

Diseases of llamas and alpacas

Llamas and alpacas have been the subject of a number of articles in *Surveillance* in recent years. Articles have covered the collection of blood, urine and faecal samples¹, a summary of the anatomy, physiology, reproduction, nutrition and handling of lamoids², adverse reactions to a trypanocidal drug³ and experiences in the handling, transportation and importation of these animals.^{4,5}

The review published below discusses the most important diseases of lamoids, emphasising those recently diagnosed by the New Zealand Animal Health Laboratory network and those which may be in the future. There is a shortage of detailed reference material on diseases of lamoids and so an open minded approach should be taken when investigating new syndromes in these species.

Skin diseases

The skin diseases of llamas and alpacas which have been diagnosed in New Zealand include bacterial dermatitis due to *Staphylococcus aureus*, dermatophilosis, and dermatophytosis associated with *Microsporum gypseum*.^{6,7} Bacterial skin infections in lamoids have usually presented as exudative crusting lesions, especially on the head and distal extremities. There may be hair loss and pruritus also. Penicillin or trimethoprim-sulphadiazine have been effective treatments.⁸ Dermatophilosis caused by *Dermatophilus congolensis* produces exudate with matted hairs, especially over the back, sides and distal extremities. Lesions may be pruritic. Topical disinfectants in conjunction with clipping and cleaning, or systemic penicillin-streptomycin therapy should be effective.⁸ Dermatophyte lesions may grossly resemble bacterial dermatitis. *Trichophyton verrucosum* and *Microsporum nanum*, both present in New Zealand, have been isolated from skin lesions in llamas in the USA. Topical anti-fungal therapies have been effective.⁸

Other skin diseases recorded overseas, and which may be seen in New Zealand, include allergic dermatitis and parasitic skin diseases. Allergic dermatitis shows as a generalised pruritus without significant skin lesions and responds well to corticosteroids.⁸ Ectoparasites commonly reported on llamas include *Sarcoptes scabiei*, *Chorioptes bovis*, *Damalinea breviceps* (biting louse) and *Microthoreis cameli* (sucking louse). Lesions and treatment are similar to those in other species.⁸ [Editor's note: Neither *D. breviceps* nor *M. cameli* have been recorded in New Zealand.]

Other skin disorders commonly seen include nasal alopecia, idiopathic cervical alopecia, zinc-responsive dermatosis and papillomatosis. Nasal alopecia occurs over the mid-dorsal bridge of the nose, mostly induced by rubbing and may be a vice or due to fly irritation. Therapy is usually not required.⁸

Idiopathic cervical alopecia occurs in the shoulder/cervical region of some llamas, especially in the spring, with regrowth about six months later. It may represent a normal shedding pattern.⁸ Zinc-responsive dermatosis or idiopathic hyperkeratosis is a common skin disorder of llamas, with lesions mostly over ventral abdomen, inguinal/axillary areas and medial thighs. Daily zinc therapy (0.5g ZnO per day) has been successful.⁸ Papillomatosis or warts have been seen on llamas in New Zealand and overseas. They are probably caused by a papillomavirus and usually occur on the less haired areas (face, legs, perineum and brisket). The warts normally regress spontaneously over a period of months.⁸

Gastrointestinal diseases

The most common gastrointestinal disease seen in lamoids in New Zealand is an acute fatal haemorrhagic enteritis of unknown etiology seen in alpacas.⁹ Laboratory tests for *Salmonella*, *Yersinia* and clostridial enterotoxaemias have proven negative in these cases.



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Lumpy jaw due to *Actinomyces* species is common in South America and this, along with woody tongue due to *Actinobacillus lignieresii*, may well be seen in New Zealand.⁹

Contagious ecthyma (scabby mouth) is seen in alpacas at two to four months of age in the USA and is clinically similar to that seen in lambs. It is likely the disease can be spread from sheep to alpacas and, therefore, will probably be diagnosed in New Zealand. The sheep vaccines are not recommended for use in alpacas.^{9,10}

Johnes' disease has been suspected overseas but, although a granulomatous enteritis was seen in one animal, no acid-fast organisms were detected.⁹ Clumps of acid-fast organisms have been detected in faecal smears from two animals in New Zealand. However, the diagnosis was not confirmed with culture or histopathology.¹¹

Enteric disease associated with *Salmonella typhimurium* has not been seen in New Zealand lamoids although the organism was cultured from an apparently normal animal.¹¹ Overseas reports suggest lamoids may be relatively resistant to salmonellosis.⁹

Enterotoxaemia deaths in alpacas in New Zealand have been suspected but not confirmed.¹¹ One animal had a 1:16 positive titre for epsilon toxin in the intestinal content. Deaths due to *Clostridium erfringens* type A, C and D have been reported overseas. Vaccination against these has been recommended although no vaccines are licensed for use in lamoids in this country.

Other common gastrointestinal problems include necrotic stomatitis (due to *Fusobacterium necrophorum*), tooth root abscess, malocclusion, bezoars, gastric ulcers and colonic impaction.^{7,9,12}

Gastrointestinal parasites detected in lamoids in New Zealand so far include *Nematodirus*, *Trichostrongylus*, *Cooperia* and *Ostertagia* species.¹¹ Clinical disease associated with these has not been reported in New Zealand lamoids yet although in South America gastrointestinal parasites cause significant disease.¹³ The clinical signs are similar to those in sheep and cattle. The common sheep and cattle anthelmintics have all been used in lamoids in the USA.¹³

Liver histopathology and elevated liver enzymes consistent with sporidesmin toxicity have been seen in New Zealand although associated photosensitivity has not been reported.¹¹

Respiratory diseases

Fibrinopurulent bronchopneumonia and death occurred in six mixed-age alpacas during shipping and quarantine while in transit to New Zealand from Chile. Multiple factors were believed involved, including low body weight, recent stress associated with shipping and mouldy hay. Bacteriology revealed a mixed growth in most cases.^{4,10}

Chronic nasal discharge is a common complaint in llamas, probably with a complex aetiology involving allergy. Chronic obstructive pulmonary disease has been seen in two animals with seasonal nasal discharge and bronchopneumonia secondary to a hypersensitivity has been reported in a llama.¹¹ Serological evidence from overseas indicates exposure to IBR, BVD and PI3 viruses. However, associated clinical signs have not been observed.⁸

Urinary system diseases

Chronic renal diseases including amyloidosis, glomerulonephritis¹¹ and chronic interstitial nephritis⁴ have been reported in lamoids. The cases of amyloidosis and glomerulonephritis had clinical signs consistent with the nephrotic

syndrome (oedema, hypoalbuminaemia, and proteinuria). These cases failed to respond to therapy and the initiating causes were unknown.

Embolic suppurative nephritis originating from a septic mural endocarditis due to *Actinobacillus suis* was diagnosed in New Zealand in a six-week-old female alpaca.⁶ A source of infection or cardiac defect was not found in this animal. *Actinobacillus suis* has since been cultured from the throat of several normal alpacas.

Urolithiasis has been reported a problem in male lamoids in some areas and seems to be a problem particularly in temperate areas. Most cases die with a bladder rupture prior to clinical detection. Prevention involves salt supplementation in a grain mix and free access to fresh water.¹¹

Nervous system diseases

Nervous system diseases seen in lamoids in this country include polioencephalomalacia,¹⁰ ryegrass stagger,¹³ a single case of suppurative meningitis,⁶ and a few cases of idiopathic mild non-suppurative encephalitis.¹⁰ Viral causes of the non-suppurative encephalitis were ruled out.

Neurologic diseases seen in lamoids overseas and which may be seen in this country included tetanus, listeriosis, spinal cord degeneration (tentatively attributed to copper deficiency) and encephalitis, retinitis and optic neuritis associated with equine herpesvirus-1 (EHV1) infection.^{8,11,14} Clinical signs associated with tetanus and listeriosis are similar to those seen in other species.⁸ Cases of spinal cord degeneration have presented with hind-limb ataxia or posterior paraparesis.¹¹ Blindness was the major sign in an outbreak of EHV1 infection in alpacas.¹⁴

Musculoskeletal diseases

Joint deformity and lameness accompanied by hypophosphataemia have been seen on three South Island properties.¹⁵ Further investigation is proceeding, with some suggestion that rickets may be the problem in these animals.

Overseas, exertional rhabdomyolysis (capture myopathy) has been reported and nutritional myopathy has been suspected to occur but is not well documented.¹¹ Clinical signs are likely to be similar to other species.

Haematopoietic diseases

Anaemia is a common problem in lamoids and often has no apparent cause. Iron deficiency has been suspected in some cases based on red cell morphology.¹⁶ Regenerative anaemias have been seen in a few alpacas in New Zealand and haemolytic anaemia was suspected from histopathology in a recently imported alpaca.¹⁰ Eperythrozoonosis has recently been described in four llamas in the USA. Manifestations included poor body con-

dition, non-regenerative anaemia, and hypoproteinaemia. A cause and effect relationship was not established and the authors were uncertain which species of *Eperythrozoon* was involved.¹⁷ Both *E. wenyoni* and *E. ovis* are present in New Zealand and it seems likely the eperythrozoonosis seen in llamas is due to one of these species.¹⁷

One case of multicentric lymphosarcoma in a mature female alpaca has been diagnosed in New Zealand. Neoplastic cells were present in lung, liver, kidney and multiple lymph nodes.¹⁰ Similar cases have been reported from the USA.¹¹

Reproductive diseases

Overseas, abortion in lamoids have been seen associated with *Brucella melitensis* type¹⁹ *Leptospira grippotyphosa*⁹ and *Chlamydia psittaci*.¹⁸ *Listeria monocytogenes* serotype 4 has been cultured from abortions in New Zealand.¹³ Pine needles and *Toxoplasma gondii* have been suspected also as a cause of abortion.¹⁸ To investigate abortions in lamoids, fixed placental samples plus a full range of fixed fetal tissues should be sent to the local diagnostic laboratory. Stomach content, placenta and lung are best for bacteriology and a range of fresh tissues for viral isolation. Fetal heart blood for *Toxoplasma* serology may be worthwhile also.

Uterine torsion has been seen several times in llamas in the USA. These have been corrected successfully by rolling the animal while pressing with a board across the flank in a manner similar to that used in cattle.¹⁸

Multisystemic diseases

Tuberculosis has occurred in natural and experimental infections with *Mycobacterium bovis*, although lamoids seem less susceptible than cattle. Clinical signs vary depending on the organ system involved but tuberculosis should be considered in the differential diagnosis of chronic weight loss in lamoids. Intradermal tuberculin testing has yet to be adequately validated in lamoids and culture is needed for a definitive diagnosis. Pathology of tuberculosis in lamoids is similar to that seen in other species.^{8,9}

Anthrax has occurred in lamoids in North and South America. It is unlikely to occur in New Zealand but should be included in the differential diagnosis of septicaemic animals with haemorrhagic discharges and/or sudden unexplained deaths.^{8,9}

Alpaca fever occurs in Peru and is due to *Streptococcus zooepidemicus*. This is a bacterial septicaemia causing a fibrinopurulent polyserositis with large quantities of fluid in the thoracic and abdominal cavities. The organism can also produce focal abscesses, balanitis and mastitis. The clinical course is variable, with non-specific signs including pyrexia, dyspnoea and colic.^{8,9}

Nutritional diseases

Nutritional deficiencies of copper, cobalt, phosphorus and magnesium have been recorded in lamoids in New Zealand.¹⁰ Clinical signs associated with copper deficiency have been illthrift, diarrhoea and musculoskeletal signs. Signs seen with cobalt deficiency have been illthrift and anorexia. Those with phosphorus deficiency have been illthrift, anorexia, musculoskeletal and nervous signs. Nervous signs have been seen with magnesium deficiency.¹⁰

Exotic diseases

Several important diseases exotic to New Zealand have been recorded in lamoids. Although these are unlikely to be seen here veterinarians should keep in mind that lamoids are susceptible. These diseases include rabies, bluetongue, foot and mouth disease, vesicular stomatitis, borna disease and rinderpest.^{8,9} The clinical appearance of these diseases in llamas and alpacas is similar to that seen in other species.

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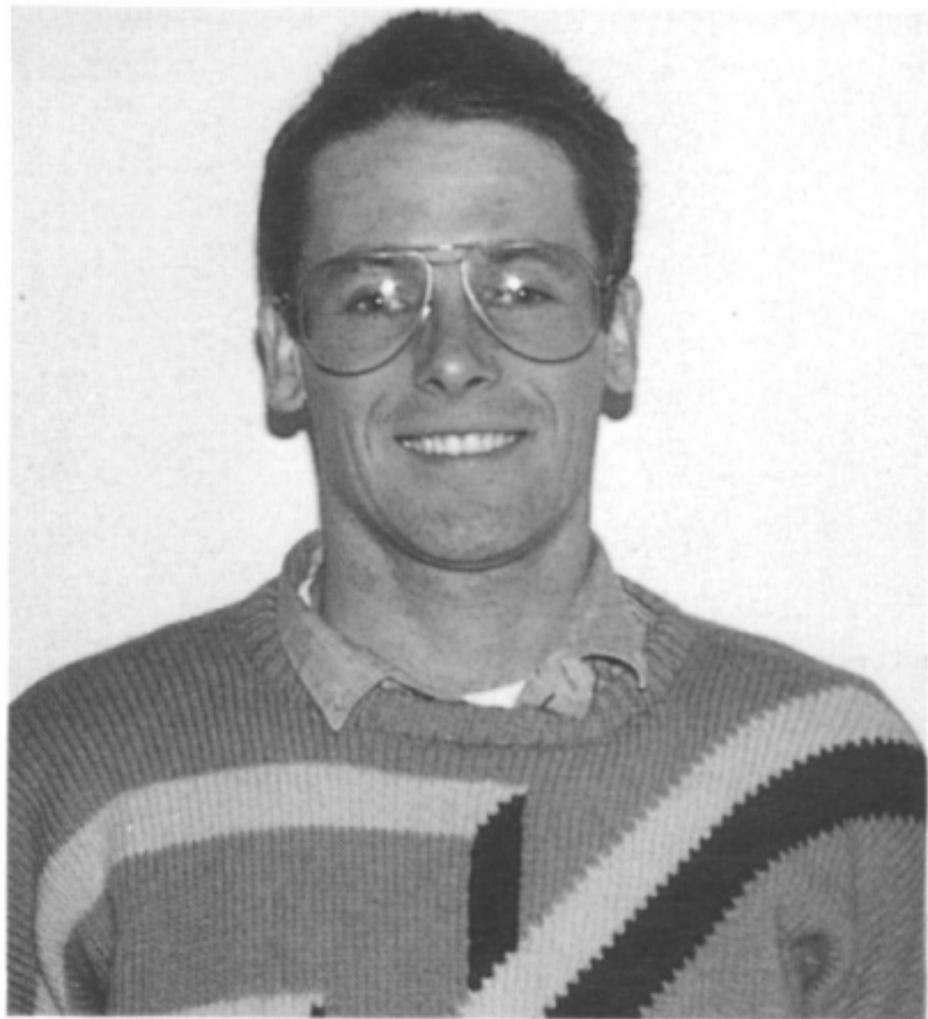
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