterial infections. The lesions can be washed with one per cent potassium permanganate solution. Antiseptic lotion can be applied to the vesicles on the foot. Boric acid and glycerine paste can be applied to the oral lesions. Diseased animals should be fed on a palliative diet and should be segregated from the heard of healthy animals. Healthy animals can be vaccinated with the inactivated vaccine as a preventive measure.

To conclude, maintaining the health of sheep and goats with a strict vaccination program, having effective parasite control program, quarantining new additions to the herd for at least three weeks, providing adequate nutrition for optimal reproductive capability and to reduce susceptibility to disease and parasitism and maintaining clean, well-ventilated housing will avoid many health problems.