Disease Strategy

Infectious bursal disease caused by very virulent IBD virus or exotic antigenic variant strains of IBD virus

Version 3.0, 2009

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.

Primary Industries Ministerial Council
This disease strategy forms part of:

**AUSVETPLAN Edition 3**

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

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**DISEASE WATCH HOTLINE**

1800 675 888

The Disease Watch Hotline is a toll-free telephone number that connects callers to the relevant state or territory officer to report concerns about any potential emergency disease situation. Anyone suspecting an emergency disease outbreak should use this number to get immediate advice and assistance.
This disease strategy for the management of an outbreak in Australia of infectious bursal disease (IBD) caused by very virulent IBD virus (vvIBD) or by exotic antigenic variant strains of IBD virus (eavIBD) is an integral part of the Australian Veterinary Emergency Plan, or AUSVETPLAN (Edition 3). AUSVETPLAN structures and functions are described in the AUSVETPLAN Summary Document. This IBD strategy provides information about the disease (Section 1), the relevant risk factors and their treatment and the options for the management of a disease outbreak (Section 2), and the policies that will be adopted in the case of an outbreak (Sections 3 and 4). The key features of IBD are described in Appendix 1.

This manual has been produced in accordance with the procedures described in the AUSVETPLAN Summary Document and in consultation with Australian national, state and territory governments and the poultry industry.

Infectious bursal disease (also known as Gumboro disease) is included on the OIE (World Organisation for Animal Health) list of notifiable diseases as an avian disease. This obliges OIE member countries to notify the OIE within 24 hours of any change in their IBD status. OIE-listed diseases are diseases with the potential for international spread, significant mortality or morbidity within the susceptible species and/or potential for zoonotic spread to humans.¹

The strategies in this document for the diagnosis and management of an outbreak of IBD are based on the recommendations in the OIE Terrestrial Animal Health Code² and the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals.³

In Australia, the very virulent form of infectious bursal disease (vvIBD) is listed as ‘infectious bursal disease (hypervirulent form)’ and 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).⁴ The exotic antigenic variant strains of IBD are not included in the EAD Response Agreement.

In this manual, the placing of text in square brackets [xxx] indicates that that aspect of the manual remains contentious 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.

Detailed instructions for the field implementation of AUSVETPLAN are contained in the disease strategies, operational procedures manuals, management manuals and wild animal manual. Industry-specific information is given in the relevant

¹ These criteria are described in more detail in Chapter 1.2 of the OIE Terrestrial Animal Health Code (http://www.oie.int/eng/normes/mcode/en_chapitre_1.1.2.htm)
² http://www.oie.int/eng/normes/mcode/en_chapitre_1.10.11.htm
³ http://www.oie.int/eng/normes/mmanual/2008/pdf/2.03.12_IBD.pdf
enterprise manuals. The full list of AUSVETPLAN manuals that may need to be accessed in an emergency is shown below.


**AUSVETPLAN manuals**

**Disease strategies**
- Individual strategies for each of 30 diseases
- Bee diseases and pests
- Response policy briefs (for diseases not covered by individual manuals)

**Operational procedures manuals**
- Decontamination
- Destruction of animals
- Disposal
- Public relations
- Valuation and compensation
- Livestock management and welfare

**Wild animal manual**
- Wild animal response strategy

**Management manuals**
- Control centres management
- (Parts 1 and 2)
- Laboratory preparedness
- Animal Emergency Management
- Information System

**Enterprise manuals**
- Artificial breeding centres
- Dairy processing
- Feedlots
- Meat processing
- Poultry industry
- Saleyards and transport
- Zoos

**Summary document**

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5 The complete series of AUSVETPLAN documents is available on the internet at:
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1 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.

1.1 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.

1.2 Susceptible species

1.2.1 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-week-old 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).

1.2.2 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.

1.2.3 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).
1.2.4 Geese
IBD virus has been isolated from a goose in China (Wang et al 2007).

1.2.5 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).

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

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

1.2.8 Waterfowl
Antibodies have been detected in magpie geese (Anseranus semipalmata), shearwaters (Puffineus carneipes), sooty terns (Sterna fuscata), common noddies (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.

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

1.3 World distribution and occurrence in Australia
Classical serotype 1 strains are endemic throughout the world. They 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. 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).

### 1.4 Diagnostic criteria

#### 1.4.1 Clinical signs

**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).

1.4.2 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

Infectious bursal disease (Version 3.0)
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 (histopathology)**

**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.

### 1.4.3 Laboratory tests

**Specimens 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**

Blood samples and unpreserved tissue specimens should be chilled and transported with frozen gel packs. If prolonged delays are anticipated, tissues should be frozen and forwarded on dry ice (Geering et al 1995). For further information, see the [Laboratory Preparedness Manual](#).

Specimens should initially be sent to the state or territory diagnostic laboratory, from where they will be forwarded to the Commonwealth Scientific and Industrial Research Organisation Australian Animal Health Laboratory (CSIRO-AAHL), Geelong, for emergency disease testing. This is after the necessary clearance has been obtained from the chief veterinary officer (CVO) of the state or territory of the disease outbreak, and after the CVO of Victoria has been informed about the transport of the specimens to Geelong.

**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-AAHL are shown in Table 1.1.
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).

**1.4.4 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.
Table 1.1 Diagnostic tests available for different strains of IBD at CSIRO-AAHL

<table>
<thead>
<tr>
<th>Test</th>
<th>Specimen required</th>
<th>Test detects</th>
<th>Time from sample receipt to result</th>
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<tbody>
<tr>
<td><strong>Tests for vvIBD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virus isolation and identification</td>
<td>bursa</td>
<td>IBD virus</td>
<td>3–4 days</td>
</tr>
<tr>
<td>Pathogenicity testing(^a)</td>
<td>fresh bursa</td>
<td>mortality rate in SPF chickens</td>
<td>3–5 days</td>
</tr>
<tr>
<td>ELISA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>polyclonal(^b)</td>
<td>serum</td>
<td>antibody to any IBD virus</td>
<td>24 hours</td>
</tr>
<tr>
<td>competitive</td>
<td>serum</td>
<td>antibody to vvIBD virus</td>
<td>24 hours</td>
</tr>
<tr>
<td>Ac ELISA</td>
<td>bursa</td>
<td>IBD virus, and differentiates vvIBD virus</td>
<td>24 hours</td>
</tr>
<tr>
<td>Real-time PCR</td>
<td>bursa</td>
<td>viral RNA and vvIBD virus-specific sequence</td>
<td>24 hours</td>
</tr>
<tr>
<td>PCR and gene sequencing</td>
<td>tissues</td>
<td>viral RNA</td>
<td>2 days</td>
</tr>
<tr>
<td></td>
<td>virus isolate</td>
<td>virulence markers</td>
<td>3 days</td>
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<tr>
<td><strong>Tests for eavIBD</strong></td>
<td></td>
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</tr>
<tr>
<td>Virus isolation and identification</td>
<td>bursa</td>
<td>IBD virus</td>
<td>3–4 days</td>
</tr>
<tr>
<td>Real-time PCR</td>
<td>bursa</td>
<td>viral RNA and eavIBD virus-specific sequence</td>
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<td>PCR and gene sequencing</td>
<td>tissues</td>
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<tr>
<td></td>
<td>virus isolate</td>
<td>virulence markers</td>
<td>3 days</td>
</tr>
</tbody>
</table>

Ac ELISA = antigen-capture ELISA; CSIRO-AAHL = Commonwealth Scientific and Industrial Research Organisation Australian Animal Health Laboratory; 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

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.
1.5 Resistance and immunity

1.5.1 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).

1.5.2 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.

1.5.3 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.

### 1.6 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.

1.6.1 Incubation period

The viral incubation period is 2–3 days. However, the World Organisation for Animal Health (OIE) recommends an incubation period of 7 days for regulatory purposes. Virus excretion can begin as early as 24 hours after infection.

1.6.2 Persistence of the virus

General properties and environment

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.

In chickens, the highest virus titres are found in the bursa, which can inadvertently be left attached to the carcass 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).

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.

**Animal products and byproducts**

**Chicken meat**

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.

**Poultry feathers and meal**

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

**Poultry excretions**

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

1.6.3 **Modes of transmission**

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.

**Live animals**

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.

**Semen and embryos**

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

**Windborne spread**

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.

**Animal products and byproducts**

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.

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

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

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

Equipment and personnel
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.

1.6.4 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 1.5, 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 1.4.3).

**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.

### 1.7 Manner and risk of introduction to Australia

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.

### 1.8 Social and economic 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.

1.9 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 Appendix 1).

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 Appendix 1 for a guide to the surveillance and testing that may be necessary.
2 Principles of control and eradication

2.1 Critical factors assessed in formulating response policy

Case definition

Very virulent IBD (vvIBD) and exotic antigenic variant IBD (eavIBD) cases can be defined as the isolation (by the CSIRO Australian Animal Health Laboratory) of any virus that meets the description of vvIBD virus or eavIBD virus.

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.

2.2 Options for control or eradication based on the assessed critical factors

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 3.
3 Policy and rationale

3.1 Overall 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 very virulent (or hypervirulent) form of IBD (vvIBD) is a Category 4 disease under the government–industry Emergency Animal Disease (EAD) Response Agreement. Costs of control will be shared 20% by government and 80% by industry. The exotic antigenic variant forms of IBD (eavIBD) are not included in the EAD Response Agreement.

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.

The chief veterinary officer (CVO) in the state or territory in which the outbreak occurs is responsible for developing an emergency animal disease (EAD) response plan for the particular outbreak.

The Consultative Committee on Emergency Animal Diseases (CCEAD), convened specifically for the incident, assesses the response plan drawn up by the affected jurisdiction’s CVO for technical soundness and consistency with AUSVETPLAN, and endorses or seeks modifications to it. Overall operational management of the incident rests with the CVO of the affected jurisdiction, with oversight by the CCEAD.

The National EAD Management Group (NMG), also convened for the specific incident, decides on whether cost sharing will be invoked (following advice from the CCEAD) and manages the national policy and resourcing needs.

For further details, refer to the AUSVETPLAN Summary Document.

CVOs will implement disease control measures as agreed in the EAD Response Plan and in accordance with relevant legislation. They will make ongoing decisions on follow-up disease control measures in consultation with the CCEAD and the NMG, based on epidemiological information about the outbreak.

For information on the responsibilities of the state or territory disease control headquarters and local disease control centres, see the AUSVETPLAN Control Centres Management Manuals.

### 3.2 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.

### 3.2.1 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.

### 3.2.2 Quarantine and movement controls

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 the movements of birds, avian products, fomites and people will be strictly controlled. Changes of clothing and footwear and appropriate decontamination procedures will be required.

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.

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.

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 4 for further details on declared areas and quarantine and movement controls.

3.2.3 Tracing and surveillance

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.

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.

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.

Active surveillance will also begin as soon as vvIBD or eavIBD is suspected to help establish the extent of the RA and CA (see Appendix 1 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 1.4.3).

3.2.4 Zoning and compartmentalisation

Zoning or compartmentalisation (or both) will be introduced as soon as possible after epidemiological investigations have been completed and the extent and severity of the disease have been determined. The measures adopted must meet the principles contained in international standards.

3.2.5 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 4.2).

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 1.5.3 for further information on vaccination.

3.2.6 Treatment of infected animals

Treatment of birds for vvIBD and eavIBD is not appropriate.

3.2.7 Treatment of animal products

Heat inactivation of IBD virus in poultry meat requires times and temperatures that exceed those used in commercial cooking (see Section 1.6.2). 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 4 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.

3.2.8 Disposal of animals and animal products

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 Disposal Manual).

### 3.2.9 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 carcasses, dead birds, eggs, litter, manure, waste products, and fittings and building materials that cannot be effectively decontaminated. Equipment and fixtures must be dismantled, hand-washed 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 Decontamination Manual.

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.

### 3.2.10 Wild animal and vector control

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.

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 1.6.3). If practical, steps should be taken to reduce their numbers and minimise the chance of flies entering bird sheds.

### 3.2.11 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.

### 3.2.12 Public health implications

IBD has no public health implications.

### 3.3 Other policies

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 (e.g., 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 3.2 will be applicable.

3.4 Funding and compensation

The very virulent form of IBD is a Category 4 emergency animal disease under the EAD Response Agreement between the governments of Australia and the livestock industries. For this category, the costs will be shared 20% by governments and 80% by the relevant industries (refer to the EAD Response Agreement for details).6

The exotic antigenic variant strains of IBD are not included in the EAD Response Agreement.

Information on the cost-sharing arrangements can be found in the Summary Document and in the Valuation and Compensation Manual.

4 Recommended quarantine and movement controls

4.1 Guidelines for classifying declared premises and areas

4.1.1 Declared premises

Infected premises
Premises classified as infected premises (IPs) will be defined areas (which may be all or part of a property) in which very virulent infectious bursal disease (vvIBD) virus or exotic antigenic variant infectious bursal disease (eavIBD) virus exists, or is believed to exist. An IP will be subject to quarantine served by notice, and to eradication and control procedures.

Dangerous contact premises
Premises classified as dangerous contact premises (DCPs) will be those that contain animals, animal products, waste or other items that have recently been introduced from an IP (usually up to 21 days before the premises were declared infected) and are likely to be infected or contaminated, or any of these items that may have been in substantial contact with people, vehicles and equipment that have been associated with an IP within 3 days of visiting the DCP.

Suspect premises
Premises classified as suspect premises (SPs) will be those that contain:

- animals that have possibly been exposed to vvIBD or eavIBD such that quarantine and surveillance, but not pre-emptive destruction, are warranted; or
- animals not known to have been exposed to the virus but showing clinical signs requiring differential diagnosis.

‘Suspect premises’ is a temporary classification because the premise contains animals that are suspected of having the disease. High priority should be given to clarifying the status of the suspect animals so that the SP can be reclassified either as an IP and appropriate quarantine and movement controls implemented, or as free from disease, in which case no further disease control measures are required.

4.1.2 Declared areas

Restricted area
A restricted area (RA) will be a relatively small declared area (compared with a control area) around IPs that is subject to intense surveillance and movement control. Movement out of the area will, in general, be prohibited, while movement into the area would only be by permit (see Section 4.2). Multiple RAs may exist within one control area (CA).
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 or SP. This distance will vary with the size and nature of the potential source of disease agent, but will be between 1 and 5 km from the IP, depending on the density of premises. The boundary could be the perimeter fence of the IP, if the IP is in an isolated location. The boundary in a densely populated area will take into account the distribution of susceptible birds; traffic patterns to markets, service areas and abattoirs; and areas that constitute natural barriers to movement.

**Control area**

The CA will be a larger declared area around the RA(s) and, initially, possibly as large as a state or territory where restrictions will reduce the risk of disease spreading from the RA(s). The boundary of the CA will be adjusted as confidence about the extent of the outbreak increases. However, it must remain consistent with the OIE Terrestrial Code chapters on surveillance and zoning (Chapter 1.4 and Chapter 4.3, respectively, of the Terrestrial Code). In general, surveillance and movement controls will be less intense, and animals and products may be permitted to move under permit from the area.

The declaration of a CA also helps to control the spread of the outbreak from within the RA. The CA is a buffer zone between the RA and the rest of the industry. The CA boundary does not have to be circular or parallel to that of the RA but should be 2–10 km from the boundary of the RA. In general, the movement of possibly contaminated items and materials within the CA is allowed, but movement out of the CA is prohibited without approval from the chief veterinary officer (see Section 4.2 for details). This type of CA allows reasonable commercial activities to continue.

**International 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.

**4.2 Movement controls for IBD**

**4.2.1 Declared premises**

Table 4.1 shows the movement controls that will apply to IPs, DCPs and SPs in the event of an IBD incident.
### Table 4.1 Movement controls for declared premises

<table>
<thead>
<tr>
<th>Quarantine or movement controls</th>
<th>Infected premises (IPs) and dangerous contact premises (DCPs)</th>
<th>Suspect premises (SPs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Movement out of IPs, DCPs or SPs by:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Live susceptible birds</td>
<td>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.</td>
<td>Allowed under permit for slaughter at an abattoir, subject to negative test results for IBD virus</td>
</tr>
<tr>
<td>Dead susceptible birds</td>
<td>To be disposed of on premises, or in the RA under permit, or sent under permit to a laboratory for testing</td>
<td>Allowed under permit within the RA</td>
</tr>
<tr>
<td>Nonsusceptible birds</td>
<td>Prohibited</td>
<td>Allowed under permit</td>
</tr>
<tr>
<td>Other animals (eg dogs)</td>
<td>Prohibited</td>
<td>Allowed under permit</td>
</tr>
<tr>
<td>Litter and manure</td>
<td>Prohibited</td>
<td>Prohibited</td>
</tr>
<tr>
<td>Equipment and feed</td>
<td>Allowed under permit, subject to appropriate decontamination</td>
<td>Allowed under permit</td>
</tr>
<tr>
<td>Fertile eggs</td>
<td>Allowed under permit for salvage of genetically valuable stock, subject to surface decontamination procedures</td>
<td>Allowed under permit, subject to surface decontamination procedures</td>
</tr>
<tr>
<td>Table eggs</td>
<td>Allowed under permit, subject to surface decontamination procedures</td>
<td>Allowed under permit, subject to surface decontamination procedures</td>
</tr>
<tr>
<td>Fresh or frozen meat from susceptible birds</td>
<td>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</td>
<td>Allowed under permit from flocks with negative test results for IBD virus, or held until status of premises clarified</td>
</tr>
<tr>
<td>Horticultural or agricultural crops</td>
<td>Allowed</td>
<td>Allowed</td>
</tr>
</tbody>
</table>

**Movement in and out of IPs, DCPs or SPs by:**

<p>| People | Allowed, with appropriate decontamination | Allowed, with appropriate decontamination |</p>
<table>
<thead>
<tr>
<th>Quarantine or movement controls</th>
<th>Infected premises (IPs) and dangerous contact premises (DCPs)</th>
<th>Suspect premises (SPs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicles</td>
<td>Allowed under permit, with appropriate decontamination</td>
<td>Allowed under permit, with appropriate decontamination</td>
</tr>
</tbody>
</table>

**Movement into IPs, DCPs or SPs by:**

<table>
<thead>
<tr>
<th></th>
<th>Susceptible birds</th>
<th>Nonsusceptible birds</th>
<th>Bird feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prohibited</td>
<td>Allowed under permit</td>
<td>Allowed under permit</td>
<td>Allowed under permit, with appropriate decontamination of vehicles and equipment</td>
</tr>
</tbody>
</table>

**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 |
### 4.2.2 Declared areas

Table 4.2 shows the movement controls that will apply to RAs and CAs in the event of an IBD incident.

#### Table 4.2 Movement controls for declared areas

<table>
<thead>
<tr>
<th>Quarantine or movement controls</th>
<th>Restricted area (RA) (if declared)</th>
<th>Control area (CA) (if declared)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Movement out of susceptible birds</strong></td>
<td>Prohibited</td>
<td>Allowed under permit</td>
</tr>
<tr>
<td><strong>Movement in of by susceptible birds</strong></td>
<td>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.</td>
<td>Movement from a free area to a property or abattoir allowed under permit</td>
</tr>
<tr>
<td><strong>Movement in or out of nonsusceptible birds</strong></td>
<td>Allowed under permit</td>
<td>Allowed under permit</td>
</tr>
<tr>
<td><strong>Movement within of susceptible birds</strong></td>
<td>Movement to an abattoir for immediate slaughter or to a property allowed under permit or after testing with negative results for IBD virus</td>
<td>Allowed</td>
</tr>
<tr>
<td><strong>Movement through of susceptible birds</strong></td>
<td>Direct movement allowed under permit, provided the origin and destination are both outside the RA and CA</td>
<td>Allowed</td>
</tr>
<tr>
<td><strong>Movement out of litter and manure</strong></td>
<td>Prohibited</td>
<td>Prohibited, except under permit</td>
</tr>
<tr>
<td><strong>Movement out of equipment and feed</strong></td>
<td>Allowed under permit, after appropriate decontamination</td>
<td>Allowed</td>
</tr>
<tr>
<td><strong>Hatcheries</strong></td>
<td>Declared RAs should not include hatcheries if possible. Activities will be suspended.</td>
<td>Fertile eggs can be sourced from outside the CA, and day-old chickens from hatcheries are allowed out of the CA under permit.</td>
</tr>
<tr>
<td>Quarantine or movement controls</td>
<td>Restricted area (RA) (if declared)</td>
<td>Control area (CA) (if declared)</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>To and from an abattoir</td>
<td>Birds from DCPs and SPs allowed under permit, subject to negative test results for IBD virus. Equipment and vehicles to be appropriately decontaminated.</td>
<td>Allowed under permit. Equipment and vehicles to be appropriately decontaminated.</td>
</tr>
<tr>
<td>Movement of meat from susceptible birds</td>
<td>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.</td>
<td>Movement into or within the CA allowed. Movement out of the CA allowed under permit.</td>
</tr>
<tr>
<td>Movement of offal and waste from susceptible birds</td>
<td>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.</td>
<td>Movement into or within the CA allowed. Movement out of the CA allowed under permit.</td>
</tr>
<tr>
<td>Risk enterprises (eg private avian laboratories, cull hen collectors, dead-bird pick-up [not processing establishments])</td>
<td>Operations may be allowed under permit</td>
<td>May continue to operate under permit</td>
</tr>
<tr>
<td>Sales, shows, pigeon races, and so on</td>
<td>All gatherings of susceptible birds prohibited</td>
<td>May continue to operate under permit</td>
</tr>
<tr>
<td>Movement of table eggs in or out, other than from IPs and DCPs</td>
<td>Allowed under permit, subject to surface decontamination procedures</td>
<td>Allowed into, within or out of the CA under permit</td>
</tr>
<tr>
<td>Movement of fertile eggs</td>
<td>Allowed under permit, subject to surface decontamination procedures</td>
<td>Allowed within the CA. Allowed under permit to outside the CA, subject to surface decontamination procedures.</td>
</tr>
<tr>
<td>Movement of egg pulp from plants, including on-farm plants</td>
<td>Prohibited, except under permit for appropriate heat treatment after surface decontamination procedures</td>
<td>Allowed within the CA. Allowed under permit to outside the CA.</td>
</tr>
<tr>
<td>Domestic pets and susceptible birds</td>
<td>Within the RA, all pets to be confined or tied up and all free susceptible birds to be confined</td>
<td>Movement allowed under permit</td>
</tr>
</tbody>
</table>
4.3 Criteria for issuing permits

When conducting a risk assessment regarding the issue of a permit, the officer should take into account the following:

- status of the originating and destination premises;
- age and species of bird, and composition of the flock (e.g., whether the birds are multi-age);
- confidence in animal tracing and surveillance;
- results of testing;
- destination and use of the animals or products;
- likelihood of contamination of the equipment, product or material (the ability to decontaminate);
- security of transport; and
- potential harbours for vectors (the ability to decontaminate).
Appendix 1 Key features of infectious bursal disease

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.
Appendix 2 Procedures for surveillance and proof of freedom

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.

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:

<table>
<thead>
<tr>
<th>Susceptible birds</th>
<th>Other (if containing susceptible birds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chickens</td>
<td>Aviaries</td>
</tr>
<tr>
<td>Turkeys</td>
<td>Pet shops</td>
</tr>
<tr>
<td>Game birds</td>
<td>Zoos</td>
</tr>
</tbody>
</table>
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.
Procedures during the outbreak

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.

Procedures to establish 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.
Glossary

Animal byproducts

Products of animal origin that are not for consumption but are destined for industrial use (e.g., hides and skins, fur, wool, hair, feathers, hoofs, bones, fertiliser).

Animal Health Committee

A committee comprising the CVOs of Australia and New Zealand, Australian state and territory CVOs, Animal Health Australia, and a CSIRO representative. The committee (formally called the Veterinary Committee) provides advice to PIMC on animal health matters, focusing on technical issues and regulatory policy. See also Primary Industries Ministerial Council (PIMC).

Animal products

Meat, meat products and other products of animal origin (e.g., eggs, milk) for human consumption or for use in animal feedstuff.

Australian Chief Veterinary Officer

The nominated senior veterinarian in the Australian Government Department of Agriculture, Fisheries and Forestry who manages international animal health commitments and the Australian Government's response to an animal disease outbreak. See also Chief veterinary officer.

AUSVETPLAN

Australian Veterinary Emergency Plan. 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.

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.

Compensation

The sum of money paid to an owner for stock that are destroyed and property that is compulsorily destroyed because of an emergency animal disease. See also Cost-sharing arrangements, Emergency Animal Disease Response Agreement.

Consultative Committee on Emergency Animal Diseases (CCEAD)

A committee of state and territory CVOs, representatives of CSIRO Livestock Industries and the relevant industries, and chaired by the Australian CVO. CCEAD convenes and consults when there is an animal disease emergency due to the introduction of an emergency animal disease of livestock, or another serious epizootic of Australian origin.
Control area (CA) A declared area in which the conditions applying 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 outbreak according to need).
See Section 4 for further details.

Cost-sharing arrangements Arrangements agreed between governments (national, state and territory) and livestock industries for sharing the costs of emergency animal disease responses.
See also Compensation, Emergency Animal Disease Response Agreement.

Critical date The earliest time vvIBD virus entered the premises. The critical date is determined by the CVO in consultation with the laboratory and epidemiologists and should be consistent with the apparent incubation period of the current outbreak.

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 Premises that contain dangerous contact animals or other serious contacts.
See Section 4 for further details.

Declared area A defined tract of land that is subjected to disease control restrictions under emergency animal disease legislation. Types of declared areas include restricted area, control area, infected premises, dangerous contact premises and suspect premises.
See Section 4 for further details.

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 slaughter 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.
Disposal
Sanitary removal of animal carcases, animal products, materials and wastes by burial, burning or some other process, so as to prevent the spread of disease.

Egg-marketing premises
A premise where table eggs are graded and packed for the retail market. The premises may also contain a pulp plant and facilities for manufacturing egg-based products.

Egg pulp
A homogenous liquid made from either whole liquid egg, egg albumen or egg yolk, pasteurised for marketing as a liquid or frozen product.

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.

Emergency animal disease
A disease that is (a) exotic to Australia, (b) a variant of an endemic disease, (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, state and territory governments and livestock industries on the management of emergency animal disease responses. Provisions include funding mechanisms, 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

Epidemiological investigation
An investigation to identify and qualify the risk factors associated with the disease. See also Veterinary investigation

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.
Further processing plant | A plant that receives fresh carcases from an abattoir for cutting up; processing into poultry nuggets, rolls, etc; and cooking or partially cooking for fast food outlets and retail markets.

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 the pathogen into the animal and the first clinical signs of the disease.

Infected premises (IP) | A defined area (which may be all or part of a property) in which an emergency disease exists, is believed to exist, or in which the infective agent of that emergency disease exists or is believed to exist. An infected premises is subject to quarantine served by notice and to eradication or control procedures. See Section 4 for further details

Local disease control centre (LDCC) | 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. See also Surveillance

Movement control | Restrictions placed on the movement of animals, people and other things to prevent the spread of disease.

National management group (NMG) | A group established to direct and coordinate an animal disease emergency. NMGs may include the chief executive officers of the Australian Government and state or territory governments where the emergency occurs, industry representatives, the Australian CVO (and chief medical officer, if applicable) and the chairman of Animal Health Australia.

Native wildlife | See Wild animals


Operational procedures | Detailed instructions for carrying out specific disease control activities, such as disposal, destruction, decontamination and valuation.
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>Person responsible for a premises (includes an agent of the owner, such as a manager or other controlling officer).</td>
</tr>
<tr>
<td>Polymerase chain reaction (PCR)</td>
<td>A method of amplifying and analysing DNA sequences that can be used to detect the presence of virus DNA.</td>
</tr>
<tr>
<td>Premises</td>
<td>A tract of land including its buildings, or a separate farm or facility that is maintained by a single set of services and personnel.</td>
</tr>
<tr>
<td>Prevalence</td>
<td>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.</td>
</tr>
<tr>
<td>Primary Industries Ministerial Council (PIMC)</td>
<td>The council of Australian national, state and territory and New Zealand ministers of agriculture that sets Australian and New Zealand agricultural policy (formerly the Agriculture and Resource Management Council of Australia and New Zealand). See also Animal Health Committee</td>
</tr>
<tr>
<td>Processing plant</td>
<td>An abattoir for slaughtering poultry for human consumption, with chilled and frozen storage facilities.</td>
</tr>
<tr>
<td>Proventriculus</td>
<td>Front (thin-walled) part of stomach in birds.</td>
</tr>
<tr>
<td>Quarantine</td>
<td>Legal restrictions imposed on a place or a tract of land by the serving of a notice limiting access or egress of specified animals, persons or fomites.</td>
</tr>
<tr>
<td>Restricted area (RA)</td>
<td>A relatively small declared area (compared with a control area) around an infected premises that is subject to intense surveillance and movement controls. See Section 4 for further details</td>
</tr>
<tr>
<td>Risk enterprise</td>
<td>A defined livestock or related enterprise, which 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, garbage depots.</td>
</tr>
<tr>
<td>Salvage</td>
<td>Recovery of some (but not full) market value by treatment and use of products, according to disease circumstances.</td>
</tr>
<tr>
<td>Sentinel animal</td>
<td>Animal of known health status that is monitored to detect the presence of a specific disease agent.</td>
</tr>
<tr>
<td>Seroconversion</td>
<td>Appearance in the blood serum of antibodies following vaccination or natural exposure to a disease agent.</td>
</tr>
<tr>
<td>Serotype</td>
<td>A subgroup of microorganisms identified by the antigens carried (as determined by a serology test).</td>
</tr>
</tbody>
</table>
Stamping out | Disease eradication strategy based on the quarantine and slaughter of all susceptible animals that are infected or exposed to the disease.

State or territory disease control headquarters | The emergency operations centre that directs the disease control operations to be undertaken in that state or territory.

Surveillance | A systematic program of investigation designed to establish the presence, extent of, 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. See also Monitoring

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 premises containing suspect animals. After rapid resolution of the status of the suspect animal(s) contained on it, a suspect premises is reclassified either as an infected premises (and appropriate disease-control measures taken) or as free from disease. See Section 4 for further details

Tracing | The process of locating animals, persons or other items that may be implicated in the spread of disease, so that appropriate action can be taken.

Vaccination | Inoculation of healthy individuals with weakened or attenuated strains of disease-causing agents to provide protection from disease.

- ring vaccination | Vaccination of susceptible animals around a focus of infection to provide a buffer against the spread of disease.
<table>
<thead>
<tr>
<th><strong>Vaccine</strong></th>
<th>Modified strains of disease-causing agents that, when inoculated, stimulate an immune response and provide protection from disease.</th>
</tr>
</thead>
<tbody>
<tr>
<td>– attenuated</td>
<td>A vaccine prepared from infective or ‘live’ microbes that have lost their virulence but have retained their ability to induce protective immunity.</td>
</tr>
<tr>
<td>– live</td>
<td>A vaccine prepared from infective or ‘live’ virus that may or may not have lost some of its virulence but has retained its ability to induce protective immunity.</td>
</tr>
<tr>
<td>– inactivated</td>
<td>A vaccine prepared from a virus that has been inactivated (‘killed’) by chemical or physical treatment.</td>
</tr>
<tr>
<td><strong>Vector</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>
| **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** | Animals that are indigenous to Australia and may be susceptible to emergency animal diseases (eg bats, dingoes, marsupials). |
| – native wildlife | Domestic animals that have become wild (eg cats, horses, pigs). |
| – feral animals | Nondomestic animal species that are not indigenous to Australia (eg foxes). |
| **Zoning** | The process of defining disease-free and infected areas in accord with OIE guidelines, based on geopolitical boundaries and surveillance, in order to facilitate trade. |
| **Zoonosis** | A disease of animals that can be transmitted to humans. |
# Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANEMIS</td>
<td>Animal Health Emergency Management Information System</td>
</tr>
<tr>
<td>AUSVETPLAN</td>
<td>Australian Veterinary Emergency Plan</td>
</tr>
<tr>
<td>CA</td>
<td>control area</td>
</tr>
<tr>
<td>CCEAD</td>
<td>Consultative Committee on Emergency Animal Diseases</td>
</tr>
<tr>
<td>CSIRO-AAHL</td>
<td>Commonwealth Scientific and Industrial Research Organisation Australian Animal Health Laboratory</td>
</tr>
<tr>
<td>CVO</td>
<td>chief veterinary officer</td>
</tr>
<tr>
<td>DCP</td>
<td>dangerous contact premises</td>
</tr>
<tr>
<td>EAD</td>
<td>emergency animal disease</td>
</tr>
<tr>
<td>eav</td>
<td>exotic antigenic variant</td>
</tr>
<tr>
<td>eavIBD</td>
<td>exotic antigenic variant infectious bursal disease</td>
</tr>
<tr>
<td>ELISA</td>
<td>enzyme-linked immunosorbent assay</td>
</tr>
<tr>
<td>IBD</td>
<td>infectious bursal disease</td>
</tr>
<tr>
<td>IP</td>
<td>infected premises</td>
</tr>
<tr>
<td>NMG</td>
<td>national management group</td>
</tr>
<tr>
<td>OIE</td>
<td>World Organisation for Animal Health (Office International des Epizooties)</td>
</tr>
<tr>
<td>PCR</td>
<td>polymerase chain reaction</td>
</tr>
<tr>
<td>PIMC</td>
<td>Primary Industries Ministerial Council</td>
</tr>
<tr>
<td>RA</td>
<td>restricted area</td>
</tr>
<tr>
<td>SP</td>
<td>suspect premises</td>
</tr>
<tr>
<td>SPF</td>
<td>specific pathogen free</td>
</tr>
<tr>
<td>VP2</td>
<td>viral protein 2</td>
</tr>
<tr>
<td>vvIBD</td>
<td>very virulent infectious bursal disease</td>
</tr>
</tbody>
</table>
References


Quality Control Unit (1997). Heat inactivation of infectious bursal disease virus strain CS88. CVLS/06/97, Quality Control Unit, Central Veterinary Laboratory, Surrey, UK.


**Video/training resources**

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

**Further reading**

AQIS (Australian Quarantine and Inspection Service) (1997). Conditions of the importation from approved countries of fertile eggs (domestic hen) from source flocks, which have been vaccinated against Newcastle disease. AQIS, DPIE, Canberra.


29th National Meeting on Poultry Health and Processing, Ocean City, Maryland, 95-99.
