AUSTRALIAN VETERINARY EMERGENCY PLAN

AUSVETPLAN

1996

Disease Strategy

Vesicular stomatitis

AUSVETPLAN is a series of technical response plans that describe the proposed Australian approach to an exotic animal disease incursion. The documents provide guidance based on sound analysis, linking policy, strategies, implementation, coordination and emergency-management plans.

Agriculture and Resource Management Council of Australia and New Zealand

This Disease Strategy forms part of:

AUSVETPLAN Edition 2.0, 1996

[AUSVETPLAN Edition 1.0, was published in 1991]

This strategy will be reviewed regularly. Suggestions and recommendations for amendments should be forwarded to the AUSVETPLAN Coordinator (see Preface).

Record of amendments to this manual:

There are occasional minor differences in the page breaks between the paper and this electronic version which we can unfortunately not avoid.

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PREFACE

This **Disease Strategy** for the control and eradication of **vesicular stomatitis** is an integral part of the **Australian Veterinary Emergency Plan**, or AUSVETPLAN (Edition 2.0). AUSVETPLAN structures and functions are described in the **Summary Document**.

This strategy sets out the disease control principles that were approved in February 1991 by the then Australian Agricultural Council at meeting number 135 for use in a veterinary emergency caused by the introduction of vesicular stomatitis to Australia. This strategy has been updated and approved by the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) out-of-session in January 1996.

Vesicular stomatitis is designated as a List A disease by the Office International des Epizooties (OIE). List A diseases are, 'Communicable diseases which have the potential for serious and rapid spread, irrespective of national borders; which are of serious socioeconomic or public health importance and which are of major importance in the international trade of animals and animal products'. The principles contained in this document for the diagnosis and management of an outbreak of vesicular stomatitis conform with the **OIE International Animal Health Code 1992** (OIE Code; see Appendix 3).

Vesicular stomatitis is included in the list of diseases for which arrangements exist under the Commonwealth/States cost-sharing agreement for the eradication of certain exotic animal diseases. Information on the cost-sharing arrangements can be found in the AUSVETPLAN **Summary Document** and in the **Valuation and Compensation Manual.**

Detailed instructions for the field implementation of the disease strategies are contained in the AUSVETPLAN **Operational Procedures Manuals.** Cross references to strategies, manuals, and other AUSVETPLAN documents are expressed in the form:

> Document name, Section no.
> For example, **Valuation and Compensation Manual, Section 5.**

In addition, *Exotic Diseases of Animals: A Field Guide for Australian Veterinarians* by W.A. Geering, A.J. Forman and M.J. Nunn (Australian Government Publishing Service, Canberra, 1995) is a source for some of the information about the aetiology, diagnosis and epidemiology of the disease and should be read in conjunction with this strategy.

This strategy will be reviewed regularly. Suggestions and recommendations for amendments should be forwarded to:

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The writing group was responsible for drafting this strategy. However, the text may have been amended at various stages of the consultation/approval process and the policies expressed in this version do not necessarily represent the views of all members of the writing group. Contributions may also have been made by other people not listed above and the assistance of all involved is gratefully acknowledged.

CONTENTS

1 NATURE OF THE DISEASE

Vesicular stomatitis (VS) is an infectious viral disease of cattle, horses, pigs and possibly sheep and goats. The disease is characterised by the formation of vesicles in the mouth and on the feet and teats, which are clinically indistinguishable from those caused by foot-and-mouth disease (FMD). The disease produces significant economic losses in livestock, and poses zoonotic risks to people. The epidemiology of the disease is not well understood.

1.1 Aetiology

VS is caused by a vesiculovirus of the family Rhabdoviridae. There are two diverse serotypes: Indiana (with 3 subtypes) and New Jersey. Within serotypes, isolates differ in their physical, chemical and biological properties (Hanson 1985). Pathogenicity is not related to virus type. Other serologically-related vesiculoviruses have been isolated from an opossum in Central America, a person in India, and sandflies in Iran.

1.2 Susceptible species

Clinical disease occurs in cattle, horses and pigs. Natural disease in sheep and goats is rare, although they can be infected experimentally. In cattle the clinical disease is mainly confined to animals over one year old.

Many American wildlife species are also susceptible to VS, including deer, raccoon, skunk, monkeys, sloths, rodents, bats and wild pigs.

Humans can become infected clinically or subclinically with VS virus.

The virus can be propagated in the laboratory in guinea pigs, mice and chicken embryos. Cats, rabbits, hamsters, ferrets and chinchillas have been infected experimentally. Dogs appear to be resistant to infection.

1.3 World distribution and occurrence in Australia

VS is endemic in the Americas, outbreaks having occurred from southern Canada to northern Argentina. The disease has not occurred in Canada since 1948. For further details see Geering et al 1995.

There have been no occurrences of VS in Australia.

1.4 Diagnostic criteria

[For terms not defined in the text see Glossary]

VS is clinically indistinguishable from the other vesicular diseases of livestock, notably FMD. Any vesicular disease in cloven-hoofed animals must be regarded as suspicious of FMD until proven otherwise. VS and FMD have occurred concurrently within the same area and herd, and mixed infections have been induced experimentally in cattle.

1.4.1 Clinical signs

Animals

Many infections with VS virus are subclinical.

The incubation period is short (1–3 days) and the earliest clinical signs in livestock are fever and loss of appetite. Excess salivation, difficulty in eating, lip smacking and lameness may be observed.

Intact vesicles are not frequently seen unless animals are closely examined in the early stages of disease. Thin-walled, isolated or coalescing vesicles (blisters) may appear on the tongue, lips, gums, coronary bands, interdigital skin, or teats near the teat orifice. The vesicles are transitory and readily rupture. The resulting ulcers usually heal rapidly over the next 10 days, although secondary infections may delay healing for several weeks. In many animals, epithelial inflammation, oedema and necrosis occurs but does not progress to gross vesiculation. The area appears blanched before forming a dry ulcer. In any one herd, lesions tend to occur at only one site (mouth, feet or teats).

Affected animals reduce feed intake or stop eating and lose condition. Lactating animals reduce milk production or cease lactation. Unlike FMD, reduction in milk production can be permanent. Mastitis may result from viral infection of the teat canal and mammary epithelium, complicated by secondary bacterial infection. Central nervous system signs (involuntary jaw and tongue movements and intention tremors of the head) have been observed in a small number of cows.

Morbidity is very variable but can be up to 100%. Mortality is low, and usually associated with other concurrent infections.

Signs and lesions are similar in cattle, horses, pigs and deer. In addition, in horses the turbinates, nasopharynx and larynx may be affected, resulting in nose bleeding and difficulty in eating and breathing. Coronary band lesions can lead to deformity and sloughing of the hoof. Lesions can occur on the udder or prepuce.

Humans

Clinical disease in humans has mostly been reported in laboratory workers and veterinarians. However, as the symptoms resemble influenza, many unrecognised cases might occur in rural populations. Up to 90% of farmers in some endemically-infected areas have antibody to VS virus

1.4.2 Pathology

Apart from the vesicles described above there are no other characteristic gross lesions. There are no disease-specific histopathological changes (microscopic lesions).

1.4.3 Laboratory tests

Animal specimens should initially be sent to the State or Territory diagnostic laboratory from where they will be forwarded to the Australian Animal Health Laboratory (AAHL), Geelong for exotic disease testing after obtaining the necessary clearance from the chief veterinary officer (CVO) of the State or Territory of the disease outbreak and informing the CVO of Victoria (for transport of the specimens to Geelong).

Specimens required

The preferred specimens for identification of virus are vesicular fluid and vesicular lesion epithelial coverings or flaps. Other samples that should be collected include swabs and

scrapings from the periphery of ulcers, whole blood, sera and, from dead animals, fresh and formalised samples from several tissues.

Transport of specimens

Unpreserved tissue and blood specimens should be forwarded with water ice or frozen gel packs (dry ice if a delay of more than 48 hours is expected) in an AAHL-approved specimen transport container. For further information see the **Laboratory Preparedness Manual, Section 6 and Appendix 3**.

Laboratory diagnosis

Laboratory tests such as electron microscopy and ELISA can rapidly detect viral antigens and can provide a diagnosis within 4 hours. Tissue cultures, suckling mice or embryonated eggs can be used for virus isolation and subsequent characterisation. The tests currently available at AAHL are shown in Table 1.

Serological tests, including serum neutralisation and ELISA, are useful during trace-back, epidemiological studies and surveillance. However, the degree of cross-reaction with endemic rhabdoviruses in Australia is unknown.

Table 1 Diagnostic tests currently available at AAHL for vesicular stomatitis

Test	Specimen required	Test detects	Time taken to obtain result
ELISA	tissues	viral antigen and typing	4 hours
Electron microscopy	vesicular fluid/epithelium	virus particles	4–6 hours
Virus isolation	tissues	virus	2–4 days
Virus identification	virus isolate	serotype	4 days
Serum neutralisation	serum	antibody	2–3 days

Source: Information provided by AAHL, 1995 [refer to AAHL for the most up-to-date information]

1.4.4 Differential diagnosis

Other diseases in which signs and lesions similar to VS may be seen include:

- e*xotic viral diseases*—foot-and-mouth disease (FMD), swine vesicular disease (SVD), vesicular exanthema (VE), bluetongue, rinderpest, peste des petits ruminants (PPR);
- e*ndemic infectious diseases*—bovine ulcerative mammilitis, pseudocowpox, bovine papular stomatitis, mucosal disease, bovine malignant catarrh, contagious ecthyma ('scabby mouth'), infectious bovine rhinotracheitis / infectious pustular vulvovaginitis;
- *lameness*—footrot, hoof abscess, laminitis, bad floors, new concrete, mud;
- *dermatitis*—scalding, wetting, contact dermatitis, photosensitisation;
- *phytophotodermatitis*—contact with certain plants containing furocoumarins (especially Umbelliferae eg parsnips, celery, parsley) resulting in photosensitisation (Pathak et al 1962, Montgomery et al 1987a, b);
- *trauma*.

Recent or concurrent disease in horses should be investigated to assist differential diagnosis, as other viral vesicular diseases do not affect horses.

1.5 Resistance and immunity

1.5.1 Passive immunity

Maternal antibodies are passed to calves via colostrum and persist for 3–4 months.

1.5.2 Active immunity

Recovered cows develop antibodies that may persist for several years in the absence of apparent reinfection or latent infection. Humoral and cell-mediated immunity persisted for at least 6 months after experimental infection of pigs (Redelman et al 1989).

1.5.3 Vaccination

Attenuated ('live') vaccines, prepared from chicken embryo adapted or cell cultured virus, induce protective immunity in cattle when administered intramuscularly without causing disease or resulting in shedding of virus. In pigs, however, lesions are sometimes induced and virus liberated. Inactivated vaccines have been successfully used in pigs. Cross-immunity between serotypes does not appear to occur (Bennett 1986).

1.6 Epidemiology

Key factors in the epidemiology of VS are:

- domestic animals are probably not the primary hosts of VS virus;
- epidemics occur erratically and behave unpredictably;
- wild animals may act as reservoirs of infection;
- insect vectors are probably involved in transmission;
- topography and climate influence the pattern of disease spread; and
- the virus only enters animals through damaged skin and mucous membranes.

Much of the epidemiology of VS remains unresolved. It has not been established where and how the virus is maintained in nature and how it is transmitted between animals and herds. None of the possible modes of transmission can be excluded and there are no convincing arguments to support one mode over another.

1.6.1 Incubation period

The incubation period in natural outbreaks is generally 1–3 days. However, in one study a mean of 9 days was observed between the introduction of cows to an infected herd and the appearance of clinical signs (Thurmond et al 1987). The OIE Code (see Appendix 3) recommends that, for regulatory purposes, the maximum incubation period be regarded as 21 days.

1.6.2 Persistence of virus

General properties/environment

VS virus is relatively unstable. It apparently survives no more than several days in premises that have housed infected animals although experimentally the virus has been shown to survive longer at lower temperatures, and in the presence of organic matter. The virus is sensitive to moderately high temperatures (50–60°C), acids and alkalis, and ultraviolet light (Hanson 1981). VS virus contains lipids and is sensitive to detergents and most commonly-used disinfectants (see Section 2.2.8).

Live animals

Infectivity diminishes rapidly and may be lost within a week after the vesicles rupture. Virus is shed in vesicular fluids and saliva for a few days only, although an isolation from tongue epithelium 21 days after the first appearance of signs has been reported (Thurmond et al 1987). Virus has not been isolated from faeces or urine of infected or recovered cattle, nor from saliva once lesions have healed.

Immunity appears to be of short duration, probably not longer than six months. Carrier or latent infections have not been demonstrated in domestic animals.

Animal products and by-products

Virus is not found in any part of the edible carcase of infected animals. It has been found in raw milk but it does not survive pasteurisation (Hanson 1981).

1.6.3 Modes of transmission

Infection is thought to spread to and between livestock:

- by direct contact between infected domestic and wild animals and susceptible livestock;
- mechanically by flies feeding on infected secretions;
- mechanically on equipment such as teat cups and harness bits, or on human hands;
- by biting insects — Indiana strains have been isolated from several insects and shown to replicate in mosquitoes and phlebotomine flies; no potential vectors have been identified for New Jersey strains;
- via drinking water or feed contaminated with infected saliva and vesicular fluid; the virus has been isolated from water troughs.

Live animals

VS virus enters livestock hosts through damaged mucosa and skin. The virus cannot penetrate intact tissues. The virus may generalise via a transient viraemia or remain localised in the epithelium, depending on the strain of virus and other unknown factors. This might explain why, in some herds, lesions are confined in most animals to one site (presumably reflecting the route of infection and mode of transmission), whilst in other herds lesions occur more generally within or among individuals. There is no evidence for *in utero* infection. Suckling calves have reportedly been infected from teat lesions.

Infective aerosols and intradermal, subcutaneous and intramuscular injections have been shown experimentally to induce antibody but not disease in cows. Aerosols are thought to play little or no part in disease transmission within or between herds.

Artificial breeding

In bovines transmission in semen is thought to be possible. Transmission is not considered likely via embryos though additional experimental work is necessary.

In pigs and horses the virus is present in and can be transmitted in semen contaminated with vesicular fluid. It is known to be present in ova but transmission is considered unlikely.

There is no viraemia with VS infection, so there can be no haematogenous contamination of semen or embryos with virus. See the **Artificial Breeding Centres Manual, Section 1.5** for further details.

Vectors

VS virus has been isolated from several insect species, including sandflies (*Phlebotomus, Culicoides*), mosquitoes (*Aedes aegypti, Culex pipiens quinquefasciatus, Trichoprosopon digitatum*), mites (*Gigantolaelaps*), gnats (*Hippelates pusion*), horn (buffalo) flies, stable flies (*Stomoxys calcitrans*) and blackflies (buffalo gnats).

In endemic areas, the virus is probably maintained by transmission cycles between insects and wild mammals, though this has not been confirmed. Many wild animals in tropical and subtropical (but not temperate) areas are seropositive to VS virus. Antibodies have not been found in migratory birds, and attempts to infect birds have been largely unsuccessful. It has been hypothesised that the VS virus might be a natural parasite of plants and/or invertebrates that are inadvertently eaten by grazing animals and the virus liberated during mastication.

Human infection

The primary routes of human infection are the respiratory tract via infective aerosols, the nasopharynx and conjunctiva via contaminated hands or contact with infective fluids, and through skin abrasions. Vector transmission cannot be excluded. Foodborne infection is highly unlikely, as the virus is not found in any edible animal tissues and is destroyed in milk by pasteurisation. However, the consumption of raw milk from animals in the early stages of disease could present a risk.

1.6.4 Factors influencing transmission

The factors influencing transmission in the Americas are not well understood, but may include the following.

- *Topography* — the virus is endemic in lowland tropical and subtropical forests and savanna. Outbreaks occur along river valleys, and on plains if there are shade trees and natural surface water. The disease has not been reported on treeless, dry plains or at higher altitudes. This distribution may relate to the habitat of insect vectors.
- *Climate* — outbreaks occur more regularly in tropical and subtropical areas, and infrequently in temperate areas. Outbreaks generally occur during late summer or the end of the wet season, and cease with the onset of frosts or once the dry season is well established. These observations are consistent with insect transmission, though major outbreaks have occurred in southern United States during winter.
- *Feed quality* — transmission can be enhanced by abrasion of the oral mucosa by feed such as coarse roughage, hard pellets, seeds, stubble, rough bushy pasture, or feed contaminated with awns, burrs, thorns or stalks.
- *Husbandry* — transmission may be aided by ill-fitting, poorly maintained or roughly applied milking equipment, harness bits or feeding troughs, which traumatise the teat skin, teat canal or oral mucosa. In cattle and horses, the incidence and severity of disease tends to be higher in animals at pasture than in housed animals. It has been observed in dairy herds that morbidity increased as the quality of management declined (Hansen et al 1985). Identified risk factors include higher stocking densities, poor milking hygiene, poor ground surface conditions, left-over feed and uncleaned feeding troughs.
- *Age* — older dairy cows and calves suffered more disease than other cows (Hansen et al 1985, Goodger et al 1985).
- *Stress* — high producing dairy cows have exhibited more severe disease than low producers.

- *Internal parasitism* — it has been shown experimentally that pigs fed ascarids and VS virus simultaneously are more likely to develop disease.

The disease may make sudden, unexpected geographical jumps. On every occasion in which VS has occurred in the United States, the disease has leapt over, and not extended into, major populations of susceptible cattle whilst returning to herds in areas infected some years before. The disease regularly recurs in some areas, but has never been reported in other counties within the same state with large cattle populations. VS has been observed to appear almost simultaneously over a large area, suggesting that the virus was already widespread and that some event triggered its transmission to livestock. On other occasions, the disease has moved progressively up a river valley or across a state. It has also been seen to spread from two or three apparently independent foci centrifugally outward, moving much faster in some directions than others. In all cases, many herds were spared and the disease did not spread along roads. The pattern of spread did not conform to movements of animals or humans.

As many infections are subclinical, the expression of clinical disease presumably relates to environmental and host factors.

1.7 Manner and risk of introduction into Australia

There are large numbers of susceptible cattle, pigs and horses in Australia and although it is possible that some unknown epidemiological factors are missing from the Australian environment, in the absence of complete scientific data on VS maintenance and spread, it should be assumed that the disease could become established here. As sheep and goats are relatively resistant to VS the disease may be less likely to become established in these species in Australia (Geering 1990).

The most likely route of entry of VS into Australia would be with infected livestock or on contaminated equipment such as harnesses. The virus could theoretically be introduced with insects on planes or ships, or by infected people.

2 PRINCIPLES OF CONTROL AND ERADICATION

2.1 Introduction

The immediate response to a suspected outbreak of VS in cloven-hoofed animals should be, as for any exotic vesicular disease, based on the assumption that it is FMD (see the **Foot-and-mouth Disease Strategy, Section 3**). However, it may be economically and politically desirable to enact a more discreet response pending differential diagnosis and where the diseases is present in horses (see Section 3).

Because the mechanisms of spread of VS are poorly understood, and because outbreaks have not occurred outside endemically infected areas, effective control and eradication methods have not been established. This proposed strategy entails:

- imposing rigid quarantine to control the movement of susceptible animals, people, vehicles, equipment and animal products, especially over infected and dangerous contact premises and high risk enterprises (see Section 2.2.1 and Appendixes 1 and 2);
- judicious slaughter and disposal of infected animals (see Sections 2.2.5, 2.2.7);
- urgent identification of infected and dangerous contact premises through tracing and surveillance. Serological surveys are essential (see Sections 2.2.3, 2.2.4);
- reducing contact between susceptible hosts and biting insects (see Section 2.2.11);
- modifying (potentially) traumatic husbandry practices (see Section 1.6.4); and
- decontamination of the premises and of materials possibly contaminated with virus (see Section 2.2.8).

2.2 Methods to prevent spread and eliminate pathogens

2.2.1 Quarantine and movement controls

Although VS can spread rapidly and cause up to 100% morbidity within affected herds, it is not highly contagious between herds. Nevertheless, outbreaks (especially amongst horses) have been traced to the movement of infected animals. Effective quarantine and movement controls are therefore essential. By helping to prevent further spread of virus, movement controls increase the speed and likelihood of successful eradication, and reduce the cost of control programs and compensation payouts. Initially, stringent controls on the movement and congregation of cattle, horses and pigs should be imposed. These may be relaxed once the situation has been fully assessed.

Quarantine should be imposed by the imposition of declared areas at several levels (see Appendixes 1 and 2):

- *Infected premises (IP)* — a premises on which VS is confirmed or presumed to exist — total movement control, will be imposed.
- *Dangerous contact premises (DCP)* — a premises containing susceptible animals that have been in direct or indirect contact with an IP or infected animals — total movement control will be imposed.

- *Suspect premises (SP)* — premises to which the possible spread of disease is suspected. Provided there is no evidence of infection, quarantine will be lifted.
- *Restricted area (RA)* — an RA will be imposed around all IPs and DCPs, including as many SPs as practical — a high level of movement control and surveillance will apply in the RA.
- *Control area (CA)* — a CA will be imposed around the RA, and include all remaining SPs. The purpose of the CA is to control movement of susceptible animals and potentially-contaminated equipment such as vehicles, for as long as is necessary to complete trace-back and epidemiological studies. Less stringent movement control and surveillance will apply. Once the limits of the disease have been confidently defined, the CA boundaries and movement restrictions should be relaxed or removed.

Overseas experience suggests that the disease is likely to spread, or unrelated foci of infection appear, even with effective movement controls in place. This might or might not happen in Australia.

Affected animals should be promptly segregated to limit the spread of clinical disease within herds. To ensure that cases are detected soon enough, all animals in infected herds should be examined thoroughly and frequently for lesions.

Zoning

If VS became established in only part of a country, it might be possible to establish infected and disease-free zones, which must be effectively sealed off from each other by movement and quarantine controls.

2.2.2 Tracing

Trace-back and trace-forward of all contacts with infected animals and premises should be performed. Tracing should include:

- livestock and horses;
- animal products, feed and bedding;
- vehicles and equipment — transport vehicles, horse floats, feed trucks, horse gear, racetrack stalls; and
- people — veterinarians, AI servicemen, farriers, dentists, branders.

It is likely that the first reported case will not be the index case, and trace-back will identify other, earlier cases (see the **Control Centres Management Manual, Part 1/Section 4.4; Part 2/LRD 101**).

2.2.3 Surveillance

Surveillance during an outbreak should be carefully coordinated to optimise the available resources. In addition to herd inspections, serological surveys are essential to establish the extent of the infection and to locate mildly-infected herds, which otherwise might have escaped detection. Although surveillance may be most intense in the RA, it will need to be more wide-ranging than for other vesicular diseases, and will be driven by findings from the epidemiology unit. Every effort must be made to educate producers about the clinical signs and to report lesions.

2.2.4 Treatment of infected animals

Infected animals have difficulty in moving and eating. They need to be carefully attended, their movement restricted and to be fed soft foods and clean water. There is no treatment for the disease but symptomatic treatment and treatment of secondary infection can assist. General hygiene and improved management practices in the handling of animals, and the proper use and maintenance of equipment, all help to contain the infection.

The animals must be treated with an insecticide to provide protection against spread of virus. Ivermectin and external parasiticides may be used and aerial and ground spraying may be applied to specific limited areas to control insects. Other methods of providing protection from insects include use of repellents and housing of infected animals.

NB As the virus can infect humans care in the handling of infected animals is essential.

2.2.5 Destruction of animals

Stamping out will be sparingly used if the disease is detected in an individual or a small group of animals and it is reasonably assumed that the disease has not spread, has not entered the insect population and the necessary protective measures against insects cannot be provided. Some animals may need to be destroyed for welfare reasons. In either case, adequate hygienic practices should be adopted and carcases must be protected against insects. For further details see the **Destruction of Animals Manual**.

2.2.6 Treatment of animal products and by-products

Milk from infected animals can be infected with virus and, therefore, is a potential source of transmission. However, the virus is readily destroyed by pasteurisation. Meat products are not a source of infection. Nevertheless, products from infected animals must not be used for human consumption. Rendering is an option for disposal of slaughtered animals provided that adequate hygienic practices are adopted.

Hides and skins should not pose problems for transmission but should only be moved under permit when the situation has been fully assessed.

Semen and embryos from infected animals may need to be destroyed, depending on the time of collection as a precaution, although the risk of disease spread through genetic material is not well documented. Semen and embryos from other animals may be assessed on their merits.

2.2.7 Disposal

Slaughtered animals and products should be disposed of on the premises by burial. Carcases need to be adequately protected from insects and the vehicles and areas of disposal must be properly cleaned and disinfected. For further information see the **Disposal Procedures Manual.**

2.2.8 Decontamination

Decontamination of vehicles, premises and animal equipment is important in eliminating virus and containing spread. The VS virus can survive in pens and on animal equipment and be transmitted to susceptible animals. Use of equipment such as teat cups, harness,

feed-troughs and yards can damage the skin and allow transmission to occur. People and vehicles entering and leaving the premises must undergo decontamination procedures.

Cleaning is more important than disinfection in the elimination of VS virus and the virus is sensitive to a wide range of disinfectants (for further information see the **Decontamination Manual, Tables 2.15, 3.21 and 4)**.

2.2.9 Vaccination

Vaccines might, in theory, be used in the control of VS (see Section 1.4.3). However, they have not been widely used overseas due to the costs involved and the sporadic nature of the disease, and commercial vaccines are not currently available.

2.2.10 Wild animal control

In the Americas, VS virus is endemic in many wild animal populations, including wild pigs. These populations are believed to be involved in the maintenance and transmission of VS, although this has not been established. Wild animal control could be important for the control of VS and essential to the eradication of the disease if the virus establishes in vector populations that are in contact with susceptible wild animals.

The actual or potential role of wild animals and the likelihood of contact between wild and infected domestic animals needs to be assessed early in an outbreak. The need to conduct examinations of wild animal populations for infection with VS will depend on the prevalence of populations of susceptible wild animals (horses and pigs) on infected premises and their ability to have close contact with infected livestock.

It is not foreseen as a high priority to take action against susceptible wild animals unless infection is established in them. Where infection is established then programs to reduce contact between infected stock, wild animals and uninfected susceptible stock should be initiated as soon as possible. This may involve improving fencing, or containing, reducing or eliminating (without dispersal) wild animal populations in the RA and CA.

The susceptibility of Australian native animals to VS virus and their likely role in the epidemiology of the disease are unknown. However, given the widespread presence of VS virus in many and diverse wild animal species in the Americas, it is possible that some species of Australian fauna would be susceptible to infection. These populations are more likely to act as potential reservoirs of infection for other vectors than as a direct source of infection to domestic livestock.

If VS is confirmed in wild animals, the source of infection and method of spread amongst wild animals should, if possible, be determined. If wild animals are only being infected from domestic livestock, it is possible that once this source of infection is eliminated, the infection may die out naturally in low-density populations. If, however, wild animals are a primary source of infection or infection is being maintained in wild populations, programs to monitor and control these populations must be instigated. It is thus important to determine the chain of infection before carrying out control activities on wild animals because such activities could disperse disease more widely.

See the **Wild Animal Control Manual (in press)** for details on conducting wild animal population surveys, containment, control, and disease surveillance.

2.2.11 Vector control

The susceptibility of Australian insects to VS virus and their likely role in the epidemiology of the disease are unknown. Some insect species from which VS virus has been isolated occur in Australia (see Section 1.6.3).

Vector control could be important in the control of VS and essential to the eradication of the disease. In practice, monitoring insects for the presence of VS virus and achieving effective insect control are difficult. Nevertheless, it may be possible to locally reduce insect populations and/or the exposure of susceptible animals to insects (see Section 2.2.4). The feasibility of this would depend on the insect species involved and their distribution and abundance, the weather and topography, and the availability of suitable labour and materials.

2.2.12 Sentinel and restocking measures

Restocking will be limited if stamping-out measures have not been applied. In the event that the disease has occurred in a defined area such as a quarantine station or a stable, sentinel animals could be introduced after decontamination procedures are complete. However, the virus does not survive well in the environment (see Section 1.6.2) and the use of sentinel animals would be limited in most circumstances.

2.2.13 Public awareness

VS is a difficult disease to understand and to control and, because it exhibits signs similar to FMD in cattle and pigs, it has the potential to raise major concerns among producers. Close liaison with the industry and the media will be essential to fully inform them of the consequences of VS and of the necessary control measures.

A media campaign must emphasise the importance of inspecting susceptible animals regularly and of reporting suspicious lesions and deaths promptly. The public needs to be informed that animal products are not infective and are therefore not harmful. Maintaining confidence in the product will be a major role of the media and veterinary administrators.

All persons associated with infected animals must be informed that the virus can cause disease in humans. The public must be reassured that there is no risk from contacting or consuming animal products.

3 POLICY AND RATIONALE

3.1 Overall policy for vesicular stomatitis

Vesicular stomatitis (VS) is an OIE List A disease that has the potential for rapid spread, has public health implications, and is important in the international trade of animals as it can be confused with FMD.

The policy is to eradicate the disease, recognising that the virus may be transmitted by a variety of insect vectors and that the disease does not always follow predictable transmission and distribution patterns. If eradication cannot be achieved, the policy will be modified to contain the disease and to minimise the effects on trade.

The strategies that will be employed include:

- ***judicious slaughter* of clinically affected animals;**
- ***quarantine and movement controls* on animal, animal products and things in declared areas to prevent spread of infection;**
- ***tracing and surveillance* to determine the source and extent of infection and to provide proof of freedom from the disease;**
- ***vector control* to protect valuable individual animals in declared areas and to reduce further transmission;**
- ***decontamination* of products and things to eliminate residual virus on infected premises and equipment and to prevent spread in declared areas;**
- ***epidemiological investigations* to determine whether insect or wild animal vectors are implicated in the spread of infection; and**
- ***a public awareness campaign* to facilitate cooperation from industry and the community.**

VS is important because it causes clinical signs resembling foot-and-mouth disease in cattle and pigs, and less often in sheep and goats. It occurs in horses, which is not the case with other vesicular diseases. It is also an important disease in its own right, and can significantly affect production in dairy cattle and performance in horses.

Early diagnosis will be important because FMD will have to be considered. Delay in the definitive diagnosis may have a major effect on international trade for a range of commodities until FMD is excluded. If the disease becomes established, ongoing recurrent outbreaks would result in periodic disruption to our international markets.

VS is included in the Commonwealth/States cost-sharing agreement.

The CVO(s) in the State(s)/Territory(s) in which the outbreak(s) occurs will be responsible for implementing disease control measures (in accordance with relevant legislation), and will make ongoing decisions on follow-up disease control measures in consultation with the Consultative Committee on Exotic Animal Diseases (CCEAD), the State/Territory and Commonwealth governments, and representatives of the affected industries. The detailed control measures adopted will be determined using the principles of control and eradication (Section 2) along with epidemiological information about the outbreak. For further information on the responsibilities of the State/Territory disease control headquarters and local disease control centre(s), see the **Control Centres Management Manual, Part 1, Sections 3 and 4**.

3.2 Strategy for control and eradication

The aim of the selected strategies will be to eliminate the virus if the disease is isolated and limited and insect vectors are not involved. The main strategies to be applied will be quarantine and movement controls, tracing and surveillance in association with an epidemiological investigation to identify the main factors involved in transmission and spread and the likelihood of recurrence. Supportive strategies such as vector control, treatment of clinically-affected animals and improved management practices will all assist in reducing the spread of infection and in meeting the health and welfare needs of affected animals.

While the virus is probably transmitted by insects, it may be maintained in wild animals, including native fauna, and is a difficult disease to control. It is a zoonosis. It is important that liaison with industry, the media and the public is constant and ongoing to ensure all parties are aware of the consequences of the disease and of the required control measures. It should be stressed that the disease does not affect the safety of products.

The most likely event is that VS would occur in imported animal(s) and that with swift implementation of disease control activities there would be no spread of infection.

3.2.1 Stamping out

One option to help eradicate the disease quickly is the adoption of a stamping-out policy to remove a major source of virus with its public health implications. The possibility of confusion with FMD when there is infection in ruminants make the presence of VS in Australia of major concern and its eradication most desirable.

However, stamping out is unlikely to be effective unless the disease is detected in an individual or a small group of animals. If insect vectors are involved and the virus has entered the wildlife populations, slaughtering will be used sparingly. If animals are very valuable (eg expensive thoroughbreds) it is more likely that they will be treated and provided with protection against insects until they are no longer infective.

3.2.2 Quarantine and movement controls

If VS occurs in a valuable horse-breeding or racing stable, then eradication by stamping out may not be a suitable control strategy because of cost and other pressures that can delay action. A suitable strategy in this case may be to isolate the property and animals and await the outcome of epidemiological studies. Every measure should be taken to minimise the chance of virus spread. If the virus can be contained on the property, the infection should die out in due course. However, this ‘wait and see’ policy carries risk if

proper and adequate precautions are not implemented. This policy is supported by the fact that the disease has never spread outside of the Americas although there must have been opportunities.

The infected premises (IP) will be declared. If insects are suspected of being involved neighbouring premises should be declared as dangerous contact premises (DCPs) or suspect premises (SPs). Tracing and surveillance will identify other DCPs and SPs, which will also be subjected to official control. Strict movement controls will be imposed on live animals, which are the main source of disease transmission.

A restricted area (RA) will be declared and the size of this will depend on the presence or absence of insects and wild animal populations. The size should initially cover an area of at least a 100 km radius around the IP. All movements within this area will be restricted. Congregations of animals such as sales, shows and race meetings will be prohibited in the RA.

The control area (CA) around the RA will initially reflect the size of the RA and the factors operating at the time. If initial indications are that infection is limited, a CA of 5–20 km radius outside the RA is suggested. Movement restrictions in the CA will be less severe but will be adequate to ensure controls over susceptible animals, equipment and vehicles.

The epidemiological investigations will help to define the limits of the RA and CA and, as vital information becomes available, modifications to the movement controls may be possible.

Infected animals must be isolated, protected from insects and provided with care and attention.

For further details see Appendixes 1 and 2.

Zoning

If the disease spreads widely or becomes established in wild animal and/or insect populations, eradication by stamping out would be virtually impossible to achieve. The RA and CA could be zoned off, creating infected and free zones.

The size of the infected zone will need to comply with international requirements with an area of at least 100 km radius around the IP. The movement of animals, vehicles and animal equipment will be subject to permit and special conditions may apply. As there is no evidence that domestic animals become latently infected or carriers, recovered animals may be permitted to leave the infected areas.

The disease often occurs only in one area and does not tend to move out of the area if strict controls are applied. This may assist with a zoning program.

3.2.3 Treatment of infected animals

There is no treatment for the disease but symptomatic treatment including treatment for secondary infection will assist. Good management, improved hygiene and the modification of some husbandry practices (to reduce trauma) will help to reduce infection rates and assist some animals to resist infection.

If possible, infected animals should be assembled close to help and be completely isolated with implementation of good quarantine practices. Measures should be taken to prevent the spread of the virus from infected animals by insects. Aerial and ground spraying may

be applied to specific limited areas to control insects. The use of repellents and housing of infected animals will also provide protection (see Section 2.2.4).

Care must be taken to prevent human infection.

3.2.4 Treatment of animal products and by-products

Milk from infected animals must be pasteurised. Meat products are not known to be a source of infection for humans. However, product from clinically-infected animals cannot be used for human consumption. Slaughtered animals can be rendered into meatmeal provided that adequate hygienic practices are adopted, carcases are protected against insects and the vehicles and areas of disposal are properly cleaned and disinfected.

Hides and skins should only be moved under permit when the situation has been fully assessed.

Semen and embryos from infected animals may need to be destroyed, depending on the time of collection. Semen and embryos from other animals may be assessed on their merits.

3.2.5 Vaccination

Safe and effective attenuated vaccines against VS have been developed for use in cattle but are not widely used overseas. Attenuated vaccines for use in pigs can cause lesions and shedding of virus. Inactivated vaccines are considered to be satisfactory for pigs. Vaccines might have a role in limiting the spread and severity of infection, but their potential usefulness in the eradication of VS is not known. Commercial supplies of vaccine are unlikely to be available at the time the outbreak is detected.

3.2.6 Tracing and surveillance

Rapid tracing and surveillance, including an assessment of whether insect populations and wild animals have become infected, will assist in defining the best strategies for the particular situation. Surveillance will be important to identify subclinical cases as these will not be detected during normal inspections. Animals, people, vehicles and animal equipment entering and leaving the premises during the period from 21 days before the first clinical signs and up to the time quarantine was imposed must be traced. As feed could also have been contaminated with virus this must also be included in the tracing priorities.

DCPs and SPs must be quickly identified so that control measures can be imposed.

An epidemiological study will be undertaken concurrently to identify factors that may influence spread, such as weather and insect populations. The results may lead to modified control strategies.

Ongoing surveillance will be required throughout the control/eradication period to monitor progress (see Appendix 4). If the disease cannot be eradicated, surveillance will need to be ongoing to advise other countries of the situation for trade purposes. This will be a requirement if zoning is introduced, to enable better access to overseas markets.

3.2.7 Decontamination

Decontamination of vehicles, premises and animal equipment is important in eliminating virus and containing spread. Virus will survive in pens and on animal equipment and can,

therefore, be transmitted to susceptible animals. Equipment such as teat cups, harness, feed-troughs and yards can result in damage to the skin and allow transmission to occur. Slaughtered animals and products should be disposed of on the premises by burial. People and vehicles entering and leaving the premises will be subjected to decontamination.

3.2.8 Vectors

The epidemiological studies must attempt to provide early advice on whether insects are involved in transmission of the virus and which insects may be involved. If the virus establishes infection in the insect populations, then eradication may be impossible. If the responsible insects are only mechanical transmitters and are likely to die out due to factors such as the onset of cold weather in the region, then the virus may also disappear.

Vector control on an individual or localised basis may prove effective in containing the disease but if infected insects are widely distributed then control is likely to prove impossible.

3.2.9 Wild animal control

If the virus established infection cycles in wild animal populations (including native fauna) and insects are involved in transmission, then eradication would be impossible. Elimination of the range of wild animals that may be involved is not feasible. It would be necessary to continue to monitor wild animal populations to provide information for trade purposes and the prevalence of the virus.

3.2.10 Media and public relations

Close liaison with the industry and the media will be essential, to fully inform them about the consequences of the disease and the control measures. Maintaining confidence in animal products will be a major role of the media and veterinary administrators.

People handling infected animals must be informed that the virus can cause disease in humans. However, there is little risk if infected animals, equipment and products are handled using hygienic standards.

3.3 Social and economic effects

The extent of the social and economic effects of VS would depend on a number of factors including how quickly it was differentiated from FMD, the severity and location of the outbreak, the types and distribution of animals affected, the time of year of the outbreak, the speed with which it was contained and eradicated and the reaction of overseas markets to the importation of Australian livestock, including horses, and animal products, including genetic material.

Restrictions on the local and international movement of horses and on the holding of horse races and other equestrian events could have major social and economic consequences. The Australian horse industry has an annual turnover in excess of $20 billion and contributes significantly to government revenue (AEDLC 1990). Estimates of the effect of a 4-week cancellation of racing in Victoria include losses of stakes of $1–5 million, betting revenue of $150 million, and racing industry income of $50 million affecting 20 500 people (Huntington 1990). In addition, horse racing and other equestrian events provide leisure activities for many thousands of people (see Huntington 1990 for a more

detailed description and discussion of the potential social and economic effects of disease control measures in the horse industry).

The most serious consequences of an outbreak of VS would arise if the disease is initially confused with, and reported in the media or internationally as, FMD. This could result in the immediate cessation of exports of beef, mutton, lamb, live sheep, live cattle, pig products, and probably greasy wool, to our major trading partners. Depending on how long it takes to conclusively diagnose the disease as VS and to convince importers of this diagnosis, the short-term effect on the national economy could be significant. The effect on our major exports of animal products is expected to be minimal after the diagnosis of VS virus is confirmed.

For these reasons, initial investigations of and responses to vesicular diseases should be performed rapidly but prudently until a differential diagnosis is obtained (within 48 hours of reporting). A carefully considered and balanced response must be made so as to contain infection through movement controls and alert relevant personnel to an impending exotic disease campaign, whilst minimising speculation and alarm within the industry, media and general public.

The social and economic effects of VS should be minimal provided the disease was confirmed, contained and eradicated promptly. Quarantine and movement controls will result in loss of market access for some producers. The slaughter of animals, particularly horses, is likely to raise concerns and opposition.

Once introduced, VS might become endemic in Australia with little likelihood of eradication in the long term. This would depend on the presence of wild animal, insect and/or plant populations that could act as reservoirs or vectors of the virus. The probability of this occurring is not known.

VS can cause significant production losses in affected herds and performance losses in affected stables. Losses of US$97-202 per animal were recorded by Goodger (1985) over a two-month period in dairy cattle. Ongoing losses resulted from reproductive problems. Beef cattle will lose weight and marketing will be delayed.

However, outbreaks in many herds are not serious and of no more than nuisance value. The United States has lived with endemic VS for at least 130 years without taking major control measures.

3.4 Criteria for proof of freedom

The OIE Code states that a country is considered to be free from VS when no clinical, epidemiological or other evidence of VS has been found during the previous 2 years (see Appendix 3). If Australia is able to eradicate the disease, it will be necessary to undertake widespread and statistically based surveillance during this two-year period to provide the information for proof of freedom. The survey will need to include an assessment of infection in wild animal and insect populations. See Appendix 4 for further details.

3.5 Funding and compensation

Vesicular stomatitis is included in the list of diseases for which arrangements exist under the Commonwealth/States cost-sharing agreement for the eradication of certain exotic animal diseases. Information on the cost-sharing arrangements can be found in the

AUSVETPLAN **Summary Document, Appendix 3** and in the **Valuation and Compensation Manual.**

3.6 Strategy if the disease becomes established

Zoning must be adopted in an attempt to contain the infection and assist marketing both internationally and domestically.

The OIE Code provides conditions for the importation of animals from countries considered infected with VS. These conditions require the animals to be held in quarantine and protected from insects for 21 days, and be serologically negative and healthy at the time of shipment. No requirements for meat or other animal products are specified. Animal products, apart from milk, do not pose any problems in the transmission of disease. Donors for semen and embryos can be effectively tested and protected from insects during times of collection.

Preventative measures, such as improved management and husbandry practices (and possibly vaccination), can be undertaken to minimise the clinical and economic effects of the disease in affected animals and herds.

APPENDIX 1 Guidelines for classifying declared areas

Infected premises (IP)

A premises classified as an IP will be a defined area (which may be all or part of a property) in which VS disease or virus is known or presumed to exist. IPs will be subject to quarantine served by notice and to eradication or control procedures.

Dangerous contact premises (DCP)

Premises classified as DCPs will be:

- all premises sharing a common boundary with an IP, where susceptible animals have been kept during the period from 21 days before the onset of disease on the IP;
- all premises to which any susceptible animals or equipment (eg teat cups, horse bits) that have been in contact with infected or suspect infected susceptible animals have been moved during a period from 21 days before the onset of clinical signs of VS on the IP;
- all premises on which susceptible animals have been destroyed on suspicion of VS; and
- all premises to which the disease could possibly have spread from an IP by way of movement of people, vehicles, equipment or foodstuffs during the period 21 days before signs of VS on the IP.

Premises classified as DCPs will be subject to quarantine, intensive surveillance and control procedures.

Suspect premises (SP)

Premises classified as SPs will be:

- all premises owned or managed in conjunction with an IP or a DCP;
- other premises on which susceptible animals are kept within the RA; and
- all premises where susceptible animals are kept, from where it is considered that the disease could have spread to the IP during the period from 21 days before the onset of signs of VS on the IP, whether by movement of animals (including wild animals), people, vehicles, equipment or feed.

SPs will be subject to quarantine and intensive surveillance.

Restricted area (RA)

An RA will be drawn around all IPs and include as many DCPs as practical. The actual distance in any one direction will be determined by factors such as geographic features, and where there is infection of insects and/or wild animals, the occurrence of insects and the distribution and movement of livestock and wild animals.

The boundary of the RA should be at least 1 km from the boundary of the IP or any DCP. There should be at least two stockproof barriers between the IP or DCP and the outer boundary of the RA. In areas where infection has established in susceptible wild animal populations, the RA should include an area substantially greater than the home range of the wild animals so that any wild animals that are likely to have been infected are contained within the RA. The boundaries would be modified as new information came to hand.

Control area (CA)

The boundary of the CA should initially be large and substantially exceed the home range of any susceptible wild animals within the area. Where there is no infection of insects and wild animals, the CA should have a 5–20 km radius.

APPENDIX 2 Recommended quarantine and movement controls

Infected and dangerous contact premises	Suspect premises
Movement out of susceptible animals: Prohibited.	Prohibited. Subject to intense surveillance.
Movement in of susceptible animals: Prohibited.	Allowed under permit (1). Subject to surveillance.
Movement out of other animals: Allowed under permit (2).	Allowed under permit (2).
Movement in and out of people: Allowed with appropriate decontamination.	Allowed with appropriate decontamination.
Movement in and out of vehicles and equipment: Allowed under permit (2).	Allowed under permit (2).
Movement out of carcases, meats, milk, skins, other products, offal, wastes from susceptible animals: Prohibited, except under permit (3).	May be allowed under permit (3) or after quarantine is lifted.
Movement out of semen, embryos: Allowed under permit (4).	Allowed under permit (4) or after quarantine is lifted.
Movement out of crops: May be allowed under permit (5).	Allowed under permit (5).
Restricted area	**Control area**
Movement out of susceptible animals: Prohibited, except under permit to slaughter.	Prohibited, except under permit into contiguous RA or to slaughter.
Movement in of susceptible animals: Movement from a free area or contiguous CA to an abattoir allowed under permit. Essential movement to a property may be permitted (1).	Movement from free areas to an abattoir or farm (1) allowed under permit.
Movement within of susceptible animals: Movement to an abattoir for immediate slaughter or to a farm (1) may be allowed under permit.	Movement to an abattoir or farm (1) allowed under permit.

Movement through of susceptible animals:
Direct movement by road or rail may be allowed by permit, provided the origin and destination are outside the RA and CA; the stock are not unloaded en route.

Risk enterprises:

May continue to operate with movements being under permit.	May continue to operate under permit.
Sales, shows, races, etc:	
All concentrations of susceptible animals prohibited.	May continue to operate under permit.
Movement of carcases, meats, milk, skins, other products, offal, wastes from susceptible animals:	
Movement into or within the RA allowed under permit (3). Movement out of the RA prohibited.	Movement into or within the CA allowed. Movement out of the CA unrestricted.
Movement out of semen, embryos:	
Allowed under permit (4).	No restrictions.

Vehicles:
Vehicles used to carry susceptible animals to be decontaminated between loads under supervision.

Notes:

(1) Permits for the movement of susceptible animals onto an SP or into the RA or CA should be issued with caution. Although such movements may pose no risk of spreading infection, compensation may be payable if these animals become infected. Stock must remain on the property for at least 21 days and be inspected before any further movement occurs.

(2) Movement of people, other animals, vehicles and equipment off IPs, DCPs and SPs should be restricted and subject to quarantine and decontamination to prevent mechanical spread of VS virus. Wherever possible, movement from IPs and DCPs should be delayed until after the completion of destruction, disposal, cleaning and first disinfection, and from SPs until 21 days has elapsed and quarantine has been lifted [see the **Decontamination Manual, Table 3.21).**

(3) Animal products and wastes from IPs and DCPs should preferably be disposed of on site or (for SPs only) held on site until quarantine is lifted. However, these materials probably pose little risk of spreading VS, and their movement may be permitted provided that:
- milk is pasteurised;
- vehicles, containers, etc are decontaminated between loads to prevent mechanical transfer of virus;
- products or wastes are not brought into contact with or fed to susceptible animals; and
- wastes are disposed of in an approved manner.

(4) Semen and embryos collected from susceptible animals on IPs and DCPs within 21 days preceding the first signs of VS should be destroyed and disposed of on site. Genetic material collected before this time may be removed after decontamination has been completed and the outside surfaces of containers, vials and straws have been disinfected. Other genetic material collected within the RA should be held and only released if the animals and premises of origin remain free of VS for 21 days after collection. If any doubt exists, the material should be destroyed and disposed of (see the **Disposal Procedures Manual, Section 4.5**). Embryos that have been collected, prepared with an intact zona pellucida and subjected to trypsin washings, according to IETS principles, are safe from VS infection.

(5) Crops and grains grown on paddocks that have been grazed by infected animals at any time during the 21 days preceding the likely onset of VS on the property must be disposed of on site. Other crops may be removed from IPs and DCPs after the completion of cleaning and disinfection, and from SPs after quarantine has been lifted (21 days). The crops must not be fed to or used as bedding or litter for susceptible animals. Epidemiological advice should be sought.

APPENDIX 3 OIE International Animal Health Code for vesicular stomatitis [1995]

[NB The following text is taken directly from the OIE International Health Code (1992), Chapter 2.1.2. For definitions, Appendixes, etc see the original text. The OIE Codes are amended every year in May. The Code for VS was amended in 1995; the amended version is shown below.]

Preamble: For diagnostic test, reference should be made to *Manual* (A2) [☞see OIE publications under References].

Article 2.1.2.1.

For the purposes of this *Code,* the *incubation period* for vesicular stomatitis (VS) shall be 21 days.

Article 2.1.2.2.

For the purposes of this *Code*:

VS: *free country*

A country may be considered free from VS when:

1) VS is notifiable in the country;
2) no clinical, epidemiological or other evidence of VS has been found during the past two years.

Article 2.1.2.3.

Veterinary Administrations of VS *free countries* may prohibit importation or transit through their territory, directly or indirectly, from countries considered infected with VS of:

bovine, ovine, caprine, porcine and equine animals and deer.

Article 2.1.2.4.

When importing from VS *free countries, Veterinary Administrations* should require:

for domestic cattle, sheep, goats, pigs and horses

the presentation of an *international animal health certificate* attesting that the animals:

1) showed no clinical sign of VS on the day of shipment;
2) were kept in a VS free country since birth or for at least the past 21 days.

Article 2.1.2.5.

When importing from VS *free countries, Veterinary Administrations* should require:

for wild bovine, ovine, caprine, porcine and equine animals and deer

the presentation of an *international animal health certificate* attesting that the animals:

1) showed no clinical sign of VS on the day of shipment;
2) come from a VS free country;

if the country of origin has a common border with a country considered infected with VS:

3) were kept in a *quarantine station* for the 30 days prior to shipment and were subjected to a diagnostic test for VS with negative results at least 21 days after the commencement of quarantine;

4) were protected from insect vectors during quarantine and transportation to the *place of shipment.*

Article 2.1.2.6.

When importing from countries considered infected with VS, *Veterinary Administrations* should require:

for domestic cattle, sheep, goats, pigs and horses

the presentation of an *international animal health certificate* attesting that the animals:

1) showed no clinical sign of VS on the day of shipment;

2) were kept since birth or for the past 21 days, in an *establishment* where no case of VS was officially reported during that period; or

3) were kept in a *quarantine station* for the 30 days prior to shipment and were subjected to a diagnostic test for VS with negative results at least 21 days after the commencement of quarantine;

4) were protected from insect vectors during quarantine and transportation to the *place of shipment.*

Article 2.1.2.7.

When importing from countries considered infected with VS, *Veterinary Administrations* should require:

for wild bovine, ovine, caprine, porcine and equine animals and deer

the presentation of an *international animal health certificate* attesting that the animals:

1) showed no clinical sign of VS on the day of shipment;

2) were kept in a *quarantine station* for the 30 days prior to shipment and were subjected to a diagnostic test for VS with negative results at least 21 days after the commencement of quarantine;

3) were protected from insect vectors during quarantine and transportation to the *place of shipment.*

APPENDIX 4 Procedures for surveillance and proof of freedom

Australia's freedom from VS will be considered after a period of 2 years in which no disease is detected. A declaration of freedom from VS will need to be supported by extensive serological testing.

After the outbreak has been controlled, all properties at risk must be kept under surveillance for at least 2 years. Properties considered to be at risk would be all those in the RAs as well as any other properties that may have been designated as DCPs or SPs as a result of tracing activities. The confidence/prevalence levels used as the basis for this surveillance would be determined at the time of the outbreak.

Procedures for surveillance

In determining an effective but efficient program to prove freedom after an outbreak the following elements should be considered.

1) The livestock within the restricted, control and free areas should, if possible, be defined into discrete populations for the purposes of surveillance.
2) The number of properties detected as infected during the outbreak, and the degree of spread this indicates.
3) The estimated time the virus could have been present in the country.
4) The movement of livestock as recorded on ANEMIS during the outbreak. Surveillance planning needs to take into account the OIE-designated period of 21 days for the maximum incubation period of vesicular stomatitis.
5) The accuracy, cost and availability of laboratory tests to examine a large number of animals.
6) Whether vaccine has been used (very unlikely; see Section 2.2.9).
7) The resources available to undertake surveillance testing. Close cooperation between the epidemiologist and resources manager is essential. However, limited resources should not compromise achieving a scientifically acceptable result. For example savings may be accomplished by:
   - collecting material from abattoirs, even though material can only be selected from specific age groups; and
   - organising the program over a slightly longer period.

All these factors will influence the statistically acceptable sample size of testing required for Australia to claim freedom from disease. Clearly the pattern and timing of testing will depend on the specific circumstances, but should aim at expanding the free area. A country can not claim freedom unless clinical, epidemiological or other evidence of vesicular stomatitis has been looked for but not been detected during the last two years (see Appendix 3).

GLOSSARY

ANEMIS	*An*imal Health *E*mergency *I*nformation *S*ystem. A system for the collection, assimilation, actioning and dissemination of essential disease control information using paper documentation and a computer database.
Animal by-products	Products of animal origin destined for industrial use, eg raw hides and skins, fur, wool, hair, feathers, hooves, bones, fertiliser.
Animal products	Meat products and products of animal origin (eg eggs, milk) for human consumption or for use in animal feeding.
AUSVETPLAN	A series of documents that describe the Australian response to exotic animal diseases, linking policy, strategies, implementation, coordination and counter-disaster plans.
Consultative Committee on Exotic Animal Diseases	A committee of State/Territory CVOs, AAHL and CSIRO, chaired by the CVO of Australia (Cwlth DPIE), to consult in emergencies due to the introduction of an exotic disease of livestock, or serious epizootics of Australian origin.
Control area	A declared area in which defined conditions apply to the movement into, out of, and within, of specified animals or things. Conditions applying in a control area are of lesser intensity than those in a restricted area (*see* Appendix 1).
Dangerous contact animal	An animal showing no clinical signs of disease but which, by reason of its probable exposure to disease, will be subjected to disease control measures.
Dangerous contact premises	Premises containing dangerous contact animals (*see* Appendix 1).
Decontamination	Includes all stages of cleaning and disinfection.
ELISA	Enzyme-linked immunosorbent assay — a serological test designed to detect and measure the presence of antibody or antigen in a sample. The test uses an enzyme reaction with a substrate to produce a colour change when antigen–antibody binding occurs.
Fomites	Inanimate objects (eg boots, clothing, equipment, vehicles, crates, packagings) that can carry the exotic agent and spread the disease through mechanical transmission.
Incubation period	The time that elapses between the introduction of the pathogen into the animal and the occurrence of the first clinical signs of the disease.
Infected premises	*see* Appendix 1.
Local disease control centre	An emergency operations centre responsible for the command and control of field operations in a defined area.
Movement controls	Restrictions placed on movement of animals, people and things to prevent dissemination of disease.

Premises	A defined area or structure, which may include part or all of a farm, enterprise or other private or public land, building or property.
Prevalence	The number of cases of a specific disease (or infection or positive antibody titre) occurring in a given population at a particular time (expressed as the proportion of sampled animals with the condition of interest at a given time).
Quarantine	Legal restrictions imposed on a place, animal, vehicle or other things limiting movement.
Rendering	Processing by heat to inactivate infective agents. Rendered material may be used in various products according to particular disease circumstances.
Restricted area	A declared area in which defined rigorous conditions apply to the movement into, out of, and within, of specified animals, persons or things (*see* Appendix 1).
Risk enterprise	A livestock or livestock-related enterprise with a high potential for disease spread, eg an abattoir, milk factory, artificial breeding centre or livestock market.
Salvage	Recovery of some (but not full) market value by treatment and use of products, according to disease circumstances.
Sentinel animals	Animals of known health status monitored for the purpose of detecting the presence of a specific exotic disease agent.
Serosurveillance	Surveillance of an animal population by testing serum samples for the presence of antibodies to disease agents.
Serotype	A subgroup of a genus of microorganisms identifiable by the antigens carried by the members.
Serum neutralisation	A type of serological test designed to detect and measure the presence of antibody in a sample. The test is based on the ability of an antibody to neutralise the biological activity of an antigen.
Stamping out	Eradication procedures based on quarantine and slaughter of all infected animals and animals exposed to infection.
State/Territory disease control headquarters	The emergency operations centre that directs the disease control operations to be undertaken in the State/Territory.
Surveillance	A systematic program of inspection and examination of animals or things to determine the presence or absence of an exotic disease.
Susceptible species	Animals that can be infected with the disease (for VS — pigs, cattle, horses, humans).
Suspect animals	An animal which may have been exposed to an exotic disease such that its quarantine and intensive surveillance is warranted; OR an animal not known to have been exposed to a disease agent but showing clinical signs requiring differential diagnosis.
Suspect premises	Premises containing suspect animals (*see* Appendix 1).
Tracing	The process of locating animals, persons or things that may be implicated in the spread of disease, so that appropriate action be taken.

Vaccine	
– inactivated	A vaccine prepared from a virus that has been inactivated ('killed') by chemical or physical treatment.
– attenuated	A vaccine prepared from infective or 'live' microbes that have lost their virulence but have retained their ability to induce protective immunity.
Vector	A living organism (frequently an arthropod) that transmits an infectious agent from one host to another. A *biological* vector is one in which the infectious agent must develop or multiply before becoming infective to a recipient host. A *mechanical* vector is one that transmits an infectious agent from one host to another but is not essential to the life cycle of the agent.
Vesicular disease	Any disease in which intact, ruptured or healing blisters, papules or ulcers may be evident on skin or mucosal surfaces.
Viraemia	The presence of viruses in the blood.
Zoning	Dividing a country into defined infected and disease-free zones. A high level of movement control between zones will apply.
Zoonosis	Disease transmissible from animals to people.

Abbreviations

AAHL	CSIRO Australian Animal Health Laboratory, Geelong
AI	Artificial insemination
ANEMIS	Animal health emergency information system
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
CA	Control area
CCEAD	Consultative Committee on Exotic Animal Disease
CVO	Chief veterinary officer
DCP	Dangerous contact premises
DPIE	Department of Primary Industries and Energy (Cwlth)
ELISA	Enzyme-linked immunosorbent assay
FMD	Foot-and-mouth disease
IETS	International Embryo Transfer Society
IP	Infected premises
OIE	World Organisation for Animal Health [Office International des Epizooties]
RA	Restricted area
SP	Suspect premises
SVD	Swine vesicular disease
VE	Vesicular exanthema
VS	Vesicular stomatitis

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Training resources

Foot-and-mouth disease and other vesicular diseases (72 slides), available from the Animal Diseases/Incidents Section, DPIE, Canberra

[See the **Summary Document** for a full list of training resources.]

OIE publications

OIE Code (1992). *International Animal Health Code* (6th edition), OIE, Paris, France.

OIE Manual (1992). *Manual of Standards for Diagnostic Tests and Vaccines* (2nd edition), OIE, Paris, France.

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