AUSTRALIAN VETERINARY EMERGENCY PLAN

AUSVETPLAN

Response strategy

Infectious bursal disease (hypervirulent form)

Version 5.0

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

National Biosecurity Committee

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Contents

1 Introduction

1.1 This manual

1.1.1 Purpose

As part of AUSVETPLAN (the Australian Veterinary Emergency Plan), this response strategy contains the nationally agreed approach for the response to an incident – or suspected incident – of infectious bursal disease (hypervirulent form) in Australia. It has been developed to guide decision making to ensure that a fast, efficient and effective response can be implemented consistently across Australia with minimal delay.

1.1.2 Scope

This response strategy covers IBD caused by virulent infectious bursal disease virus and exotic antigenic variant infectious bursal disease virus.

This response strategy provides information about:

- the disease (Section 2)
- the implications for Australia, including potential pathways of introduction, social, environmental, human health and economic effects, and the critical factors for a response to the disease (Section 3)
- the agreed policy and guidelines for agencies and organisations involved in a response to an outbreak (Section 4)
- declared areas and premises classifications (Section 5)
- biosecurity controls, including quarantine and movement controls (Section 6)
- response surveillance and establishing proof of freedom (Section 7).

The key features of IBD are described in the **infectious bursal disease (hypervirulent form) Fact Sheet** (Appendix 1).

1.1.3 Development

The strategies in this document for the diagnosis and management of an outbreak of IBD are based on risk assessment. They are informed by the recommendations in the World Organisation for Animal Health (OIE) *Terrestrial animal health code* (Chapter 10.8) and the OIE *Manual of diagnostic tests and vaccines for terrestrial animals* (Chapter 3.3.12). The strategies and policy guidelines are for emergency situations and are not applicable to policies for imported animals or animal products.

This manual has been produced in accordance with the procedures described in the **AUSVETPLAN *Overview***, and in consultation with Australian national, state and territory governments; the relevant livestock industries; nongovernment agencies; and public health authorities, where relevant.

In this manual, text placed in square brackets [xxx] indicates that that aspect of the manual remains unresolved or is under development; such text is not part of the official manual. The issues will be worked on by experts and relevant text included at a future date.

1.2 Other documentation

This response strategy should be read and implemented in conjunction with:

- other AUSVETPLAN documents, including the operational, enterprise and management manuals; and any relevant guidance and resource documents. The complete series of manuals is available on the Animal Health Australia website[1]
- relevant nationally agreed standard operating procedures (NASOPs).[2] These procedures complement AUSVETPLAN and describe in detail specific actions undertaken during a response to an incident. NASOPs have been developed for use by jurisdictions during responses to emergency animal disease (EAD) incidents and emergencies
- relevant jurisdictional or industry policies, response plans, standard operating procedures and work instructions
- relevant Commonwealth and jurisdictional legislation and legal agreements (such as the Emergency Animal Disease Response Agreement – EADRA[3]), where applicable.

1.3 Training resources

EAD preparedness and response arrangements in Australia

The EAD Foundation Online course[4] provides livestock producers, veterinarians, veterinary students, government personnel and emergency workers with foundation knowledge for further training in EAD preparedness and response in Australia.

[1] www.animalhealthaustralia.com.au/our-publications/ausvetplan-manuals-and-documents
[2] www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/nationally-agreed-standard-operating-procedures
[3] https://animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement
[4] www.animalhealthaustralia.com.au/emergency-animal-disease-training-program

2 Nature of the disease

Infectious bursal disease (IBD) is an acute, contagious viral infection that causes immunosuppression in young chickens and disease and mortality in 3–6-week-old chickens (van den Berg et al 2000, Lukert and Saif 2003). The virus infects actively dividing B lymphocytes within the bursa of Fabricius, leading to immunosuppression of varying duration and severity, and increased susceptibility to secondary viral and bacterial infections.

2.1 Aetiology

IBD is caused by a virus of the genus Avibirnavirus of the family Birnaviridae. There are two serotypes of the virus: IBD virus serotype 1 and IBD virus serotype 2. IBD virus serotype 1 is an important pathogen of chickens. Antibody has been detected but no clinical disease has been reported in chickens or turkeys as a result of infection with IBD virus serotype 2 (Lukert and Saif 2003). However, antibodies to serotype 2 viruses can cross-react with antibody to serotype 1 in some commercial enzyme-linked immunosorbent assay (ELISA) kits.

This AUSVETPLAN manual deals only with serotype 1 IBD viruses.

Serotype 1 IBD viruses can be classified in a number of ways, based on phenotypic traits (such as antigenicity and pathogenicity) and genetic molecular traits (nucleotide sequence of the gene coding for the viral protein VP2) (Lukert and Saif 2003).

Based on their phenotypic traits, serotype 1 IBD viruses can be classified as attenuated (vaccine strains), classical (standard), antigenic variant, and very virulent (also known as hypervirulent) strains (van den Berg et al 2000). This classification is also supported by the genetic traits — that is, VP2 amino acid sequence differences. Both classical and antigenic variant strains exist in Australia, but these are genetically different from classical, variant and very virulent strains found overseas (Sapats and Ignjatovic 2000, Ignjatovic and Sapats 2002). 'Classical' serotype 1 virus strains were responsible for most IBD problems in Europe, Asia, Australia and the United States until about 1987, when the first very virulent IBD (vvIBD) virus strains appeared in Europe. The vvIBD viruses spread throughout Europe, the Middle East and Asia by 1992 but were not recognised in North America, several northern European countries, New Zealand or Australia (Lasher and Shane 1994).

In the United States, antigenic variation has resulted in 'variant' strains of serotype 1 IBD virus that are mainly associated with immunosuppression. These strains are a distinct immunogenic type that can replicate and cause lesions in the bursa in the presence of immunity to classical viruses. Vaccines manufactured from classical serotype 1 viruses do not protect well against them (Rosenberger et al 1987). They are thought to have evolved under genetic selection pressure from vaccination.

Antigenic variant-like strains have also been described in Asia, Europe, and Central and South America. The endemic classical and variant serotype 1 viruses in Australian poultry flocks cause immunosuppression and atrophy of the bursa, with occasional haemorrhage and swelling of the bursa, but do not generally cause mortalities. In addition, some live IBD vaccines used in Australia based on classical strains can cause similar gross and histopathological changes to the bursa as the field viruses, especially when administered to chickens with no or low levels of maternal antibody. Antigenic variant strains have been reported in Australia, but these are antigenically, genetically, and phylogenetically distinct from variants in the United States (Sapats and Ignjatovic 2000). The latter are termed 'exotic antigenic variant' (eav) strains.

2.2 Susceptible species

Chickens
Antibodies to serotype 1 IBD viruses are widely distributed. As vaccines are used in virtually all countries, the prevalence of natural infection is difficult to determine (McFerran 1993), but the virus is considered to be ubiquitous.

All commercial breeding flocks in Australia are vaccinated with both live and inactivated IBD vaccines based on classical strains of serotype 1 vaccine viruses. Progeny of vaccinated flocks have variable and declining passive immunity to IBD for several weeks after hatching. A high level of maternal antibodies will protect most young chickens against challenge by vvIBD virus for up to 3 weeks after hatching (van den Berg 2000). In addition, the persistence of the endemic serotype 1 virus between flocks and subsequent infection should provide most chickens older than 3 weeks with active antibodies for protection against clinical disease. However, because young meat and layer chickens are not commonly vaccinated in Australia, the most susceptible population will be those chickens with low or no maternal antibodies that have failed to develop active antibodies. Overseas, outbreaks of vvIBD have been most commonly observed in 3–4-weekold chickens.

Progeny of parent flocks vaccinated with classical strains of IBD virus may have poor maternal immunity against eav strains of the virus (Ignjatovic et al 2001).

Turkeys
Antibodies to classical serotype 1 strains and serotype 2 strains of IBD virus have been demonstrated in turkeys in the United Kingdom and in the United States but not in Australia. Although microscopic changes have been observed in the bursa of Fabricius of turkeys, there were no clinical signs of IBD. There are no records of the occurrence of vvIBD or eav virus in turkeys.

Ducks
A serotype 1 IBD virus has been isolated from the faeces of clinically healthy adult ducks, but the significance of the isolation is uncertain (McFerran 1993, Wang et al 2007).

Geese
IBD virus has been isolated from a goose in China (Wang et al 2007).

Game birds
Antibodies to serotype 1 IBD virus have been found in pheasant, guinea fowl and quail, and quail may shed the virus for several days after experimental inoculation. In one experimental study, guinea fowl inoculated with IBD virus developed clinical signs and pathology typical of IBD, and transmitted the infection to in contact chickens (Adewuyi et al 1989).

Ratites
Birnavirus-like virus particles have been isolated from ostriches. Antibody to IBD virus has been reported in ostriches from Israel.

Waterfowl
Antibodies have been detected in magpie geese (*Anseranus semipalmata*), shearwaters (*Puffineus carnepies*), sooty terns (*Sterna fuscata*), common noddy (*Anous stolidus*), silver gulls (*Larus novaehollandiae*) and black ducks (*Anas superciliosa*) in Australia. Serotype 1 antibodies have been reported in a silver gull, serotype 2 antibodies in magpie geese and common noddies, and both serotypes in shearwaters and black ducks.

In 1997, antibody to IBD virus was detected in emperor penguins in the Antarctic.

Other birds
Antibodies have been reported in crows and pigeons and in village weavers (*Ploceus cucullatus*) and pied cordon bleus (*Uraeginthus bengalus*) in Nigeria. IBD virus has been isolated from a sparrow in China.

Other animals and humans
There is no evidence that IBD virus can infect other animals.

2.2.1 Zoonotic potential

IBD does not affect humans.

2.3 World distribution

For the latest information on the distribution of IBD, refer to the World Organisation for Animal Health (OIE) World Animal Health Information Database.[5]

2.3.1 Distribution outside Australia

Classical serotype 1 strains are endemic throughout the world.

A strain with low virulence was identified in New Zealand in 1993; an eradication program was implemented in 1994, and no cases have been found since 1999.

Very virulent IBD was first described in the Netherlands in 1987 (de Vries 1990). By 1990, it had spread throughout Europe, and by 1992 to the Middle East, Africa, South America and Asia. The vvIBD virus is now endemic in most parts of southern Asia, including most of the Indonesian islands, but has not been reported in the United States, several northern European countries, New Zealand or Australia.

Variant IBD viruses were first reported in the Delmarva Peninsula region of the eastern United States in 1984. Variant strains are the predominant viruses in the United States (Lukert and Saif 2003).

2.3.2 Occurrence in Australia

Classical serotype 1 strains were first identified in Australia in 1974 (Firth 1974). The classical strains reported in Australia are genetically different from the classical strains found overseas. Very virulent strains have not been reported in Australia.

Very virulent IBD has not been reported in Australia.

[5] www.oie.int/animal-health-in-the-world/the-world-animal-health-information-system/the-oie-data-system

2.4 Epidemiology

Key factors in the epidemiology of vvIBD and eavIBD are:

- The disease is highly contagious, spreading through the movement of poultry products, equipment, feed bags, vehicles and people, and, to a lesser extent, through aerosols of dust.
- Clinical signs of the disease are age related, with birds 3–6 weeks most susceptible to clinical disease.
- The antibody status of the exposed birds will influence the clinical expression of the disease.
- The genotype of the birds affects clinical expression, with layer breeds being more susceptible.
- The virus is highly resistant to heat and chemicals, and can persist in the shed environment for at least 4 months.
- Normal shed cleaning practices may be inadequate to eliminate the virus.
- Processed and frozen poultry meat may contain infectious virus.
- The virus is not egg transmitted but can survive on the eggshell surface.
- Natural infection is usually via the oral route, but the upper respiratory tract and conjunctiva (eye) probably also play a role.
- The role of wild birds and rodents is uncertain, but they may act as mechanical carriers.
- Mealworms (*Alphitobius diaperinus*) have been implicated as reservoirs, and *Aedes vexans* mosquitoes as vectors, of IBD virus. Mealworms are extremely difficult to eliminate from earthen-floored sheds.
- Infected chickens continue to excrete the virus in their faeces for up to 2 weeks after infection.

2.4.1 Incubation period

The viral incubation period is 2–3 days. Virus excretion can begin as early as 24 hours after infection.

OIE incubation period

For the purposes of the OIE *Terrestrial Animal Health Code,* the incubation period for IBD is 7 days.

2.4.2 Persistence of agent and modes of transmission

General properties

IBD is one of the most contagious and persistent poultry diseases, because of the ubiquity of the virus and the ease with which vvIBD spread to most countries from 1987 to 1992. In Australia and overseas, IBD viruses have gained entry to several SPF flocks that were housed under rigorous biosecurity.

In chickens, the highest virus titres are found in the bursa, which can inadvertently be left attached to the carcase after processing. Virus is also found in other lymphoid tissues, such as the thymus, bone marrow and muscle (but at lower titres). Therefore, processed and frozen poultry may contain infectious virus.

The virus is resistant to:

- pH conditions of 2–11, but it is inactivated at pH 12 (Lukert and Saif 2003)
- heat treatment, including normal domestic or commercial cooking processes [unpublished work conducted in 1997 at the Quality Control Unit, Central Veterinary Laboratory, Alderstone, United Kingdom, showed that a mix of bursal homogenate (23%), skin and fat (4%), muscle tissue (23%) and peptone broth (50%) contained no viable IBD virus only after cooking at 80°C for at least 120 minutes (Quality Control Unit 1997)]; and
- ether and chloroform (but is inactivated by a 2% chloramine solution, formalin at certain temperatures, glutaraldehyde and alkyl dimethyl-benzylammonium chloride).

Environment (including windborne spread)

IBD virus is very stable and persists in poultry houses even after cleaning and disinfection (Lukert and Saif 2003). The virus has been shown to remain infectious for 122 days in a chicken house, and for 52 days in feed, water and faeces (Benton et al 1967). It is excreted in the faeces and then contaminates water, feed and litter, where it persists and from where it commonly spreads.

Aerial spread of IBD virus is considered less important than faecal contamination of water, feed and litter (McFerran 1993). However, the nature of poultry dust and its spread over considerable distances (more than 500 metres) through normal bird movement in a shed means that the virus could spread by this route between sheds on a farm. Because the virus is very resistant to environmental temperatures, it may be present wherever poultry dust from contaminated farms is blown.

Poultry enterprises involve potentially very high concentrations of infected materials on farm sites. Broiler farms in Australia commonly consist of six sheds, each containing more than 20 000 chickens; some farms have more than 500 000 fowls. The potential to generate huge aerosols under favourable conditions exists.

The possibility of windborne spread may be greater through the mass transportation of broiler chickens and hens to processing plants in crates in open trucks. These vehicles commonly spread feathers and dust along major traffic routes, potentially leading to a wide dispersal of IBD virus.

Live animals

Infected fowls excrete the virus in faeces for up to 2 weeks after infection. Virus excretion begins from about 24 hours after infection, which can occur 1–2 days before clinical signs appear. Recovered chickens may excrete virus, although the presence of active antibody would reduce the chances of this happening. In flocks with varying levels of passive or active immunity, the virus may continue to circulate for weeks. Virus would also persist in the environment, and in dust and faeces on the chickens.

Vaccinated chickens can become infected and excrete vvIBD and eavIBD virus into the environment.

The main route of transmission is the faecal–oral route, and the virus can survive for prolonged periods in faeces and bedding (Benton et al 1967). In-contact spread occurs readily when chickens are housed together. Spread is most likely to occur through ingestion of contaminated water, feed and droppings, or exposure of respiratory or conjunctival membranes to aerosols of poultry dust.

Infected chickens can transmit the disease to new premises through faecal contamination of the environment.

The movement of day-old chickens and eggs from breeding companies to growing farms is unlikely to transmit the disease, provided precautions are taken to avoid contamination of the chickens, eggs or

containers with infected aerosols. However, where hatchery vaccination with live IBD vaccines is practised, vaccine virus will be transmitted to the farm.

The role of wild birds in the transmission of IBD virus remains uncertain.

Carcasses

Chicken carcases can become contaminated during slaughter due to mass processing methods, such as through:

- pieces of bursal tissue being incompletely removed
- faecal contamination
- direct contact or indirect contact in spin-chillers; and
- aerosols.

Animal products

Meat, meat products and casings, including use as animal feed

IBD virus can be isolated from fresh chicken meat, although initial titres are low unless the chickens are in the viraemic phase at the time of slaughter. IBD virus can persist for up to 4 weeks in the bone marrow of infected chickens (Elankumaran et al 2002).

Eggs and egg products

IBD virus is not egg transmitted, so direct contamination of egg products should not occur. However, many eggs are not washed at the farm or are transported on cardboard egg fillers that are recycled. Therefore, the virus may survive in faecal material and farm dust on the surface of eggs and enter egg products when the eggs are broken. In most cases, the amount of virus would be extremely low, and the risk of transmitting IBD virus by feeding egg products back to poultry would also be very low.

IBD virus is not known to be transmitted on properly cleaned and disinfected eggs.

Animal byproducts

Hides, skin, wool and other fibres

Although no specific data on IBD virus survival on poultry feathers is available, it may be expected to be similar to survival in the environment in and around the poultry shed (ie at least 4 months).

Swill and meatmeal

Although no specific data on IBD virus survival in poultry meal is available, temperatures used in rendering (80–95°C, with steam) should inactivate the virus. However, there is a risk of recontamination of cooked product by virus aerosols from live poultry and raw materials entering the processing plant. The virus is unlikely to survive in poultry feed that has been properly rendered and pelleted if recontamination has been prevented.

The consumption of scraps by backyard poultry may be an important pathway for disease spread in some countries.

Semen and embryos from live susceptible animals

There is no evidence that IBD virus can be transmitted through semen, but semen might become contaminated during collection.

Waste products and effluent

Survival of IBD virus in faeces has been reported for up to 52 days and in litter for 122 days (Benton et al 1967).

Biological products (eg vaccines)

Spread of IBD virus has been associated with contamination of live poultry vaccines and, rarely, the incorrect labelling of vaccines.

Equipment, including personal items

IBD virus is most commonly spread through the movement of poultry products, equipment, feed bags, vehicles and people, and to a lesser extent through aerosols of dust. The ubiquity of the disease and the resistance of the virus mean that any people and objects that come into contact with infected poultry could transmit the virus.

The increasingly frequent movement of people and their clothes and boots from countries with IBD virus to Australia increases the risk of contact with poultry or people involved with the poultry industry.

Other relevant considerations

Mealworms (Alphitobius diaperinus) have been implicated as reservoirs, and Aedes vexans mosquitoes as vectors, of IBD virus.

Antibodies have been detected in rats harvested from a farm during an outbreak of IBD, but the role of rats as vectors remains uncertain.

Viable vvIBD virus was recovered for 2 days from the faeces of a dog that had been fed tissues from experimentally infected chickens, indicating that dogs may act as mechanical vectors for the virus (Pages-Mante et al 2004)

2.4.3 Factors influencing transmission

The extent to which vvIBD or eavIBD may spread in Australia will largely depend on the:

- location of the initial outbreak
- immune status of the flock
- time before detection
- efficiency of diagnosis of early cases
- number of contacts with the infected farm
- movement of poultry
- level of biosecurity being practised on farms in the region
- poultry density of the farm and region; and

- (possible) wild bird and rodent movement from the infected farm.

Contact with the infected farm is the most important method of IBD virus spread from one premises to another. However, on high-density poultry premises, sufficient poultry dust could be generated to allow windborne transmission to adjacent premises. Additionally, the pick-up and transport of poultry and the associated windborne spread of feathers from trucks passing other poultry farms may be an important method of spread of virus.

Contact transmission

Intensive poultry-growing areas have many opportunities for initial or contact transmission because of the frequent movement of chickens, service staff, feed trucks, dead-bird pick-up trucks, equipment, vaccinating crews, chicken sexers, veterinarians and farmers.

Most major poultry companies maintain high levels of biosecurity at the hatchery and breeder-farm level. Protective measures include changing clothes and boots, showering in and out, equipment fumigation or ultraviolet treatment, wild bird and rodent proofing, external feed delivery to silos, egg disinfection, and total farm cleanout and disinfection before placement of new chickens.

Biosecurity is often at a lower level on broiler and layer farms. People may not adhere to industry biosecurity practices, such as changing their clothes or footwear before entering poultry sheds. Egg farms may also have egg-packing rooms next to poultry sheds, and the public may enter these areas when buying eggs 'at the farm gate'. Wild bird proofing may be lacking, and rodent control may be poor. Dam or river water may be used without treatment, and has been implicated in the spread of avian influenza and egg drop syndrome in Australia.

Immune status

Full manifestation of the signs of vvIBD will require a susceptible chicken population with no or little immunity to any form of IBD. As noted in Section 2.2, the window of susceptibility lies between the fall in maternal antibody and the rise in active antibody levels that follows exposure to endemic strains of IBD viruses on most poultry farms (most commonly between 2 and 4 weeks of age). If live vaccines have been used to stimulate active antibody, the timing of the administration of those vaccines in the face of falling maternal antibody levels is critical to minimise the period of susceptibility to field viruses. Broiler farms would hold susceptible chickens aged 3–6 weeks about five times each year. Multi-age farms may have sufficient circulating local IBD virus to maintain active immunity throughout most of the year, except for the 2–4-week age period.

Time before detection, and efficiency of diagnosis of early cases

The endemic viruses can cause bursal atrophy and immunosuppression, depending on the age of infection, which depends on the level of maternal antibody transferred from vaccinated hens. Even where infection with vvIBD has occurred, mortalities in chickens could be low because of partial neutralisation of the vvIBD viruses by variable levels of maternal antibody being transferred, leading veterinarians to suspect causes other than vvIBD. Australian chickens are unlikely to have protective immunity to many eav strains. However, the lack of clinical signs directly attributable to infection with some of these strains may result in a delay in diagnosis of eavIBD.

It is possible for the disease to continue to spread between poultry premises that have high levels of immunity or exhibit nonspecific clinical signs without an early diagnosis being made. The virus could then occur on a number of well-separated sites before an outbreak is suspected and investigated.

Selected tissues and serum samples could show IBD antigen and antibody, respectively, associated with endemic IBD. Although histopathological changes in the bursa should be more severe with vvIBD and eavIBD viruses, the presence of endemic infection could complicate the subjective grading of lesions. Confirmation of vvIBD and eavIBD viruses may have to wait for the results of molecular or

antigenic tests by CSIRO-AAHL. CSIRO-AAHL can detect vvIBD and eavIBD viruses in the presence of endemic IBD virus (see Section 2.5.5).

Poultry production and marketing

The poultry industry has a hierarchical structure in which genetic characteristics pass from primary breeders, through parent breeding stocks, to broilers or layers. Although most large poultry companies take extreme precautions to prevent backflow of disease, the integration of production increases the risk that infectious agents will be recycled through rendering plants and feed mills. Most large poultry companies have quality assurance programs in place to prevent this, but quality assurance may be inadequate in some smaller operations.

Poultry production systems include slaughter lines, mass chilling systems and live haulage in open crates on open-sided trucks, increasing the chance of cross-contamination of live birds and product from feathers and faecal material.

The marketing of fresh and frozen poultry provides an opportunity for carcases containing IBD virus to be disseminated, which could lead to contaminated scraps being fed back to poultry.

Windborne vector spread

Although there are no reports of IBD virus being spread by windborne vectors, IBD virus has been isolated from mosquitoes. It may be possible for flies and other insects to act as mechanical carriers over short distances.

2.5 Diagnostic criteria

2.5.1 Clinical signs

Animals

Chickens

A spectrum of disease is associated with IBD infection, and it would be very difficult to distinguish endemic strains from some exotic strains based on clinical signs. Secondary infections — particularly coccidiosis, inclusion body hepatitis, gangrenous dermatitis, Marek's disease and chronic respiratory disease — may complicate the clinical signs in the field.

Australian endemic strains

These have been divided on genetic grounds into classical (standard) strains and Australian variant strains, although it would be difficult to distinguish between these strains in the field based on clinical signs or pathology.

Classical strains of IBD virus vary in pathogenicity (Ignjatovic et al 2004). Classical (standard) and variant strains of IBD virus in Australia are associated with disease that is usually subclinical. It occurs after a decline in passive immunity, and mortality specifically due to IBD virus infection is relatively low. Occasionally, infection can lead to mild clinical signs of anorexia, watery diarrhoea and ruffled feathers in some of the flock.

Overseas, particularly in intensive poultry-growing areas, such as Delmarva, United States, a syndrome termed 'Gumboro disease' was described in which mortality was up to 3% in broiler flocks but sometimes exceeded 20% in susceptible layer flocks. In Australia, a disease outbreak during which IBD virus was isolated occurred in 1999 (Ignjatovic et al 2004), with 2.5% mortality in a flock of

broiler chickens. However, it is currently considered that the classical IBD viruses in Australia will cause few clinical signs, and a repeat of such an event is unlikely.

If a more virulent classical strain is involved, then clinical disease would be likely to appear after a short incubation period (usually 2–3 days), with clinical signs in the acute phase of the disease including anorexia, watery diarrhoea and ruffled feathers. Birds may move reluctantly or unsteadily, and become prostrate and dehydrated, with mortality reaching an early peak 3–4 days after infection and then subsiding.

Disease severity depends on the age and breed of the affected birds, the degree of passive immunity and the virulence of the strain of virus (van den Berg et al 2000), and secondary infections associated with the immunosuppressive effects of the disease. Infection by viral strains of low pathogenicity, or occurring while maternal antibodies are present, may be inapparent.

Exotic antigenic variant IBD virus strains
Exotic antigenic variant strains of IBD virus (eavIBD virus) produce no obvious clinical signs of IBD; the main effect of infection is profound immunosuppression. Chickens infected with eavIBD virus show poor performance, including reduced weight gain, high feed conversion, poor response to vaccination, and increased respiratory infections.

Very virulent IBD virus strains
The very virulent strains of IBD virus (vvIBD virus), which are not present in Australia, are associated with acute clinical disease and high mortality rates (van den Berg et al 2000). Clinical signs in the acute phase of the disease due to vvIBD virus include anorexia, anaemia, watery diarrhoea and ruffled feathers. Birds move reluctantly or unsteadily, and become prostrate and dehydrated, with mortality reaching an early peak 3–4 days after infection and then subsiding.

The mortality observed in Asia with vvIBD was generally 5–40% in layer strains and 3–5% in broiler strains. However, in severe cases, losses reached 60% in layers and 25% in broilers. Some reduction in egg production has been directly attributed to vvIBD, although this can be greatly exacerbated by secondary infections. It is notable that chickens are susceptible to clinical vvIBD in a narrow age range from 3 to 6 weeks, although there are a few reports of clinical signs occurring in chickens up to 15–20 weeks of age.

In Asia, Newcastle disease and vvIBD are commonly observed together.

Other birds

The susceptibility of birds (other than chickens) to serotype 1 IBD viruses is uncertain. There is no record of infection with vvIBD virus or eavIBD virus in turkeys. Classical serotype 1 IBD infection is subclinical.

In one study, pheasants, partridges and guinea fowl failed to excrete virus after experimental infection with vvIBD virus, while quail shed virus via the faeces for several days after inoculation, without showing clinical signs (van den Berg et al 2001). The authors concluded that the virus is highly host specific for chickens. However, in another study, experimentally infected guinea fowl showed clinical signs and pathology typical of IBD infection, and transmitted IBD to in-contact sentinel chickens (Adewuyi et al 1989).

IBD virus has recently been isolated from a sparrow in China, suggesting that wild birds could act as carriers (Wang et al 2007). However, other authors suggest that the virus is unlikely to persist in wild birds (van den Berg et al 2001).

Humans

IBD does not affect humans

2.5.2 Pathology

Gross lesions

Australian endemic strains
Lesions observed will vary considerably, depending on the virulence of the strain. In Australia, where the classical and variant strains are usually of low virulence, gross pathology may be confined to the bursa of Fabricius, where varying degrees of swelling or atrophy depending upon the stage of infection may be observed. In the early stages of infection, the bursa may be swollen to about twice its normal size because of hyperaemia and oedema. A few bursae may show frank haemorrhages in the mucosa. In some cases, a yellowish gelatinous exudate develops to cover the serosal surface of the bursa. From days 5–8 post infection, the bursa becomes grey in colour as it atrophies and may be only one third of its normal weight. With Australian classical, Australian variant or vaccine strains, the bursa may regain its original weight and size by 2 weeks post infection (Ignjatovic and Prowse 1997). With more virulent classical viruses, petechial haemorrhages may be observed in the musculature, the kidneys may be pale and swollen, and the bursa may show more haemorrhages.

Exotic antigenic variant IBD virus strains
Some antigenic variant strains cause extensive bursal necrosis and lymphoid depletion, without an inflammatory response, and there is marked reduction in size of the bursa by day 3-4 after infection. Gross lesions would appear to be confined to the bursa.

Very virulent IBD virus strains
The carcase is noticeably dehydrated, and the musculature is darkened. There may be petechial (pinpoint) haemorrhages on the thigh and pectoral muscle groups and in the intestinal tract, particularly at the proventriculus–gizzard junction. Very virulent IBD virus strains cause more severe lesions in the caecal tonsils, thymus, spleen and bone marrow, but bursal lesions are similar to those caused by classical IBD viruses. In the acute phase of the disease, the bursa may be swollen to about twice its normal size because of hyperaemia and oedema. Some bursae show frank haemorrhages in the mucosa. In some cases, a yellowish gelatinous exudate develops to cover the serosal surface of the bursa. Haemorrhage may also be observed in the thymus gland, with marked atrophy apparent in surviving chickens. The bone marrow becomes pale. The kidneys may be pale and swollen with urates in the tubules and ureters. Small grey foci may be observed on the surface of the spleen. By 7–10 days after infection, the bursae of surviving birds will have atrophied to about one quarter of normal size.

Microscopic lesions

Australian endemic strains
Australian endemic IBD viruses cause bursal changes including lymphoid depletion and necrosis involving most of the follicles, but do not cause changes beyond the formation of cystic and glandular cavities following proliferation of the cortico-medullary epithelium. Evidence of regeneration is observed within 14 days of infection. The endemic classical IBD viruses present in Australia cause minimal changes in the thymus and spleen. There are no marked differences in the severity of lesions between Australian classical and Australian variant strains (Ignjatovic et al 2004).

Exotic antigenic variant IBD virus strains
Exotic antigenic variant viruses cause similar histological lesions in the bursa to mild classical strains. Some eavIBD strains have been reported not to produce an acute inflammatory response in the bursa.

Very virulent IBD virus strains
Microscopic lesions induced by vvIBD virus in the bursa of Fabricius, thymus and bone marrow are useful for diagnosis and differentiation from the changes caused by the endemic and vaccine serotype 1 viruses. Differentiation is easier with experimentally infected specimens than with field specimens, in which the time of infection will vary and in which other factors may contribute to bursal regression.

More virulent viruses (including vvIBD virus) cause rapid and complete destruction of all the follicles and progress very rapidly through an acute inflammatory response. Depletion of lymphoid cells in the bursa is due to both necrosis and apoptosis. All bursal follicles are completely destroyed and replaced by cell debris and eosinophilic material. Hyperaemia and heterophil infiltration are evident, together with proliferating interfollicular connective tissue and oedema. Severe depletion of lymphoid cells may be observed in nonbursal lymphoid tissues. Atrophy of the thymus has been associated with the acute phase of the disease. This atrophy and severe changes in the bone marrow are regarded as the only histological differences between the virulent classical and vvIBD strains.

2.5.3 Differential diagnosis

Other diseases and conditions may show clinical signs or lesions similar to those of vvIBD, including:

- IBD caused by endemic serotype 1 viruses
- Newcastle disease
- acute coccidiosis
- infectious bronchitis
- Marek's disease
- avian influenza
- stress, water deprivation and intoxication
- haemorrhagic syndrome due to sulfa drug intoxication or other causes.

2.5.4 Laboratory tests

Samples required

Samples should be taken both from live, clinically affected birds and from recently dead birds. Specimens essential for the rapid confirmation of vvIBD or eavIBD include:

- bursa, spleen and faeces (for antigen detection and virus isolation)
- fresh serum (for serology); and
- bursa, spleen and thymus (for histopathological confirmation) and any other lesions (for histopathological differential diagnosis).

Transport of specimens

Specimens should be submitted in accordance with agreed state or territory protocols. Specimens should initially be forwarded to the state or territory laboratory for appropriate analysis, and assessment of whether further analysis will be required by the CSIRO Australian Centre for Disease Preparedness (CSIRO-ACDP), Geelong.

If the state or territory laboratory deems it necessary, duplicate samples of the specimens should be forwarded to CSIRO-ACDP for emergency disease testing, after the necessary clearance has been obtained from the chief veterinary officer (CVO) of the state or territory of the suspect case, and after the CVOs of Victoria and Australia have been informed about the case and the transport of the specimens to Geelong (for the first case). Sample packaging and consignment for delivery to CSIRO-ACDP should be coordinated by the relevant state or territory laboratory.

For further information, see the **AUSVETPLAN management manual *Laboratory preparedness***.

2.5.5 Laboratory diagnosis

Diagnosis depends on the isolation and characterisation of the virus and its differentiation from endemic serotype 1 viruses. Tests currently available at CSIRO-ACDP are shown in Table 2.1.

The following methods are used in Australia to differentiate between IBD virus strain types:

- Molecular approaches. It is possible to differentiate between vvIBD and eavIBD viral strains, Australian variants, Australian classical strains and overseas classical strains. To do this, nucleotide sequencing, combined with phylogenetic analysis of the hypervariable region of the viral protein 2 (VP2), must be used. Sequences for the hypervariable region of VP2 for many vaccine strains are available, and these can be differentiated from classical strains. Polymerase chain reaction (PCR) and antigen ELISA can be used for rapid diagnosis of vvIBD virus, followed by conventional PCR with nucleotide sequencing and pathogenicity testing (Ignjatovic 2004).
- Antigenic differentiation. Very virulent IBD virus, eavIBD virus and Australian variants from classical IBD virus can be differentiated using either chicken recombinant antibodies or monoclonal antibodies (Sapats and Ignjatovic 2000, Sapats et al 2005, Sapats et al 2006).
- Pathogenicity testing, bursal regression and examination of histopathological lesions.
- Cross-protection studies. Cross-protection studies include serum neutralisation tests in tissue culture, vaccination/challenge trials in specific pathogen-free (SPF) birds, and challenge experiments using young commercial meat chickens with high levels of maternal antibody to classical IBD virus strains. These methods are useful to confirm antigenic variant strains (S Sapats, CSIRO-AAHL, pers comm to Biosecurity Australia, February 2007).

CSIRO-ACDP tests

Table 2.1 Diagnostic tests available for different strains of IBD and CSIRO-ACDP

Tests for vvIBD

Test	Specimen required	Test detects	Time from sample receipt to result
Virus isolation and identification	bursa	IBD virus	3–4 days
Pathogenicity testing[a]	fresh bursa	mortality rate in SPF chickens	3–5 days
ELISA			
polyclonal[b]	serum	antibody to any IBD virus	24 hours
competitive	serum	antibody to vvIBD virus	24 hours
Ac ELISA	bursa	IBD virus, and differentiates vvIBD virus	24 hours
Real-time PCR	bursa	viral RNA and vvIBD virus-specific sequence	24 hours
PCR and gene sequencing	tissues virus isolate	viral RNA virulence markers	2 days 3 days

Tests for eavIBD

Test	Specimen required	Test detects	Time from sample receipt to result
Virus isolation and identification	bursa	IBD virus	3–4 days
Real-time PCR	bursa	viral RNA and eavIBD virus-specific sequence	24 hours
PCR and gene sequencing	tissues virus isolate	viral RNA virulence markers	2 days 3 days

Ac ELISA = antigen-capture ELISA; CSIRO-ACDP = Commonwealth Scientific and Industrial Research Organisation Australian Centre for Disease Preparedness; ELISA = enzyme-linked immunosorbent assay; IBD = infectious bursal disease; PCR = polymerase chain reaction; RNA = ribonucleic acid; SPF = specific-pathogen-free; vvIBD = very virulent infectious bursal disease
a Pending ministerial approval
b Not able to differentiate vvIBD virus

Source: Information provided by the then CSIRO-AAHL, 2009 (refer to CSIRO-ACDP for most up-to-date information).

The early diagnosis of an outbreak of vvIBD or eavIBD is critical to successful disease control and eradication. The vvIBD virus causes clinical and pathological changes in susceptible birds that should be recognised by poultry veterinarians. However, the presence of antibody to endemic strains of IBD viruses or from vaccination of most breeding flocks in Australia may make diagnosis harder. The

disease may also be masked by secondary infections associated with the immunosuppressive effects of the virus.

Exotic antigenic variant strains of IBD viruses cause immunosuppression, with increased susceptibility to secondary viral and bacterial infections. These strains of IBD virus do not cause characteristic clinical signs that would be easily recognised as a result of an exotic disease agent. The cause of disease in a flock showing nonspecific clinical signs (ie watery droppings, poor appetite) would need to be distinguished from eavIBD.

Because of the profound immunosuppression associated with infection with eavIBD virus, secondary infection with endemic infectious organisms is likely. Presence of secondary infection may complicate the diagnosis of eavIBD.

2.6 Resistance and immunity

Innate and passive immunity

Passively transferred maternal antibodies have a major effect on the susceptibility of chickens to all IBD viruses. Vaccine studies have shown that vvIBD virus will break through relatively high levels of maternal antibody, but that chickens with more than 1000 units of antibody (as shown by ELISA) are usually protected (Jackson et al 1996). The level of maternal antibody in chickens is largely influenced by the level obtained through administration of inactivated vaccines to the hen before and during egg production. In many flocks in Australia, inactivated vaccines are administered before point of lay and not after, as sometimes occurs overseas.

Consequently, hens from older breeding flocks (>50 weeks) may transfer lower levels of maternal antibody, leaving progeny relatively more susceptible to infection with IBD virus. Additionally, because broiler flocks are often derived from several breeding flocks of different ages, chickens will have varying levels of maternal antibody when hatched. As maternal antibody levels decrease, even in chickens from well-vaccinated hens, the chickens become susceptible to infection. Chickens older than 3 weeks show evidence of an age-related resistance to classical strains of IBD virus and suffer less immunosuppression, but vvIBD virus can infect chickens up to 20 weeks old. However, in the absence of protective maternal antibodies, chickens 3–6 weeks old are most susceptible to vvIBD virus.

Progeny of hens vaccinated with classical strains of IBD virus have poor maternal immunity to United States variant strains. An Australian study has shown that currently available Australian vaccine strains would incompletely protect chickens from disease associated with some eav strains (Ignjatovic et al 2001).

Active immunity

Active and protective antibody production follows natural infection and vaccination. After vaccination, chickens are well protected against challenge by 1–2 weeks, provided that the vaccine and challenge viruses are of the same immunogenic type. Cross-protection between classical and vvIBD virus strains occurs if adequate levels of antibody are present. Although the classical serotype 1 viruses offer poor protection against variant virus challenge, the variant viruses commonly protect against classical virus challenge.

2.7 Vaccination

In Australia, Australian classical strains are used to protect against all endemic strains of IBD virus. It is common practice to vaccinate breeding flocks so that maternal antibodies protect progeny chickens against field challenge with IBD. Breeder fowls are vaccinated with a live vaccine at about 8–12 weeks and then receive an inactivated vaccine before point of lay. Inactivated vaccines are sometimes administered again to breeders at 40 weeks to provide high levels of active antibody through to the end of life.

Transfer of maternal antibody to progeny chickens in Australia usually provides adequate protection against field virus challenge if the maternal antibody titres are high and uniform, and between-flock hygiene has been sufficient to reduce the level of field virus challenge. In Australia, chickens less than 6 weeks old (including meat chickens) are usually not vaccinated with live vaccine. Although the vaccination of broilers with live IBD vaccine is uncommon, several broiler companies briefly adopted live vaccination for such strains as the classical intermediate V877 strain, because maternal antibody transfer had been inadequate to protect against endemic field viruses.

Overseas, chickens can be vaccinated as early as the 18th day of embryonation by in-ovo vaccination, or from one day after hatching. As yet, embryonal vaccination against IBD has not been adopted in Australia. Embryonal vaccination uses a vaccine virus–IBD virus antibody complex, and provides protection as maternal antibodies. Studies have shown that intermediate vaccine strains similar to the Australian V877 vaccine virus can be used in this type of vaccine (Whitfill et al 1996). Other chick vaccines that are based solely on vaccine virus have to await a decline in maternal antibody levels before they can produce immunity, although some may be administered to chicks as early as one day after hatching.

In countries with vvIBD viruses, most chickens are vaccinated with live, mild to moderately virulent vaccine strains early in life (1–2 weeks) and sometimes again at about 3–4 weeks of age. Bivalent vaccines, containing classical and variant strains of IBD virus, have been developed for use in poultry in the United States. In-ovo vaccination is commonly practised in meat chickens in the United States, and about 25% of birds then receive a second dose of vaccine.

Vaccinated flocks can become infected with vvIBD virus that may replicate and be excreted from vaccinated chickens (Kabell et al 2005). Similarly, some vaccines do not fully protect flocks against infection with eavIBD virus. Experience in Europe and Asia indicates that mild rather than moderately virulent (intermediate) live vaccines may leave a proportion of the flock without protective levels of active antibody. Intermediate-plus vaccine viruses, such as the V877 strain (Jackson and Madeley 1995), have provided good immunity against vvIBD virus in Europe and Asia (Jackson et al 1996, Kouwenhoven and van den Bos 1996) without inducing immunosuppression.

2.8 Treatment of infected animals

Treatment of birds for vvIBD and eavIBD is not appropriate.

3 Implications for Australia

3.1 Potential pathways of introduction

The presence of vvIBD and eavIBD in many countries, especially in Asia, creates concerns about breaches of Australia's quarantine barriers. The virus could be introduced to Australia:

- on contaminated clothing and footwear of people entering the country
- through the illegal importation of infected birds or contaminated poultry products; or
- on contaminated equipment.

3.2 Social, economic and environmental effects

Although no estimates of the cost of eradicating vvIBD or eavIBD from Australia have been made, it would be similar to the cost of eradicating avian influenza. The costs of the 1997 Tamworth outbreak of avian influenza have been estimated at $6 million. The economic loss to the Australian poultry industry that could follow the failure to eradicate vvIBD can also be estimated by extrapolating from a calculated (hypothetical) NZ$10 million annual loss for New Zealand (Christensen 1985), after allowing for that country's freedom from all forms of IBD. The Australian poultry industry is five to six times larger, and could expect a proportionate annual loss, though losses could be lower due to IBD vaccination programs. However, these programs are targeted at maternal antibody transfer, leaving the larger population of chickens and pullets more than 3 weeks of age fully susceptible to infection.

The effects of an incursion of an exotic strain of IBD will vary with the strain of virus involved. The main losses from vvIBD would be from mortalities, which can be high, and losses caused by secondary infection and reduced productivity. There would be further loss of income for an extended period because of the stamping out policy. The disruption to the flow of product and decreased production may cause job losses on farms and in service and associated industries, depending on the time it takes to bring the outbreak under control. Even a small outbreak would result in dislocation of the industry and its normal marketing patterns. An uncontrolled outbreak would markedly increase production costs because of the impact of the disease and the need for continuing control measures.

Infection in grandparent and foundation flocks would cause the loss of some valuable genetic material and require additional imports of genetic stock.

Although vvIBD is present in most other countries, there may still be major effects on export trade in the form of health restrictions, which may take some time to be lifted.

The effects of an incursion of eavIBD would be less dramatic in terms of direct chicken mortalities. However, the immunosuppression caused by these strains would result in production losses from secondary infections and poor productivity. There would be losses to industry from control and eradication measures, as described above for vvIBD. Ongoing vaccination costs would be similar to those for vvIBD.

Control measures would disrupt breeding and production programs and the supply and movement of birds and poultry products to producers, processors and the public. Decision makers would need to continually review movement controls and restrictions to reduce the effects on production and marketing systems as much as possible, while maintaining biosecurity.

Other enterprises trading in avian species, such as pet shops and exotic bird traders, would be affected by the control measures adopted if they contained susceptible birds.

3.3 Critical factors for an Australian response

Features of vvIBD and eavIBD:

- Although vvIBD virus causes clinical and pathological changes that should be recognised in susceptible birds by poultry veterinarians, an early diagnosis of an outbreak of eavIBD will be difficult due to the frequent absence of defining clinical signs.
- The antibody status of the infected flock, due either to vaccination or to infection with endemic strains, will affect clinical expression and speed of spread of an outbreak.
- It will be difficult to detect flocks infected with exotic strains in the presence of vaccine or endemic strains.
- The disease is highly contagious, spreading through the movement of poultry products, people, fomites (equipment, feed bags and vehicles), and, to a lesser extent, through aerosols of dust.
- Natural infection is usually via the oral route, but the upper respiratory tract and conjunctiva probably also play a role.
- The virus is highly resistant to heat and chemicals, and can persist in the shed environment for at least 4 months.
- Processed and frozen poultry meat may contain infectious virus.
- The virus is not egg transmitted but can survive on the eggshell surface.
- Infected chickens may continue to excrete the virus in their faeces for up to 2 weeks after infection.
- An effective vaccine may not be readily available for some exotic strains of IBD virus.
- There are no public health implications.

Features of susceptible populations:

- In the case of eavIBD, the first infected premises (IP) identified may not be the index case.
- Market fluctuations, due to public health perceptions or product withdrawals, would reduce the value of the industry.
- Intensive production systems are prone to rapid overcrowding if output is disrupted by movement restrictions, resulting in animal welfare issues.
- Exotic strains of IBD are present in Asia, and the most likely route of introduction is through the illegal importation of infected birds or contaminated poultry products.
- Smallholder populations are not easily identified.
- Smallholders have little knowledge of disease control issues, such as the feeding of scraps and the need to report illness in their birds.
- Fear of repercussions may deter smallholders from reporting disease.

Based on the assessed critical factors, managing an incursion of IBD may require the use of some or all of the following options:

- identification of all commercial and smallholdings of susceptible birds
- application of mandatory biosecurity programs
- early determination of the extent of infection through the rapid identification of infected and potentially infected premises, including holdings of susceptible birds, slaughterhouses and cold stores

- swift declaration and effective policing of control areas, and the rapid imposition of quarantine and movement controls on infected and potentially infected premises, to prevent the movement of susceptible birds, avian products and fomites carrying virus or potentially carrying virus
- minimisation of exposure of susceptible birds by preventing direct and indirect contact of at-risk birds with infected birds and potentially contaminated avian products and fomites
- elimination of infection from IPs by the rapid destruction of birds, the sanitary disposal of carcases and fomites, and decontamination
- availability of appropriate vaccines to allow the immediate vaccination of all susceptible birds in a 1–5-km radius of the IP to reduce economic loss and restrict spread
- normal processing of healthy flocks (whether vaccinated or not) under controlled conditions, subject to negative results from flock testing
- the recall of poultry meat, offal and unsanitised eggs originating from IPs; and
- existence of an industry-based emergency disease contingency plan, and rapid establishment of a government–industry coordination committee to ensure that the agreed management plan is followed.

The stability of the virus in the environment and the ease of infection may make an eradication policy economically and practically unsustainable, in which case control measures using vaccination as an addition to control, or as the preferred option, may be implemented.

Such decisions will need to be made once information is available on the extent of spread and on the viral strains involved. The policy to be implemented is described in Section 4.

4 Policy and rationale

4.1 Introduction

4.1.1 Summary of policy

Infectious bursal disease (IBD) is an OIE-listed disease that has the potential for rapid spread, and is an important factor in international and domestic trade in poultry and poultry products.

The response policy for an outbreak of IBD will depend on the extent of the outbreak when the initial diagnosis is made and on the viral strains involved.

Early diagnosis of exotic strains of IBD

If exotic strains of IBD are diagnosed during the early stages of an outbreak, the policy is to control and eradicate vvIBD and eavIBD in the shortest possible time using 'stamping out', supported by a combination of strategies including:

- early recognition and laboratory confirmation of cases
- quarantine and movement controls over birds, avian products and potentially contaminated items in declared areas, to minimise the spread of infection
- sanitary disposal of destroyed birds and avian products likely to be contaminated, and decontamination of premises, to reduce the source of infection
- decontamination of fomites (facilities, products and things) to eliminate the virus on infected premises and to minimise spread in declared areas
- tracing and surveillance (based on epidemiological assessment) to determine the source and extent of infection and to provide proof of freedom from the disease
- zoning/compartmentalisation to define infected and disease-free areas and premises
- recall of suspect avian products; and
- a public awareness campaign.

Vaccination may be used in support of eradication to provide a buffer zone around suspected outbreaks and to protect genetically valuable flocks.

Delayed diagnosis of vvIBD

During an outbreak of vvIBD, vaccination will be considered as an alternative to eradication to control the losses associated with the disease if the diagnosis is delayed or if the disease becomes widespread and stamping out is no longer considered practicable. Vaccination would be supported by a combination of strategies including:

- zoning/compartmentalisation to define infected and disease-free areas and premises; and
- a public awareness campaign.

Delayed diagnosis of eavIBD

During an outbreak of eavIBD, vaccination will be an integral part of the control program if the diagnosis is delayed and the disease is not widespread.

If the disease is found to be widespread, the strategy for long-term control of the disease will be determined following consultation between the government and the poultry industry. Vaccination will

be the preferred option, supported by zoning/compartmentalisation to define infected and disease-free areas and premises.

4.1.2 Case definition

For the purposes of this manual, IBD (hypervirulent form) is considered to be very virulent IBD (vvIBD) and exotic antigenic variant IBD (eavIBD). vvIBD and eavIBD cases can be defined as the isolation (by the CSIRO Australian Centre for Disease Preparedness) of any virus that meets the description of vvIBD virus or eavIBD virus.

Notes:

- Positive serology in the absence of detection of IBD virus, with no clinical or epidemiological evidence supporting infection, does not constitute a definition of a case.
- AUSVETPLAN case definitions guide when a response to an emergency animal disease (EAD) incident should be undertaken. AUSVETPLAN case definitions do not determine when international reporting of an EAD incident is required.
- At the time of an outbreak, revised or subsequent case definitions may be developed with the agreement of the Consultative Committee on Emergency Animal Diseases – CCEAD.

4.1.3 Cost-sharing arrangement

In Australia, IBD is included as a Category 4 emergency animal disease in the Government and Livestock Industry Cost Sharing Deed in Respect of Emergency Animal Disease Responses (EAD Response Agreement – EADRA).[6] When cost sharing of the eligible response costs of an incident is agreed, Category 4 diseases are those for which costs will be shared 20% by government and 80% by industry.

4.1.4 Criteria for proof of freedom

There are no OIE Terrestrial Code recommendations covering freedom from IBD. Demonstrating freedom would include convincing other countries that the outbreak had been successfully contained and that surveillance to demonstrate freedom after stamping out had been adequate. This may require at least 6 months after the last case before the country could be declared vvIBD or eavIBD free again (see Section 7.2).

Adequate surveillance, beginning as soon as eradication is completed, would involve serological and virological testing, clinical observation and dead-bird sampling of repopulated sheds, as well as wider sampling in the control and free areas.

Seropositive flocks that have not been vaccinated would require further investigation. See Section 7 for a guide to the surveillance and testing that may be necessary.

[6] Information about the EAD Response Agreement can be found at www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement.

4.1.5 Governance

Governance arrangements for the response to EADs are outlined in the **AUSVETPLAN *Overview***.

Information on the responsibilities of a state coordination centre and local control centre is available in the **AUSVETPLAN management manual *Control centres management* (Parts 1 and 2)**.

4.2 Public health implications

IBD has no public health implications.

4.3 Control and eradication policy

The default policy is to control and eradicate the disease through stamping out and to re-establish Australia's status of vvIBD and eavIBD freedom in the shortest possible time. The default policy will apply if the disease is not known to be widespread, and the infected/suspect population is discrete and able to be controlled.

Within this policy, the selection of strategies to support stamping out (ie quarantine and movement controls, decontamination, product recall, tracing and surveillance) will depend on a thorough assessment of the epidemiological situation at the time, and will need to be continually reassessed during the course of the outbreak and altered if necessary. The selected strategies will take into account that the pathogen is highly resistant to the environment and chemicals, the disease can spread readily on fomites, and early detection of certain strains may be difficult. The success of this policy is dependent on knowing the locations of all commercial and small holdings of susceptible birds (preferably through a formal premises registration). Any premises identification program would need to have been implemented before the outbreak.

Serological testing is not considered a useful approach for the initial determination of the status of birds on premises due to possible interference from vaccination and the time required for the development of antibodies. Polymerase chain reaction (PCR) testing, using bursa or other appropriate tissues, provides a more reliable result.

Vaccination may be used in support of eradication to:

- contain the disease or slow its spread
- provide a buffer zone around suspected outbreaks; and
- protect genetically valuable flocks.

Regular liaison and communication throughout the poultry industry and with the media and the public will be essential.

4.3.1 Epidemiological assessment

Epidemiological investigation or assessment draws on multiple sources of information to build understanding of the disease and how it is behaving in an outbreak. This helps inform response decision making.

The key objectives for an epidemiological assessment will be to identify:

- the spatial distribution of infected and free animal populations
- potential vectors involved, including as potential amplifying hosts
- the source of infection
- the prevalence of infection
- pathways of spread and the likely size of the outbreak
- risk factors for the presence of infection and susceptibility to disease (including weather and insect populations).

Epidemiological assessment, and tracing and surveillance activities (see Section 4.3.3) in an EAD response are interrelated activities. Early findings from tracing and surveillance will be inputs into the initial epidemiological assessment (eg considering spatial distribution of infection). The outcomes of the initial epidemiological assessment will then guide decisions on subsequent tracing and surveillance priorities.

The outcomes of the epidemiological assessment will also be used initially to determine the feasibility of eradication versus long-term control and to guide the selection of other appropriate response measures (including the application of movement controls) and assess the progress of disease control measures.

Ongoing epidemiological assessment is important for any EAD response to aid evaluation of the continued effectiveness and value of response measures, and assessment of the progress of disease control measures. Ongoing epidemiological assessment will consider the outcomes of tracing and surveillance activities, and will contribute evidence to support any later claims of disease freedom.

4.3.2 Quarantine and movement controls

Quarantine

Strict controls over the movement of anything that may have become contaminated with virus and immediate imposition of quarantine on all places suspected of being infected are essential.

IPs, DCPs and suspect premises (SPs) will be declared. This will be supported by the declaration of two major disease control areas:

- A restricted area (RA), which will have a radius of 1–5 km around an IP (depending on the size and nature of the potential source of virus) and contain as many DCPs and SPs as possible. Wherever possible, the RA will exclude major markets, processing plants, general service areas and major traffic routes (more than one RA may be declared).
- A control area (CA), with a boundary no closer to the RA boundary than 2 km, to form a buffer between the infected and free areas, and assist in containing the disease within the RA. The RA will enable a reasonable level of commercial activity to continue.

The initial outer boundary of the CA (to create a buffer zone) may correspond with state or political boundaries, but may be amended on the basis of the epidemiological information to enable as much normal commercial activity as possible, in line with accepted disease control measures. Varying levels of quarantine and movement control will be imposed on different premises within the RA.

IPs and DCPs will be subjected to quarantine, and changes of clothing and footwear and appropriate decontamination procedures will be required.

Depending on the outcomes of the risk analysis, product from meat chicken flocks on DCPs and SPs will need to be canned or rendered, or destroyed and disposed of on site. Product from meat chicken flocks on SPs that have tested negative for IBD virus may be used for human consumption.

Movement controls

The movement of birds, avian products, fomites and people from IPs and DCPs will be strictly controlled.

SPs and disease-free premises within the RA will be subject to movement controls, depending on their location; the products involved; the availability and location of hatcheries, processing and marketing establishments; and epidemiological investigations.

If the RA or CA contains facilities for slaughter, meat chickens from flocks on DCPs and SPs that have tested negative for IBD virus may be removed for slaughter for human consumption, subject to a risk analysis. Transportation to a processing plant should avoid passing close to other poultry enterprises.

Unless one of the above scenarios is realised, there will be free movement of birds, products and things within the CA, subject to permit. Birds, products and fomites may enter the CA from disease-free areas, but permission will be required for their movement out of the CA.

The status of premises will be regularly updated, and restrictions on the movement of birds and products will be eased as circumstances permit.

See Section 5 and 6 for further details on declared areas and quarantine and movement controls.

4.3.3 Tracing and surveillance

Tracing

The information obtained from tracing will help to decide the extent of the RA and CA and identify any additional DCPs and SPs. Information required will be requested on Animal Emergency Management Information System (ANEMIS) forms.

Food delivery personnel, vaccinating crews, catching crews, tradespeople, company service staff and veterinarians should be interviewed, and lists compiled of all their possible contacts after visits to IPs, SPs and DCPs.

The original source of introduction of the virus should be traced, as it could remain a threat. Field surveillance should attempt to detect changes in flock health. Examinations should be done at least twice weekly by:

- producers carrying out their own surveillance and reporting by telephone; and
- local disease control centre officers, including industry personnel, carrying out regular telephone surveillance of independent premises.

Trace-back and trace-forward will begin immediately when vvIBD or eavIBD is suspected, and include birds, poultry products, feed, litter, waste, equipment and people. Trace-back will determine movements onto IPs and their origin for the 21 days before the earliest time that clinical signs were observed on the premises. Tracing will locate additional IPs and identify DCPs and SPs. The original source of introduction of the virus should be traced.

Surveillance

Although surveillance will begin immediately around the infected flock, it will have to be extended very quickly to all other sites to which birds, products or contaminated materials might have been moved from the IP. It is therefore essential to trace all movements in the 21 days before the

observation of disease. Information obtained from active surveillance will help to decide the extent of the RA and CA, and to identify DCPs and SPs.

Active surveillance will also begin as soon as vvIBD or eavIBD is suspected to help establish the extent of the RA and CA (see Section 7 for details, including on the interpretation of serological results). During the initial stages (at least), samples will be taken from all species of birds that die within the RA and checked for vvIBD and eavIBD lesions; specimens should be submitted to approved laboratories for virus isolation (see Section 2.5.4).

4.3.4 Zoning and compartmentalisation for international trade

Where it is not possible to establish and maintain disease freedom for the entire country, establishing and maintaining disease-free subpopulations, through zoning and/or compartmentalisation,[7]may be considered.

In the case of a limited disease outbreak, a containment zone[8] may be established around the areas where the outbreak is occurring, with the purpose of maintaining the disease-free status of the rest of the country outside the containment zone.

All zoning applications would need to be prepared by the Australian Government in conjunction with the relevant jurisdiction(s) and agreed to by the CCEAD. Zoning is usually negotiated after a disease outbreak has begun.

Compartmentalisation applications typically need to be negotiated before an outbreak occurs, and will require input from the relevant industries.

Recognition of both zones and compartments must be negotiated between the Australian Government and individual overseas trading partners. Zoning and compartmentalisation would require considerable resources that could otherwise be used to control an outbreak. Careful consideration will need to be given to prioritising these activities, because the resulting competition for resources could delay the quick eradication of the disease and recognition of disease freedom.

Agreements between trading partners take time to develop, consider and finalise, because of the need to provide detailed information on activities such as biosecurity, surveillance, traceability and diagnostics to support the approach that is developed. An importing country will need assurance that its animal health status is not compromised if it imports from an established disease-free zone in Australia. Trading partners may not accept a zoning or compartmentalisation proposal, regardless of the information provided. Eradication of disease may be achieved before zoning or compartmentalisation applications are finalised.

The OIE guidelines for zoning and compartmentalisation are in Chapters 4.4 and 15.1 of the OIE *Terrestrial animal health code*.

[7] With zoning, disease-free subpopulations are defined primarily on a geographical basis. With compartmentalisation, disease-free subpopulations are defined primarily by management practices (such as the biosecurity plan and surveillance practices of enterprises or groups of enterprises).

[8] The OIE defines a 'containment zone' as an infected zone within a previously free country or zone, which includes all suspected or confirmed cases that are epidemiologically linked and where movement control, biosecurity and sanitary measures are applied to prevent the spread of, and to eradicate, the infection or infestation. The Australian Government Department of Agriculture and Water Resources commissioned a report on what would be required for the establishment of containment zones in Australia. This report is available at www.ausvet.com.au/tools-resources.

4.3.5 Vaccination

The strategic objectives of vaccination as part of an eradication campaign are:

- reduction in virus production in large populations of poultry, the destruction of which is delayed by a shortage of resources
- provision of a barrier of immune birds to aid containment
- protection of particularly valuable or genetically important populations of birds
- protection of layer flocks; and
- reduction of the reinfection risk of the replacement flock after decontamination.

Vaccinated birds may become infected and shed virus while remaining clinically healthy; thus they will need to be identified and will be treated in a similar manner to nonvaccinated birds. Where vaccine is used to establish a buffer of immune birds and the birds or premises do not become infected, the vaccinated birds will be able to be slaughtered at the end of their commercial lives and marketed, subject to flock testing with negative PCR results or under permit (see Section 6.3).

If the aim is to protect genetically important flocks, these will need to be vaccinated as soon as possible. In Australia, vaccination of these birds is normally with live vaccines based on the V877 vaccine, and inactivated vaccines based on V877 or D78 vaccine strains.

The NMG will need to decide whether vaccination will be carried out and whether it will be compulsory. If the NMG decides to vaccinate, vaccination, which is already common practice in Australian breeder flocks, will be required for broiler and laying flocks. A suitable vaccine produced from a vaccine strain shown to be effective against the strain of IBD virus involved may be used. This is to reduce the volume of virus in an infected flock before stamping out when resources are limited, or to establish a barrier of immune birds around an outbreak. In ring vaccination, the outer edge of the ring should be put in place first, in case the virus has already spread further than expected. Vaccinating flocks from the perimeter to the centre of a zone also allows vaccination teams to move from low-risk to high-risk flocks, thereby reducing the chance of the teams inadvertently spreading the IBD virus.

See Section 2.7 for further information on vaccination.

4.3.6 Treatment of infected animals

Infected or susceptible animals will not be treated.

4.3.7 Treatment of animal products and byproducts

Heat inactivation of IBD virus in poultry meat requires times and temperatures that exceed those used in commercial cooking (see Section 2.4.2). Product cooked to these requirements may not be suitable for human consumption, and may need to be canned or rendered. Before the product is moved from quarantined premises, whether or not the necessary parameters have been met needs to be considered. See Section 6 for conditions for movement of products and byproducts.

Any treatment required for poultry products will depend on the type of product, the nature of the declared area and the disease status of the premises. Stored and frozen products from SPs will need to be held until the status of the premises is clarified.

Permits for egg collection from genetically valuable stock will stipulate the biosecurity measures to be adopted at the farm, hatchery and brooder or growing house; the procedures for the collection and

surface decontamination of the eggs; and the procedures to be adopted at the hatchery and at the brooder or growing house for the detection of virus or disease (see the Poultry Enterprise Manual). Should premises containing genetically valuable stock become infected, an agreed protocol for the safe removal of eggs from the farm for hatching and subsequent growing will be established. IBD virus is not egg transmitted; therefore, it should be possible to obtain clean eggs for setting, provided that appropriate decontamination of the egg surfaces and the egg fillers and boxes is carried out.

4.3.8 Destruction of animals

Stamping out

Infected premises (IPs) will be subjected to stamping out procedures. Decisions on the destruction of birds on other premises, including dangerous contact premises (DCPs), will be based on an analysis of the risk factors, such as the strain of virus present, the duration and extent of the outbreak, and other information that becomes available from tracing, surveillance and testing.

4.3.9 Disposal of animals, and animal products and byproducts

A major objective of the eradication program is the prompt and effective disposal of infective material. Available methods include burial, composting, cremation and rendering. Products not destined for human consumption will normally be disposed of either by burning or burial (in a way that prevents them from being scavenged).

The disposal of very large numbers of birds in a short time presents environmental and logistical problems (see the **AUSVETPLAN operational manual *Disposal***).

4.3.10 Decontamination

The decontamination of premises, fomites and people is an essential part of the stamping out policy and must be rigorously applied. One of the major objectives of the eradication program is prompt and effective disposal of infective material in which virus could persist, such as fresh and frozen carcases, dead birds, eggs, litter, manure, waste products, and fittings and building materials that cannot be effectively decontaminated. Equipment and fixtures must be dismantled, handwashed and disinfected, rather than being cleaned and disinfected in situ using high-pressure water or steam hoses. Clothing, footwear, crates, feed sacks and egg fillers should be decontaminated if possible, or destroyed.

Decontamination will include rodent and insect control.

Particular attention will be paid to the decontamination of litter. Since IBD virus can survive for up to 52 days in faecal material, it is necessary to thoroughly disinfect the surface of the litter. Methods such as prolonged composting for inactivation of the virus may then be used.

For the type, concentration and method of application of disinfectants and further information on decontamination, see the **AUSVETPLAN operational manual *Decontamination***.

Sentinel birds can be placed on premises immediately after decontamination has been completed. To ensure that IBD virus has been eliminated, no evidence of any IBD virus (or vaccine virus) should be found in the sentinels. Birds should be tested for antigen and serum tested for IBD antibodies to confirm that the virus has been eliminated.

4.3.11 Wild animal management

Wild birds that visit poultry sheds may act as mechanical carriers of IBD virus. Whether they can become infected and act as true carriers has not been established. They could introduce eavIBD or vvIBD virus to an area, but appear to play little part in the spread of disease between flocks during epidemics.

Quarantined poultry houses and contaminated sites will be bird-proofed while eradication procedures are underway. For more details, see the **AUSVETPLAN operational manual *Wild animal response strategy***.

4.3.12 Vector management

A rodent baiting program will be instituted during decontamination as rodents could act as mechanical carriers between farms.

Mealworms can act as carriers of IBD. If they are present, they should be controlled by effective insecticides or other proven methods during decontamination of the premises. Flying insects can spread the disease mechanically (see Section 2.4.2). If practical, steps should be taken to reduce their numbers and minimise the chance of flies entering bird sheds.

4.3.13 Public awareness and media

A media campaign must emphasise the importance of producers regularly inspecting susceptible birds and promptly reporting suspicious lesions and unusual deaths, disease or production problems. It should also emphasise the risks of disease transfer associated with the feeding of poultry scraps to backyard poultry.

A focus of the awareness activity is that IBD does not cause disease in humans and that eggs and poultry products that enter the market are safe to eat.

4.4 Other control and eradication options

In an outbreak of vvIBD, if the diagnosis is delayed or if the disease becomes widespread and stamping out is no longer considered practical, a policy to control the losses associated with the disease using vaccination as an alternative to eradication will be considered. If used, vaccination will be supported by a combination of strategies, including movement controls over birds, avian products and fomites to minimise the spread of infection; zoning and compartmentalisation to define infected and disease-free areas and premises; and a public awareness campaign to facilitate cooperation from industry and the community (especially smallholders).

The policy for long-term control of the disease will be determined following consultation between the government and the poultry industry. An eradication policy may be continued, subject to industry meeting the costs.

If the diagnosis is delayed but the disease is not considered to be widespread during an outbreak of eavIBD, vaccination will be an integral part of the control program. This will be supported by movement controls over birds, avian products and fomites to minimise the spread of infection; and zoning/compartmentalisation to define infected and disease-free areas and premises.

If eavIBD is found to be widespread when diagnosed, the policy for long-term control of the disease will be determined following consultation between the government and the poultry industry. Possible policies may be to continue to attempt eradication or to accept that eavIBD strains have become endemic. Vaccination will be the preferred option, supported by zoning/compartmentalisation to define infected and disease-free areas and premises.

The major consideration would be that regaining eavIBD- or vvIBD-free status for the country would take a long time and that the costs may be higher than the likely benefits. The international acceptance of disease-free status based on zoning or compartmentalisation will likely be earlier.

Whichever policy is adopted, there will be a need for constant liaison with industry, the media and the public. This will be combined with a detailed education program and advice to producers about the disease, the control options and the best methods of handling the situation, including:

- means of minimising the spread of infection (eg biosecurity practices, such as water treatment, bird-proofing, pest control, isolation, hygienic practices)
- available vaccines and vaccination programs, taking into account the strain of virus and the age and type of birds; and
- the need for disease monitoring and flock examinations, and rapid reporting of unusual events.

The strategies described in Section 4.3 will be applicable.

4.5 Funding and compensation

Details of the cost-sharing arrangements can be found in the Government and Livestock Industry Cost Sharing Deed in Respect of Emergency Animal Disease Responses.[9] Details of the approach to the valuation of, and compensation for, livestock and property in disease responses can be found in the **AUSVETPLAN operational manual *Valuation and compensation***.

[9] www.animalhealthaustralia.com.au/what-we-do/emergency-animal-disease/ead-response-agreement

5 Declared areas and premises

When an emergency animal disease (EAD) is first suspected, the premises involved would undergo a clinical and/or epidemiological investigation. If the case definition, as defined in the relevant AUSVETPLAN response strategy, is met (ie the index case[10]), the relevant chief veterinary officer (CVO) or their delegate will determine the premises classification and may declare the premises an infected premises (IP).

After the identification of the first IP, a restricted area (RA) and a control area (CA) may be declared.[11] A transmission area (TA) may also be defined, if appropriate. All premises within these areas will be classified. At the beginning of an EAD incident, the initial premises classifications would be IP, at-risk premises (ARP), premises of relevance (POR), unknown status premises (UP) and zero susceptible species premises (ZP).

Any premises within the RA or CA will have only one classification at any one time. After an epidemiological investigation, clinical assessment, risk assessment or completion of control measures, a premises may be reclassified.

Once the first IP has been identified, intelligence gathering through veterinary epidemiological investigations would quickly lead to the identification of suspect premises (SPs) and trace premises (TPs). These would be high priorities for follow-up investigation by the relevant state or territory authorities. In a worst-case scenario, an SP could become an IP; therefore, SPs need to be investigated as a matter of very high priority. Similarly, investigation and risk assessment of a TP might identify it as an IP, dangerous contact premises (DCP) or dangerous contact processing facility (DCPF). An SP or TP might also be assessed as negative and qualified as SP-AN or TP-AN, and eventually reclassified as an ARP, POR or ZP.

All premises classifications are subject to change as a result of a modification in the case definition(s) or investigation(s) as the incident response proceeds.

Classifications should be applied with information needs of managers in mind. They should assist managers to monitor and report progress. Premises classifications to be used should be agreed early in a response, so that control centre personnel can apply the correct and consistent classifications and definitions from the outset of the investigation and response.

5.1 Declared areas

Maintaining movement restrictions on areas for long periods has important implications for resource management, animal welfare, business continuity, and socioeconomic impacts on producers and regional communities.

During the course of an EAD response, it may become necessary for a CA or RA to be expanded, as additional geographical areas or new foci of infection are identified. Later in the response, as control is achieved, mechanisms for gradually reducing the size of the CA and RA can be introduced.

An EAD may involve multiple foci of infection, with several jurisdictions potentially involved. Since disease might be controlled at different rates in different areas, there may be the opportunity to progressively lift restrictions on an area basis. This would involve reclassifying previously declared

[10] The first case to come to the attention of investigators

[11] This is invariably the case with highly contagious diseases (eg foot-and-mouth disease, equine/avian/swine influenza, classical swine fever) but may not apply to less contagious diseases (eg Hendra virus, anthrax, Australian bat lyssavirus).

areas (RAs and CAs), with a staged approach to lifting of movement restrictions. This is a key step in the recovery process and will have positive benefits on the community.

5.1.1 Restricted area (RA)

An RA is a relatively small legally declared area around IPs and DCPs that is subject disease controls, including intense surveillance and movement controls.

An RA will be a relatively small declared area[12] (compared with a CA) drawn with at least 1 km radius around all IPs and DCPs, and including as many SPs, TPs and DCPFs as practicable. Based on risk assessment, the RA is subject to intense surveillance and movement controls. The purpose of the RA is to minimise the spread of the EAD. The RA does not need to be circular but can have an irregular perimeter, provided that the boundary is initially an appropriate distance from the nearest IP, DCP, DCPF, SP or TP. Multiple RAs may exist within one CA.

The boundaries will be modified as new information becomes available, including from an official surveillance program. The actual distance in any one direction will be determined by factors such as terrain, the pattern of livestock movements, livestock concentrations, the weather (including prevailing winds), the distribution and movements of relevant wild (including feral) animals, and known characteristics of the disease agent. In practice, major geographic features and landmarks, such as rivers, mountains, highways and roads, are frequently used to demarcate the boundaries of the RA. Although it would be convenient to declare the RA on the basis of local government areas, this may not be practical, as such areas can be larger than the particular circumstances require.

5.1.2 Control area (CA)

A CA is a legally declared area where the disease controls, including surveillance and movement controls, applied are of lesser intensity than those in an RA (the limits of a CA and the conditions applying to it can be varied during an incident according to need).

A CA is a disease-free buffer between the RA and the outside area (OA). Specific movement controls and surveillance strategies will be applied within the CA to maintain its disease-free status and prevent spread of the disease into the OA.

An additional purpose of the CA is to control movement of susceptible livestock for as long as is necessary to complete tracing and epidemiological studies, to identify risk factors and forward and backward risk(s).

The CA will be a larger declared area around the RA(s) – initially, possibly as large as the state or territory in which the incident occurs – where restrictions will reduce the risk of disease spreading from the RA(s). The CA will have a minimum radius of 2 km, encompassing the RA(s). It may be defined according to geography, climate and the distribution of relevant wild (including feral) animals. The boundary will be adjusted as confidence about the extent and distribution of the incident increases.

In general, surveillance and movement controls will be less intense in the CA than in the RA, and disease-susceptible animals and their products may be permitted to move under permit within and out of the area.

[12] As defined under relevant jurisdictional legislation

5.2 Other areas

It is possible that other types of areas (eg vaccination area or surveillance area), which are not legally declared, may be used for disease control purposes in some jurisdictions.

5.3 Premises classifications

Detailed guidelines for classifying premises statuses are provided in the **AUSVETPLAN guidance document *Declared areas and application of premises classifications in an EAD response***, and the definitions are in the Glossary.

5.3.1 Premises status classifications

For infectious bursal disease (IBD), the premises classifications to be used are:

- infected premises (IP)
- suspect premises (SP)
- trace premises (TP)
- dangerous contact premises (DCP)
- dangerous contact processing facility (DCPF)
- approved processing facility (APF)
- approved disposal site (ADS)
- at-risk premises (ARP)
- premises of relevance (POR)
- resolved premises (RP)
- unknown status premises (UP)
- zero susceptible species premises (ZP).

5.3.2 Qualifiers

Please also refer to the **AUSVETPLAN guidance document *Declared areas and premises classifications*** for more detail on qualifiers.

For infectious bursal disease (IBD), the qualifiers to be used are:

- assessed negative (AN)
- sentinels on site (SN)
- vaccinated (VN).

5.4 Reclassifying premises and previously declared areas

Maintaining movement restrictions on areas for long periods has important implications for resource management, animal welfare, business continuity, and socioeconomic impacts on producers and regional communities. Therefore, attention should be given to reclassifying premises and previously declared areas as quickly as possible.

Detailed guidelines for reclassifying previously declared areas are provided in the **AUSVETPLAN guidance document *Declared areas and application of premises classifications in an EAD response***.

5.4.1 Reclassifying previously declared areas

The lifting of restrictions in declared areas is managed by jurisdictions according to their local legislation, regulations and processes.

The key principles for reclassifying a previously declared area during a response should include the following, noting that not all will be relevant for some diseases:

- The area should be epidemiologically distinct from other declared areas.
- All TPs and SPs have been investigated and reclassified, and all IPs, DCPs and DCPFs in the area have been reclassified as RPs (or APFs).
- All tracing and surveillance associated with EAD control has been completed satisfactorily, with no evidence or suspicion of infection in the area.
- A minimum period of 14 days[13] has elapsed since predetermined disease control activities and risk assessment were completed on the last IP or DCP in the area or a risk assessment supports reclassification.
- An approved surveillance program (including the use of sentinel animals, if appropriate) has confirmed no evidence of infection in the RA (see below).
- For vector-borne diseases, vector monitoring and absence of transmission studies indicate that vectors are not active.

Lifting of restrictions is a process managed by the relevant CVO under jurisdictional legislation and consistent with the most current agreed Emergency Animal Disease Response Plan (EADRP). When the appropriate conditions are satisfied, an affected jurisdiction can, in consultation with the Consultative Committee on Emergency Animal Diseases (CCEAD), reduce the size of either or both the CA and RA or lift all restrictions as surveillance/monitoring indicates change in risk. The previous part of the RA would then become part of the CA. Jurisdictions should be able to present documented evidence that the appropriate conditions have been met.

When an RA is lifted and becomes part of the CA, it will have a lower risk status, and the movement restrictions that apply will be consistent with those applying within the CA. Over time, all of the RAs will be reduced and lifted.

If more than one jurisdiction is affected, each will use its own appropriate legal jurisdictional mechanisms to lift the declaration of the RA or CA, coordinating with each other and consulting with the CCEAD to ensure wide communication and coordination.

[13] The minimum period uses, or is based on, the disease-specific incubation periods defined by the OIE – two incubation periods is a common guideline.

After a further period of surveillance and monitoring, and provided that the additional surveillance and monitoring find no evidence of infection, a jurisdiction, in consultation with the CCEAD, could lift the CA. This would result in the lifting of all the remaining regulatory controls associated with the response, and a return to business as usual.

5.4.2 General considerations

The World Organisation for Animal Health (OIE) defines an infected zone as a clearly defined part of a country containing an animal subpopulation 'in which the absence of the disease under consideration has not been demonstrated by the requirements specified in the Terrestrial Code being met'. This area must be clearly defined by the veterinary authorities in agreement with environmental, ecological and geographical factors, epidemiological factors, and the type of husbandry being practised.

6 Movement controls

6.1 Principles

The principles for the recommended quarantine practices and movement controls are as follows:

- Containment and eradication of infectious bursal disease (IBD) is the highest priority. Therefore, 'normal business movements' are not allowed.
- Live animals pose the greatest risk of disease spread; therefore, their movements from all premises within the restricted area (RA) and control area (CA) must be strictly controlled.
- The outside area (OA) should remain as 'clean' as possible. Therefore, movement of animals from the RA to the OA is prohibited, and movement of products is generally prohibited. Movement of animals and products from the CA to the OA will also be restricted.
- Trace premises (TP) and suspect premises (SP) are temporary classifications, and every effort should be made to resolve the status of these premises as soon as possible.
- The numbers of susceptible animals within the RA should be minimised. Therefore, movements of animals into the RA will be limited and usually for slaughter only.
- Movement restrictions are more stringent within the RA than within the CA, and will be more stringent in the early stages of the response.
- Movement controls may be varied during a response from those listed here. However, this will involve a variation to the agreed Emergency Animal Disease Response Plan, with endorsement by the Consultative Committee on Emergency Animal Diseases (CCEAD) and the National Management Group (NMG).
- Recommended movement controls apply to any movement off a premises, whether on foot or by vehicle, that involves either public or private land.
- All movement control matrixes and narratives are for guidance.
- Application for a movement permit does not automatically mean that one will be granted.
- In emergency or exceptional circumstances, any proposed movement may be considered by the jurisdictional chief veterinary officer (CVO) on a risk-assessed case-by-case basis.
- Interstate movements will need to meet the import requirements of the receiving jurisdiction.

6.2 Guidelines for issuing permits

In an emergency animal disease (EAD) event, quarantine and movement controls must strike a balance between quick and effective disease control and business continuity. Therefore, it is not appropriate to simply prohibit all movement of animals and products. On the other hand, diligence needs to be applied to minimise the risk of further spread of the disease.

Recommended biosecurity and movement controls in each AUSVETPLAN response strategy provide guidance on which movements can be allowed and under what conditions. This is based on an analysis of the disease risks that are presented by a specific movement, of a specific commodity, at a specific time during the EAD response phase. Each disease strategy will indicate whether a proposed movement is:

- allowed (under normal jurisdictional, including interstate, requirements)
- prohibited – except under the conditions of a general, special or emergency permit
- prohibited.

Permits may not be available until the relevant CVO provides approval for movements, and this may not be available in the early stages of a response. When assessing risk for the purposes of issuing a permit, the elements to consider may include:

- sources of risk
    - risk material such as live or dead susceptible animals, semen, embryos, meat, meat products, waster products, offal, paunch screenings, manure, render material, fertiliser, biological specimens, casings, used wrappers and cartons, effluent, fomites (vehicle, people, nonsusceptible animals, crops, grains, hay silage and mixed feeds)
    - presence of disease agent on both the originating and destination premises, and uncertainty
    - location of source and destination premises
    - fate at destination premises (eg for slaughter vs for growing out)
    - current vector activity, if relevant
    - organisation and management issues (ie confidence in animal tracing and surveillance, biosecurity)
    - proposed use of the animals or products
    - proposed transport route
    - vaccination status of the animals, if relevant
    - treatment of animals and vehicles to prevent concurrent movement of vectors, if relevant
    - security of transport
    - security and monitoring at the destination
    - environment and natural events
    - community and human behaviour
    - risk of sabotage
    - technology
    - regulations and standards
    - available resources for compliance and enforcement
- areas of impact
    - livestock health (health of affected species, including animal welfare)
    - human health (including work health and safety)
    - trade and economic impacts (including commercial and legal impacts)
    - environmental impacts
    - organisational capacity
    - political impacts
    - reputation and image
- proposed risk treatment measures
    - vaccination
    - destruction of animals
    - processing of product
    - disinfection or other treatment of animals, vehicles and fomites
    - vector control, if relevant
    - security
    - communication.

6.3 Types of permits

Permits are either general or special. Emergency permits are a form of special permit. Permits are legal documents that describe the animal(s), commodities or things to be moved, the origin and destination, and the conditions to be met for the movement. Either type of permit may include conditions. Once permit conditions have been agreed from an operational perspective, all permit conditions must be met for every permit. Both general and special permits may be in addition to documents required for routine movements between or within jurisdictions (eg health certificates, waybills, consignment notes, National Vendor Declarations – NVDs).

General permit

General permits (GPs) are used for lower-risk movements, and create a record of each movement to which they apply. They are granted without the need for direct interaction between the person moving the animal(s), commodity or thing and a government veterinarian or gazetted inspector of stock. The permit may be completed via a webpage or in an approved place (such as a government office or commercial premises). A printed version of the permit must accompany the movement. The permit may impose preconditions and/or restrictions on movements. GPs may not be available until the relevant CVO gives approval for general movements, and this may not be available in the early stages of a response.

Special permit

Special permits (SpPs) are issued by the relevant government veterinarian or gazetted inspector of stock. They are used for higher-risk movements, and therefore require formal application and individual risk assessment. SpPs describe the requirements for movement of an animal (or group of animals), commodity or thing, for which a specific assessment has been conducted by the relevant government veterinarian or gazetted inspector of stock. A printed version of the permit must accompany the movement. The permit may impose preconditions and/or restrictions on movements.

Emergency permit

An emergency permit is an SpP that specifies strict legal requirements for an otherwise high-risk movement of an animal, to enable emergency veterinary treatment to be delivered, to enable animals to be moved for animal welfare reasons, or to enable any other emergency movement under exceptional circumstances. These permits are issued on a case-by-case basis under the authorisation of the relevant CVO.

Other movement requests

Movements not reflected within any of the movement control matrixes or narratives may be considered by the relevant jurisdictional CVO on a risk-assessed case-by-case basis.

6.4 Recommended movement controls

Declared premises

Table 6.1 shows the movement controls that will apply to IPs, DCPs and SPs in the event of an IBD incident.

Table 6.1 Movement controls for declared premises

Quarantine or movement controls	Infected premises (IPs) and dangerous contact premises (DCPs)	Suspect premises (SPs)
Movement out of IPs, DCPs or SPs by:		
Live susceptible birds	All birds on IPs to be destroyed on farm. Relevant risk factors (including negative test results for IBD virus) will be assessed to determine whether birds on DCPs are to be destroyed on farm or allowed under permit for slaughter at an abattoir.	Allowed under permit for slaughter at an abattoir, subject to negative test results for IBD virus
Dead susceptible birds	To be disposed of on premises, or in the RA under permit, or sent under permit to a laboratory for testing	Allowed under permit within the RA
Nonsusceptible birds	Prohibited	Allowed under permit
Other animals (eg dogs)	Prohibited	Allowed under permit
Litter and manure	Prohibited	Prohibited
Equipment and feed	Allowed under permit, subject to appropriate decontamination	Allowed under permit
Fertile eggs	Allowed under permit for salvage of genetically valuable stock, subject to surface decontamination procedures	Allowed under permit, subject to surface decontamination procedures
Table eggs	Allowed under permit, subject to surface decontamination procedures	Allowed under permit, subject to surface decontamination procedures
Fresh or frozen meat from susceptible birds	Meat to be either destroyed on premises, or canned or rendered under permit Allowed under permit for human consumption from flocks on DCPs with negative test results for IBD virus	Allowed under permit from flocks with negative test results for IBD virus, or held until status of premises clarified
Horticultural or agricultural crops	Allowed	Allowed

Movement in and out of IPs, DCPs or SPs by:		
People	Allowed, with appropriate decontamination	Allowed, with appropriate decontamination
Vehicles	Allowed under permit, with appropriate decontamination	Allowed under permit, with appropriate decontamination
Movement into IPs, DCPs or SPs by:		
Susceptible birds	Prohibited	Allowed under permit (with caution, due to compensation issues)
Nonsusceptible birds	Allowed under permit	Allowed under permit
Bird feed	Allowed under permit, with appropriate decontamination of vehicles and equipment	Allowed under permit, with appropriate decontamination of vehicles and equipment
Movement to and from a hatchery:		
	Prohibited	Allowed under permit, provided the fertile eggs, chickens and hatchery waste have undergone appropriate decontamination procedures
Movement to and from an abattoir:		
	Plant is to be decontaminated before operating again if it has received birds from an IP or DCP. Stored fresh and frozen carcases from an IP to be either destroyed on premises, or canned or rendered under permit.	Plant is to be decontaminated before operating again if it has received birds not tested negative.
Movement of abattoir waste:		
	Waste to be buried on site or removed under permit, subject to appropriate decontamination	Allowed under permit, subject to appropriate decontamination

Declared areas

Table 6.2 shows the movement controls that will apply to RAs and CAs in the event of an IBD incident.

Table 6.2 Movement controls for declared areas

Quarantine or movement controls	Restricted area (RA) (if declared)	Control area (CA) (if declared)
Movement out of susceptible birds	Prohibited	Allowed under permit
Movement in of by susceptible birds	Movement from a free area or contiguous CA to a clean abattoir for immediate slaughter allowed under permit or after testing with negative results for IBD virus. Birds for restocking may be allowed under permit.	Movement from a free area to a property or abattoir allowed under permit
Movement in or out of nonsusceptible birds	Allowed under permit	Allowed under permit
Movement within of susceptible birds	Movement to an abattoir for immediate slaughter or to a property allowed under permit or after testing with negative results for IBD virus	Allowed
Movement through of susceptible birds	Direct movement allowed under permit, provided the origin and destination are both outside the RA and CA	Allowed
Movement out of litter and manure	Prohibited	Prohibited, except under permit
Movement out of equipment and feed	Allowed under permit, after appropriate decontamination	Allowed
Hatcheries	Declared RAs should not include hatcheries if possible. Activities will be suspended.	Fertile eggs can be sourced from outside the CA, and day-old chickens from hatcheries are allowed out of the CA under permit.
To and from an abattoir	Birds from DCPs and SPs allowed under permit, subject to negative test results for IBD virus. Equipment and vehicles to be appropriately decontaminated.	Allowed under permit. Equipment and vehicles to be appropriately decontaminated.
Movement of meat from susceptible birds	Movement into or within the RA allowed. Movement out of the RA allowed under permit, to approved premises for heat treatment sufficient to inactivate IBD virus unless the meat originates from flocks with negative test results for IBD virus.	Movement into or within the CA allowed. Movement out of the CA allowed under permit.

Quarantine or movement controls	Restricted area (RA) (if declared)	Control area (CA) (if declared)
Movement of offal and waste from susceptible birds	Movement into or within the RA allowed. Movement out of the RA allowed under permit to approved premises for heat treatment sufficient to inactivate IBD virus.	Movement into or within the CA allowed. Movement out of the CA allowed under permit.
Risk enterprises (eg private avian laboratories, cull hen collectors, dead-bird pick-up [not processing establishments])	Operations may be allowed under permit	May continue to operate under permit
Sales, shows, pigeon races, and so on	All gatherings of susceptible birds prohibited	May continue to operate under permit
Movement of table eggs in or out, other than from IPs and DCPs	Allowed under permit, subject to surface decontamination procedures	Allowed into, within or out of the CA under permit
Movement of fertile eggs	Allowed under permit, subject to surface decontamination procedures	Allowed within the CA. Allowed under permit to outside the CA, subject to surface decontamination procedures.
Movement of egg pulp from plants, including on-farm plants	Prohibited, except under permit for appropriate heat treatment after surface decontamination procedures	Allowed within the CA. Allowed under permit to outside the CA.
Domestic pets and susceptible birds	Within the RA, all pets to be confined or tied up and all free susceptible birds to be confined	Movement allowed under permit

7 Surveillance and proof of freedom

7.1 Surveillance

Intensive surveillance aims to identify potential new cases. Farm visits are invaluable, but inspectors must be extremely aware of the risk of spreading virus through movements between farms. The following procedures should be adopted to minimise the need for multiple farm inspections:

- industry reporting on flocks by telephone or fax
- telephone surveys
- serological testing
- dead-bird pick-up and transport to a laboratory; and
- visits to only potential new cases identified by the above.

Surveillance can be done at any of the following three phases:

- early in an outbreak
- later in an outbreak, when recovered flocks have seroconverted; and
- if the disease is established.

7.1.1 Specific considerations

Training needs

Surveillance officers must:

- be familiar with the poultry industry; and
- pass information to poultry industry experts for interpretation.

Surveillance officers must have access to the following:

- Flock health data for the class of stock under normal circumstances.
- A summary of the disease — for example, a list, several pictures and a video of clinical signs, as well as an example of how health and production records would change in flocks infected with vvIBD virus and eavIBD virus. Note that with eavIBD, clinical signs may not be obvious and may vary with the nature of secondary infections. Production losses rather than increased mortality will predominate with eavIBD.

Information required

Information will be required from high-risk flocks in the restricted areas (RAs) and control areas (CAs). These could be:

Susceptible birds	***Other (if containing susceptible birds)***
Chickens	Aviaries
Turkeys	Pet shops
Game birds	Zoos
Backyard flocks	
Fancy flocks	

A reporting procedure that includes the following observations should be adopted.

Perusal of records and interviews of owners and staff
This should include information on the following:

- any sudden increase in mortality, especially between 3 and 6 weeks of age
- the IBD antibody status of the flock
- the use of IBD vaccines on the flock; and
- any increase in secondary infections in the flock.

Examination of flocks
Examinations of flocks should note any:

- flock depression or prostration
- pallor of comb and wattles
- wet-dropping problems; and
- respiratory diseases (ie secondary infections).

Field autopsy findings
Autopsy results should record:

- marked dehydration and darkening of the muscles
- haemorrhages in the breast and thigh muscles
- enlarged bursa with cream-coloured gelatinous exudate or haemorrhages
- atrophy of the bursa, with or without signs of inflammation (eavIBD)
- haemorrhages at the junction of the proventriculus and gizzard and in the caecal tonsils
- swollen kidneys (often containing urates) and spleen; and
- evidence of secondary infections.

Laboratory analysis
Decisions should be made at the local disease control centre on which laboratory will be responsible for the laboratory testing and who will manage and evaluate the results in the following situations:

- before a diagnosis is confirmed
- after a diagnosis is confirmed (chief veterinary officer to decide whether diagnosis is to be on clinical signs or laboratory investigation, taking into account the possible absence of definitive clinical signs in eavIBD infections); and
- after repopulation of IPs and DCPs.

7.1.2 Premises surveillance

In the restricted area

Arrangements should be made for local laboratories to autopsy samples of all species of bird that are found dead. Flock health can be monitored by:

- twice weekly (or more frequently if needed) telephone or fax reporting by producers and dead-bird pick-up, followed up by a field visit if needed
- twice weekly (or more frequently if needed) surveillance of SPs and dead-bird pick-up, followed up with a field visit if needed
- sampling of flocks to provide a 95% level of confidence that vvIBD or eavIBD virus is not present at the 5% level (a diagnostic test capable of distinguishing vvIBD or eavIBD virus from endemic IBD virus should be used); and
- quarantining of suspicious flocks, attempts at virus isolation and resampling of the flock in 7 days time

In the control area

Surveillance in the CA will begin immediately if there is confidence that the outbreak has been contained, and will involve:

- weekly surveillance of susceptible flocks, including flocks of other species
- flock sampling
- weekly reporting on flock health by producers
- follow-up on any unusual disease conditions
- flock sampling of meat chickens and spent hens at abattoirs
- sampling of flocks to provide a 95% level of confidence that vvIBD or eavIBD virus is not present at the 5% level (a diagnostic test capable of distinguishing vvIBD or eavIBD virus from endemic IBD virus should be used); and
- quarantining of suspicious flocks, attempts at virus isolation and resampling of the flock in 7 days time.

Wider geographical surveys

Wider geographical surveys may be required within the free area, and these should begin immediately when there is confidence that the outbreak has been controlled. Surveys should aim at a 95% confidence level of detecting a 5% infection rate in at least 1% of commercial flocks. The interpretation of results should consider the use of an IBD vaccine.

7.2 Proof of freedom

Proof of freedom from vvIBD can best be achieved by clinical observations and dead-bird sampling of repopulated sheds and possible disease outbreaks, rather than widespread testing.

Some surveillance will be required, and it is recommended that this be performed on former IPs, DCPs and SPs at 30 days after repopulation and again at 5 months to establish a 95% confidence of detecting infection at less than 5%. This is to be supported by twice-weekly clinical examinations for 30 days and then fortnightly for 5 months, and virus isolation carried out on dead birds. Seropositive flocks that have not been vaccinated will require further investigation and virus isolation.

Further testing may be considered in other areas if the epidemiological information suggests that this is warranted.

Appendix 1

INFECTIOUS BURSAL DISEASE FACT SHEET

Disease and cause

Infectious bursal disease (IBD) is an acute, contagious viral infection that causes immunosuppression in young chickens, and disease and mortality in 3–6-week-old chickens. The virus results in immunosuppression of varying duration and severity, and increased susceptibility to secondary viral and bacterial infections.

IBD viruses that cause disease in chickens can be classified according to their phenotypic traits (such as antigenicity and pathogenicity) as attenuated (vaccine strains), classical (standard), antigenic variant, and very virulent (also known as hypervirulent) strains. This classification is also supported by viral protein 2 (VP2) amino acid sequence differences. Both classical and antigenic variant strains exist endemically in Australia, but these are genetically different from classical, antigenic variant (exotic antigenic variant, or eav) and very virulent strains found overseas. The endemic IBD viruses in Australian poultry flocks cause immunosuppression and atrophy of the bursa, with occasional haemorrhage and swelling of the bursa, but do not generally cause mortalities.

Species affected

Although antibodies have been found in other avian species, chickens are the only birds that show clinical signs of IBD. There is no evidence that IBD virus can infect humans.

Distribution

Classical strains of IBD virus are endemic throughout the world, including Australia.

Very virulent IBD (vvIBD) virus has spread throughout Europe, to the Middle East, Africa, South America and Asia. It is endemic in most parts of southern Asia, but has not been reported in the United States, several northern European countries, New Zealand or Australia.

Antigenic variant strains are the predominant viruses existing in the United States and have also been described in Asia, Europe, and Central and South America. Antigenic variant strains of IBD virus have been isolated in Australia but they are genetically and antigenically different from overseas variant strains.

Key signs

Three main clinical forms of IBD are described, in association with different viral strains:

- The classical strains of IBD virus were originally associated with low mortality, but in recent years they are usually associated with subclinical disease; the disease syndrome develops after a decline in passive immunity, and mortality specifically due to IBD virus infection is relatively low. Clinical signs of the disease include anorexia, watery diarrhoea and ruffled feathers. However, the associated immunosuppression may lead to increased susceptibility to secondary infections.
- The eavIBD virus strains do not cause obvious clinical signs, and principally cause more pronounced immunosuppression, leading to an increased susceptibility to secondary infections.
- The vvIBD virus strains are associated with acute clinical disease and high mortality rates. After a short incubation period, clinical signs in the acute phase of the disease include anorexia, watery diarrhoea and ruffled feathers. Birds become prostrate and dehydrated.

Disease severity depends on the age and breed of the affected birds, the degree of passive immunity, the virulence of the strain of virus and the type of secondary infection.

Australian endemic strains of IBD viruses can be classified on genetic grounds into classical strains and Australian variant strains. The significance of the genetic differences is uncertain, as the clinical signs associated with Australian classical and variant strains are essentially indistinguishable in the field.

Spread

The disease is highly contagious, spreading through the movement of poultry products, equipment, feed bags, vehicles and people, and to a lesser extent through aerosols of dust.

The main route of transmission is the faecal–oral route, and the virus can survive for prolonged periods in faeces and bedding. In-contact spread occurs readily when chickens are housed together. Spread is most likely to occur through ingestion of contaminated water and feed, ingestion of infected droppings or exposure of respiratory or conjunctival membranes to aerosols of poultry dust.

Persistence of the agent

The virus is highly resistant to heat and chemicals, and normal shed-cleaning practices may be inadequate to eliminate the virus.

Processed and frozen poultry meat may contain infectious virus. The virus is not egg transmitted but can survive on the eggshell surface.

Glossary

Standard AUSVETPLAN terms

Animal byproducts	Products of animal origin that are not for consumption but are destined for industrial use (eg hides and skins, fur, wool, hair, feathers, hoofs, bones, fertiliser).
Animal Health Committee	A committee whose members are the chief veterinary officers of the Commonwealth, states and territories, along with representatives from the CSIRO Australian Centre for Disease Preparedness (CSIRO-ACDP) and the Australian Government Department of Agriculture, Water and the Environment. There are also observers from Animal Health Australia, Wildlife Health Australia, and the New Zealand Ministry for Primary Industries. The committee provides advice to the National Biosecurity Committee on animal health matters, focusing on technical issues and regulatory policy. *See also* National Biosecurity Committee
Animal products	Meat, meat products and other products of animal origin (eg eggs, milk) for human consumption or for use in animal feedstuff.
Approved disposal site	A premises that has zero susceptible livestock and has been approved as a disposal site for animal carcasses, or potentially contaminated animal products, wastes or things.
Approved processing facility	An abattoir, knackery, milk processing plant or other such facility that maintains increased biosecurity standards. Such a facility could have animals or animal products introduced from lower-risk premises under a permit for processing to an approved standard.
At-risk premises	A premises in a restricted area that contains a live susceptible animal(s) but is not considered at the time of classification to be an infected premises, dangerous contact premises, dangerous contact processing facility, suspect premises or trace premises.
Australian Chief Veterinary Officer	The nominated senior veterinarian in the Australian Government Department of Agriculture, Water and the Environment who manages international animal health commitments and the Australian Government's response to an animal disease outbreak. *See also* Chief veterinary officer
AUSVETPLAN	*Aus*tralian *Vet*erinary Emergency *Plan*. Nationally agreed resources that guide decision making in the response to emergency animal diseases (EADs). It outlines Australia's preferred approach to responding to EADs of national significance, and supports efficient, effective and coherent responses to these diseases.
Carcase	The body of an animal slaughtered for food.
Carcass	The body of an animal that died in the field.
Chief veterinary officer (CVO)	The senior veterinarian of the animal health authority in each jurisdiction (national, state or territory) who has responsibility for animal disease control in that jurisdiction. *See also* Australian Chief Veterinary Officer

Compartmentalisation	The process of defining, implementing and maintaining one or more disease-free establishments under a common biosecurity management system in accordance with OIE guidelines, based on applied biosecurity measures and surveillance, to facilitate disease control and/or trade.
Compensation	The sum of money paid by government to an owner for livestock or property that are destroyed for the purpose of eradication or prevention of the spread of an emergency animal disease, and livestock that have died of the emergency animal disease. *See also* Cost-sharing arrangements, Emergency Animal Disease Response Agreement
Consultative Committee on Emergency Animal Diseases (CCEAD)	The key technical coordinating body for animal health emergencies. Members are state and territory chief veterinary officers, representatives of CSIRO-ACDP and the relevant industries, and the Australian Chief Veterinary Officer as chair.
Control area (CA)	A legally declared area where the disease controls, including surveillance and movement controls, applied are of lesser intensity than those in a restricted area (the limits of a control area and the conditions applying to it can be varied during an incident according to need).
Cost-sharing arrangements	Arrangements agreed between governments (national and state/territory) and livestock industries for sharing the costs of emergency animal disease responses. *See also* Compensation, Emergency Animal Disease Response Agreement
Dangerous contact animal	A susceptible animal that has been designated as being exposed to other infected animals or potentially infectious products following tracing and epidemiological investigation.
Dangerous contact premises (DCP)	A premises, apart from an abattoir, knackery or milk processing plant (or other such facility) that, after investigation and based on a risk assessment, is considered to contain a susceptible animal(s) not showing clinical signs, but considered highly likely to contain an infected animal(s) and/or contaminated animal products, wastes or things that present an unacceptable risk to the response if the risk is not addressed, and that therefore requires action to address the risk.
Dangerous contact processing facility (DCPF)	An abattoir, knackery, milk processing plant or other such facility that, based on a risk assessment, appears highly likely to have received infected animals, or contaminated animal products, wastes or things, and that requires action to address the risk.
Declared area	A defined tract of land that is subjected to disease control restrictions under emergency animal disease legislation. There are two types of declared areas: restricted area and control area.
Decontamination	Includes all stages of cleaning and disinfection.
Depopulation	The removal of a host population from a particular area to control or prevent the spread of disease.
Destroy (animals)	To kill animals humanely.

Disease agent	A general term for a transmissible organism or other factor that causes an infectious disease.
Disease Watch Hotline	24-hour freecall service for reporting suspected incidences of exotic diseases – 1800 675 888.
Disinfectant	A chemical used to destroy disease agents outside a living animal.
Disinfection	The application, after thorough cleansing, of procedures intended to destroy the infectious or parasitic agents of animal diseases, including zoonoses; applies to premises, vehicles and different objects that may have been directly or indirectly contaminated.
Disinsectation	The destruction of insect pests, usually with a chemical agent.
Disposal	Sanitary removal of animal carcasses, animal products, materials and wastes by burial, burning or some other process so as to prevent the spread of disease.
Emergency animal disease	A disease that is (a) exotic to Australia or (b) a variant of an endemic disease or (c) a serious infectious disease of unknown or uncertain cause or (d) a severe outbreak of a known endemic disease, and that is considered to be of national significance with serious social or trade implications. *See also* Endemic animal disease, Exotic animal disease
Emergency Animal Disease Response Agreement	Agreement between the Australian and state/territory governments and livestock industries on the management of emergency animal disease responses. Provisions include participatory decision making, risk management, cost sharing, the use of appropriately trained personnel and existing standards such as AUSVETPLAN. *See also* Compensation, Cost-sharing arrangements
Endemic animal disease	A disease affecting animals (which may include humans) that is known to occur in Australia. *See also* Emergency animal disease, Exotic animal disease
Enterprise	*See* Risk enterprise
Enzyme-linked immunosorbent assay (ELISA)	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.
Epidemiological investigation	An investigation to identify and qualify the risk factors associated with the disease. *See also* Veterinary investigation
Epidemiology	The study of disease in populations and of factors that determine its occurrence.
Exotic animal disease	A disease affecting animals (which may include humans) that does not normally occur in Australia. *See also* Emergency animal disease, Endemic animal disease
Exotic fauna/feral animals	*See* Wild animals
Fomites	Inanimate objects (eg boots, clothing, equipment, instruments, vehicles, crates, packaging) that can carry an infectious disease

	agent and may spread the disease through mechanical transmission.
General permit	A legal document that describes the requirements for movement of an animal (or group of animals), commodity or thing, for which permission may be granted without the need for direct interaction between the person moving the animal(s), commodity or thing and a government veterinarian or inspector. The permit may be completed via a webpage or in an approved place (such as a government office or commercial premises). A printed version of the permit must accompany the movement. The permit may impose preconditions and/or restrictions on movements. *See also* Special permit
In-contact animals	Animals that have had close contact with infected animals, such as noninfected animals in the same group as infected animals.
Incubation period	The period that elapses between the introduction of a pathogen into an animal and the first clinical signs of the disease.
Index case	The first case of the disease to be diagnosed in a disease outbreak. *See also* Index property
Index property	The property on which the index case is found. *See also* Index case
Infected premises (IP)	A defined area (which may be all or part of a property) on which animals meeting the case definition are or were present, or the causative agent of the emergency animal disease is present, or there is a reasonable suspicion that either is present, and that the relevant chief veterinary officer or their delegate has declared to be an infected premises.
Local control centre	An emergency operations centre responsible for the command and control of field operations in a defined area.
Monitoring	Routine collection of data for assessing the health status of a population or the level of contamination of a site for remediation purposes. *See also* Surveillance
Movement control	Restrictions placed on the movement of animals, people and other things to prevent the spread of disease.
National Biosecurity Committee	A committee that was formally established under the Intergovernmental Agreement on Biosecurity (IGAB). The IGAB was signed on 13 January 2012, and signatories include all states and territories except Tasmania. The committee provides advice to the Agriculture Senior Officials Committee and the Agriculture Ministers' Forum on national biosecurity issues, and on the IGAB.
National Management Group (NMG)	A group established to approve (or not approve) the invoking of cost sharing under the Emergency Animal Disease Response Agreement. NMG members are the Secretary of the Australian Government Department of Agriculture, Water and the Environment as chair, the chief executive officers of the state and territory government parties, and the president (or analogous officer) of each of the relevant industry parties.
Native wildlife	*See* Wild animals

OIE Terrestrial Code	OIE *Terrestrial animal health code*. Describes standards for safe international trade in animals and animal products. Revised annually and published on the internet at: www.oie.int/international-standard-setting/terrestrial-code/access-online.
OIE Terrestrial Manual	OIE *Manual of diagnostic tests and vaccines for terrestrial animals*. Describes standards for laboratory diagnostic tests, and the production and control of biological products (principally vaccines). The current edition is published on the internet at: www.oie.int/en/standard-setting/terrestrial-manual/access-online.
Operational procedures	Detailed instructions for carrying out specific disease control activities, such as disposal, destruction, decontamination and valuation.
Outside area (OA)	The area of Australia outside the declared (control and restricted) areas.
Owner	Person responsible for a premises (includes an agent of the owner, such as a manager or other controlling officer).
Polymerase chain reaction (PCR)	A method of amplifying and analysing DNA sequences that can be used to detect the presence of viral DNA.
Premises	A tract of land including its buildings, or a separate farm or facility that is maintained by a single set of services and personnel.
Premises of relevance (POR)	A premises in a control area that contains a live susceptible animal(s) but is not considered at the time of classification to be an infected premises, suspect premises, trace premises, dangerous contact premises or dangerous contact processing facility.
Prevalence	The proportion (or percentage) of animals in a particular population affected by a particular disease (or infection or positive antibody titre) at a given point in time.
Proof of freedom	Reaching a point following an outbreak and post-outbreak surveillance when freedom from the disease can be claimed with a reasonable level of statistical confidence.
Qualifiers	
– assessed negative	Assessed negative (AN) is a qualifier that may be applied to ARPs, PORs, SPs, TPs, DCPs or DCPFs. The qualifier may be applied following surveillance, epidemiological investigation, and/or laboratory assessment/diagnostic testing and indicates that the premises is assessed as negative at the time of classification.
– sentinels on site	Sentinels on site (SN) is a qualifier that may be applied to IPs and DCPs to indicate that sentinel animals are present on the premises as part of response activities (ie before it can be assessed as an RP).
– vaccinated	The vaccinated (VN) qualifier can be applied in a number of different ways. At its most basic level, it can be used to identify premises that contain susceptible animals that have been vaccinated against the EAD in question. However, depending on the

	legislation, objectives and processes within a jurisdiction, the VN qualifier may be used to track a range of criteria and parameters.
Quarantine	Legally enforceable requirement that prevents or minimises spread of pests and disease agents by controlling the movement of animals, persons or things.
Resolved premises (RP)	An infected premises, dangerous contact premises or dangerous contact processing facility that has completed the required control measures, and is subject to the procedures and restrictions appropriate to the area in which it is located.
Restricted area (RA)	A relatively small legally declared area around infected premises and dangerous contact premises that is subject to disease controls, including intense surveillance and movement controls.
Risk enterprise	A defined livestock or related enterprise that is potentially a major source of infection for many other premises. Includes intensive piggeries, feedlots, abattoirs, knackeries, saleyards, calf scales, milk factories, tanneries, skin sheds, game meat establishments, cold stores, artificial insemination centres, veterinary laboratories and hospitals, road and rail freight depots, showgrounds, field days, weighbridges and garbage depots.
Sensitivity	The proportion of truly positive units that are correctly identified as positive by a test. *See also* Specificity
Sentinel animal	Animal of known health status that is monitored to detect the presence of a specific disease agent.
Seroconversion	The appearance in the blood serum of antibodies (as determined by a serology test) following vaccination or natural exposure to a disease agent.
Serosurveillance	Surveillance of an animal population by testing serum samples for the presence of antibodies to disease agents.
Serotype	A subgroup of microorganisms identified by the antigens carried (as determined by a serology test).
Serum neutralisation test	A serological test to detect and measure the presence of antibody in a sample. Antibody in serum is serially diluted to detect the highest dilution that neutralises a standard amount of antigen. The neutralising antibody titre is given as the reciprocal of this dilution.
Slaughter	The humane killing of an animal for meat for human consumption.
Special permit	A legal document that describes the requirements for movement of an animal (or group of animals), commodity or thing, for which the person moving the animal(s), commodity or thing must obtain prior written permission from the relevant government veterinarian or inspector. A printed version of the permit must accompany the movement. The permit may impose preconditions and/or restrictions on movements. *See also* General permit
Specificity	The proportion of truly negative units that are correctly identified as negative by a test. *See also* Sensitivity

Stamping out	The strategy of eliminating infection from premises through the destruction of animals in accordance with the particular AUSVETPLAN manual, and in a manner that permits appropriate disposal of carcasses and decontamination of the site.
State coordination centre	The emergency operations centre that directs the disease control operations to be undertaken in a state or territory.
Surveillance	A systematic program of investigation designed to establish the presence, extent or absence of a disease, or of infection or contamination with the causative organism. It includes the examination of animals for clinical signs, antibodies or the causative organism.
Susceptible animals	Animals that can be infected with a particular disease.
Suspect animal	An animal that may have been exposed to an emergency disease such that its quarantine and intensive surveillance, but not pre-emptive slaughter, is warranted. or An animal not known to have been exposed to a disease agent but showing clinical signs requiring differential diagnosis.
Suspect premises (SP)	Temporary classification of a premises that contains a susceptible animal(s) not known to have been exposed to the disease agent but showing clinical signs similar to the case definition, and that therefore requires investigation(s).
Swill	Also known as 'prohibited pig feed', means material of mammalian origin, or any substance that has come in contact with this material, but does not include: (i) Milk, milk products or milk by-products either of Australian provenance or legally imported for stockfeed use into Australia. (ii) Material containing flesh, bones, blood, offal or mammal carcases which is treated by an approved process.[1] (iii) A carcass or part of a domestic pig, born and raised on the property on which the pig or pigs that are administered the part are held, that is administered for therapeutic purposes in accordance with the written instructions of a veterinary practitioner. (iv) Material used under an individual and defined-period permit issued by a jurisdiction for the purposes of research or baiting. [1] In terms of (ii), approved processes are: 1. rendering in accordance with the 'Australian Standard for the Hygienic Rendering of Animal Products' 2. under jurisdictional permit, cooking processes subject to compliance verification that ensure that a core temperature of at least 100 °C for a minimum of 30 minutes, or equivalent, has been reached. 3. treatment of cooking oil, which has been used for cooking in Australia, in accordance with the 'National Standard for Recycling of Used Cooking Fats and Oils intended for Animal Feeds'

	4. under jurisdictional permit, any other nationally agreed process approved by AHC for which an acceptable risk assessment has been undertaken and that is subject to compliance verification. The national definition is a minimum standard. Some jurisdictions have additional conditions for swill feeding that pig producers in those jurisdictions must comply with, over and above the requirements of the national definition.
Swill feeding	Also known as 'feeding prohibited pig feed', it includes: • feeding, or allowing or directing another person to feed, prohibited pig feed to a pig • allowing a pig to have access to prohibited pig feed • the collection and storage or possession of prohibited pig feed on a premises where one or more pigs are kept • supplying to another person prohibited pig feed that the supplier knows is for feeding to any pig. This definition was endorsed by the Agriculture Ministers' Council through AGMIN OOS 04/2014.
Trace premises (TP)	Temporary classification of a premises that contains susceptible animal(s) that tracing indicates may have been exposed to the disease agent, or contains contaminated animal products, wastes or things, and that requires investigation(s).
Tracing	The process of locating animals, people or other items that may be implicated in the spread of disease, so that appropriate action can be taken.
Unknown status premises (UP)	A premises within a declared area where the current presence of susceptible animals and/or risk products, wastes or things is unknown.
Vaccination	Inoculation of individuals with a vaccine to provide active immunity.
Vaccine	A substance used to stimulate immunity against one or several disease-causing agents to provide protection or to reduce the effects of the disease. A vaccine is prepared from the causative agent of a disease, its products or a synthetic substitute, which is treated to act as an antigen without inducing the disease.
– adjuvanted	A vaccine in which one or several disease-causing agents are combined with an adjuvant (a substance that increases the immune response).
– attenuated	A vaccine prepared from infective or 'live' microbes that are less pathogenic but retain their ability to induce protective immunity.
– gene deleted	An attenuated or inactivated vaccine in which genes for non-essential surface glycoproteins have been removed by genetic engineering. This provides a useful immunological marker for the vaccine virus compared with the wild virus.

– inactivated	A vaccine prepared from a virus that has been inactivated ('killed') by chemical or physical treatment.
– recombinant	A vaccine produced from virus that has been genetically engineered to contain only selected genes, including those causing the immunogenic effect.
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.
Veterinary investigation	An investigation of the diagnosis, pathology and epidemiology of the disease. *See also* Epidemiological investigation
Viraemia	The presence of viruses in the blood.
Wild animals	
– native wildlife	Animals that are indigenous to Australia and may be susceptible to emergency animal diseases (eg bats, dingoes, marsupials).
– feral animals	Animals of domestic species that are not confined or under control (eg cats, horses, pigs).
– exotic fauna	Nondomestic animal species that are not indigenous to Australia (eg foxes).
Wool	Sheep wool.
Zero susceptible species premises (ZP)	A premises that does not contain any susceptible animals or risk products, wastes or things.
Zoning	The process of defining, implementing and maintaining a disease-free or infected area in accordance with OIE guidelines, based on geopolitical and/or physical boundaries and surveillance, to facilitate disease control and/or trade.
Zoonosis	A disease of animals that can be transmitted to humans.

8 Abbreviations

8.1 Standard AUSVETPLAN abbreviations

Abbreviation	Full title
ACDP	Australian Centre for Disease Preparedness
AN	assessed negative
ARP	at-risk premises
AUSVETPLAN	Australian Veterinary Emergency Plan
CA	control area
CCEAD	Consultative Committee on Emergency Animal Diseases
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CVO	chief veterinary officer
DCP	dangerous contact premises
DCPF	dangerous contact processing facility
EAD	emergency animal disease
EADRA	Emergency Animal Disease Response Agreement
EADRP	Emergency Animal Disease Response Plan
EDTA	ethylenediaminetetraacetic acid (anticoagulant for whole blood)
ELISA	enzyme-linked immunosorbent assay
GP	general permit
IETS	International Embryo Technology Society
IP	infected premises
LCC	local control centre
NMG	National Management Group
OA	outside area
OIE	World Organisation for Animal Health
PCR	polymerase chain reaction
POR	premises of relevance
RA	restricted area
RP	resolved premises
SCC	state coordination centre
SP	suspect premises

Abbreviation	Full title
SpP	special permit
TP	trace premises
UP	unknown status premises
ZP	zero susceptible stock premises

9 References

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