PARAPOXVIRUSES IN DOMESTIC LIVESTOCK IN NEW ZEALAND

Introduction

There are four types of common parapoxvirus causing infections in domestic livestock. They include bovine papular stomatitis virus (BPSV), orf virus (contagious pustular dermatitis or CPD) and pseudocowpox virus, which is very closely related and possibly identical to BPSV (Munz and Dumbell, 2004). In addition, parapoxvirus of red deer is considered to be a separate Parapoxvirus species (Robinson and Mercer 1995; Scagliarini et al., 2011). All parapox viruses are potentially zoonotic, causing nodular skin lesions usually on the fingers, hands or arms. Parapoxvirus infections are common in sheep, goats and cattle in New Zealand (Horner et al., 1987). Reports of disease in deer since 1985 suggest it is now relatively common in this species too (Horner et al., 1987; Smith et al., 1988; Hilson, 1997).

In cattle bovine papular stomatitis (BPS) is a common endemic disease that can be confused with vesicular disease. Vesicles and scabby lesions arising from pseudocowpox may also present similarly to those of vesicular disease or lumpy skin disease. Contagious pustular dermatitis is unlikely to be confused with vesicular disease in sheep. The main exotic differential for parapoxvirus in red deer is cervid poxvirus, but this disease has only been identified in mule deer and reindeer. Skin lesions for cervid poxvirus are generally a lot more extensive, with potentially some systemic involvement.

The key points of New Zealand parapoxviruses are summarised below, along with relevant case examples.

Bovine papular stomatitis (BPS)

Positive diagnoses of BPS are made from time to time at the Investigation Diagnostic Centre during investigations to exclude vesicular disease. Clinical disease is typically seen in young cattle, with stress likely to exacerbate the condition. Clinical expression of the disease varies and sometimes it is asymptomatic. In a recent investigation into herpesvirus-associated respiratory disease, BPSV was detected in two of 23 calves (9 percent) without noticeable oral lesions, using virus isolation and PCR from nasal swabs. In another case clinical signs in calves initiated a vesicular investigation, and this is detailed below as a case example.

The incubation period of BPS varies from 3–7 days and in the early stages there may be a mild fever. Generally, only cattle less than two years old are affected and in this age group the morbidity can reach 100 percent. Lesions are characterised by multiple circular papules or erosions up to 15 mm in diameter on the mouth, muzzle, nasolabium, teats, and rarely on the oesophagus and rumen. Lesions expand and may coalesce, becoming slightly depressed with a greyish-brown necrotic centre. Lesions are not generally seen on the tongue. Diagnosis is based on clinical signs, histology, electron microscopy and molecular tests. Serology is of limited value.

CASE EXAMPLE OF BPS IN CATTLE

Eight of 48 calves (17 percent) were affected with a variety of oral lesions. On further examination, their general demeanour was normal, with no drooling, lip smacking, or lameness present, but the affected calves were mildly pyrexic (rectal temperature > 40°C).

There was some variation in the oral lesions. Most were papules (4–5 mm high and 4–5 mm in diameter) present on the underside of the tongue. Periodontal reddening was also present in the oral cavity. On the muzzle and inner lips some of the lesions had coalesced to become ulcerated with peripheral reddening. Other animals present on the farm were unaffected, including another management group of 42 calves and the dairy cow herd.

A biopsy was collected from the papular lesions of one of the affected calves. A portion of the tissue collected was fixed in 10% buffered formalin and the remainder left unfixed for molecular testing. Histological examination revealed a proliferative and erosive dermatitis. Epithelial cells at the margins of lesions contained eosinophilic intracytoplasmic droplets consistent with poxviral inclusions. The fresh tissue tested positive by PCR for Parapoxvirus. Nucleotide sequences had an identity of 99 percent homology to BPSV sequences in the GenBank database.

Pseudocowpox

The presence of pseudocowpox in New Zealand was confirmed in 1968 and at the time it was considered to be relatively common in cattle (Carter et al., 1968). The incubation period is about six days. In a naive herd the disease will present as a rapidly spreading acute outbreak. Lesions begin as papules on the teats (rarely the udder) that progress to crusting with a characteristic horseshoe-shaped spread out to 15–20 mm in width. Generally,
Parapoxvirus of red deer

Until recently parapoxvirus in red deer had only been reported in New Zealand but recently an outbreak was reported from Italy (Scagliarini et al., 2011). In this case severe oral ulceration and erosions were present, in contrast to the New Zealand syndrome where clinical signs are generally mild. The *Parapoxvirus* species found in red deer is considered to be distinct from the other parapoxviruses (Robinson and Mercer, 1985; Moerdyk-Schauwecker et al., 2009).

Disease in New Zealand red deer is characterised by scabby lesions on the muzzle, lips, face, ears, neck and velvet (Horner et al. 1987). Disease is more common in younger animals (< 2 years), with morbidity often reaching 100 percent. Diagnosis is generally made on clinical signs alone, but histology, electron microscopy and molecular tests may also be useful.

**CASE EXAMPLE OF PARAPOXVIRUS IN RED DEER**

This outbreak occurred during the period of velveting (December 2011) and resulting in most of the ~200, two-year-old stags in the two management groups being affected to varying degrees (Figure 3).

The surface lesions on the velvet were characterised by thick serocellular crusts. Histologically these crusts contained massive numbers of degenerate polymorphs, sometimes extending into hair follicles.
The morphological diagnosis of lesions was subacute proliferative dermatitis with ballooning degeneration. Parapox virus of red deer was confirmed by PCR and electron microscopy.

**Contagious pustular dermatitis (CPD)**

This condition is commonly referred to as scabby mouth, and is most often seen in lambs as crusting, proliferative lesions around the mouth and nose; more rarely on the coronary band and interdigital areas of the feet. Transfer of infection to lactating ewes may occasionally cause lesions on the udder. This is the only parapoxvirus in New Zealand against which active vaccination is carried out. A three-year study in the early 1980s reported that about 0.5 percent of lambs slaughtered at meat processing plants had CPD lesions, with the highest incidence in December and January (Robinson, 1983). In this study the percentage of affected lines was greater in the South than the North Island. Factors that may be important in promoting disease include dry conditions, the presence of prickly plants, and management that promotes animal contact and causes damage to the skin (e.g., tailing and ear-tagging).

The condition is easily recognised by both farmers and veterinarians and few cases of CPD have been diagnosed as part of exotic disease investigations.

**Discussion**

The parapox viruses form a group of endemic viruses some of which are important differentials for exotic vesicular diseases such as foot-and-mouth and vesicular stomatitis. In general, parapox lesions can be differentiated from the exotic vesicular diseases by their superficial nature, the absence of vesicle formation, and non-systemic presentation with little or no pyrexia. BPS is, however, of particular relevance as it may present with multiple circular oral papules or erosions that can coalesce to develop depressed, necrotic centres. BPS is a more common initiator of calls to MAF from veterinarians concerned about the potential presence of an exotic vesicular disease.

**REFERENCES**


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