

AUSTRALIAN VETERINARY EMERGENCY PLAN

AUSVETPLAN

1999

Enterprise Manual

Artificial breeding centres

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

Agriculture and Resource Management Council of Australia and New Zealand

**This Enterprise Manual forms part of:
AUSVETPLAN Edition 2 1996**

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

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PREFACE

This **Enterprise Manual for artificial breeding centres** forms part of the **Australian Veterinary Emergency Plan**, or AUSVETPLAN (Edition 2). AUSVETPLAN is an agreed management plan and set of operational procedures that would be adopted in the event of an emergency animal disease outbreak in Australia. The procedures are briefly outlined in the **Summary Document** and details are given in the individual **Disease Strategies**. The manuals are written with specific reference to certain animal industries where a greater than normal risk of harm could be expected from an emergency disease outbreak.

The purpose of this manual is to guard against, and to recommend procedures to prevent the introduction or spread of disease through artificial breeding (AB) centre operations or artificial insemination (AI) services. The manual incorporates the appropriate emergency procedures and control/eradication strategies for cattle, sheep, and goats with reference to pigs and horses where relevant. On the declaration of an emergency disease, the emergency procedures apply to all AB centres and to all animal species and product held in storage within these centres.

This manual is aimed at both government and industry personnel who may be involved in emergency disease preparedness. For government personnel, the manual brings together from many sources operational guidelines, plans of action, or other issues pertaining to a disease emergency either on the premises or in the vicinity of the AB centre. For owners or managers, the manual provides guidelines on the strategies that may be adopted for the handling of a suspected emergency disease.

This manual is being released as a final document following full industry/government consultation and with the approval of the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).

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

Document Name, Section no.

For example, **Decontamination Manual, Section 3**.

The resource book *Exotic Diseases of Animals: A Field Guide for Australian Veterinarians* by W.A. Geering, A.J. Forman and M.J. Nunn, Australian Government Publishing Service, Canberra, 1995 (**Exotic Diseases Field Guide**) has been a source for some of the information about the aetiology, diagnosis and epidemiology of the diseases. It should be used as a field guide for veterinarians and other animal health personnel associated with exotic disease diagnosis and management in livestock enterprises.

The manuals will be revised and updated from time to time to ensure that they keep pace with the changing circumstances of the particular industry they cover. Comments and suggestions are welcome and should be addressed to:

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KEY POINTS: Artificial breeding centres

RISKS:

- An artificial breeding (AB) centre is an intensive, concentrated holding focus for various animal species.
- Collection of semen/embryos from animals incubating disease could lead to the use and storage of infected material.
- Rapid and diverse spread of an emergency disease could occur through dissemination of infected semen/embryos. The distribution of fresh and chilled semen/embryos would pose a higher risk than frozen material because the short storage time would increase the possibility of spreading the disease before clinical signs develop in the donor animals.
- Inseminators, technicians and veterinary surgeons visit farms over a large area, thereby providing the potential for rapid spread of disease.

DISEASE CONTROL STRATEGY:

- AB centres hold valuable elite breeding stock and a conserved store of genetic breeding resources. This justifies a significant commitment to ensure maximum protection at all times.
- If an emergency disease outbreak occurs in the area of an AB centre it would be feasible to adopt an approach of temporarily closing down the processing and services operations of the AB centre and associated artificial insemination services. Operations would commence when subsequent information indicates that there is no further risk of spreading the disease by semen or embryo collection, storage or use.

1 NATURE OF ENTERPRISE

The Australian artificial breeding industry has developed as a diverse interlocking group of individually owned and operated enterprises with no direct integration. The artificial breeding (AB) centres and AB service facilities are randomly scattered throughout rural Australia, operating under individual State/Territory legislation of the stock diseases and stock (artificial breeding) acts or regulations. AB centres hold valuable elite breeding stock and a conserved store of genetic breeding resources. This justifies a significant commitment to ensure maximum protection at all times and under all conditions.

The industry focus and service operations are to select, breed, offer and supply quality genetic material for the improvement in performance, type and production of animals. The species largely include cattle, sheep, goats, pigs and horses, although there is limited involvement with dogs, deer, zoo and endangered species.

To achieve these objectives the industry operates two major programs, as follows.

- (1) Worldwide importation (subject to Australian quarantine requirements) of genetic material, via frozen semen and embryos.
- (2) Various breed improvement or progeny selection programs, where potential superior sires or dams are identified and introduced into State-licensed quarantine AB centres for the collection, processing, storage and distribution of this quality or elite genetic material via semen or embryos, to breeding animals on farms.

The importation of semen or embryos is governed by the Australian Commonwealth *Quarantine Act 1908* and regulations, while the production of semen or embryos by licensed AB centres is covered by the *Code of Practice for Australian Livestock Artificial Breeding Centres (COP) 1988* and the *Minimum Health Standards for Stock Standing at Licensed or Approved Artificial Breeding Centres in Australia* (Australian Quarantine and Inspection Service [AQIS] 1988) and administered by individual State/Territory artificial breeding (animal) and stock disease legislation or regulations.

Imported semen or embryos and semen or embryos produced by licensed or approved AB centres in Australia are initially received and stored at these AB centres or at AB semen and embryo centres. From these centres they are distributed freely throughout Australia to AB semen and embryo centres, AB subcentres, commercial licensed artificial insemination (AI) technicians (inseminators), veterinarians or to livestock producers/farmers (see Section 1.1.3). The regulations governing the training, licensing, and operation of the AB semen and embryo centres, subcentres and inseminators varies between States and relates to the individual requirements of the State legislation or regulations.

The AB industry, veterinarians, technicians and farmers operate and service a diverse range of on-farm facilities for the collection and transfer of semen and embryos outside the confines of the licensed or approved AB centres. These services largely concentrate on servicing individual farmers who own the animals directly involved in the collection of semen or embryos. No effective legislation or industry code of practice covers the operations or services of these 'on-farm' enterprises, which now account for a significant proportion of all AB operations in Australia. State stock disease, stock artificial breeding, and veterinary surgeons legislation and regulations do cover some of the procedures and activities.

1.1 Description of AB centres and their operation

1.1.1 AB centres (approved for import/export)

AB centres are licensed or approved quarantine centres established to hold and maintain cattle, sheep, goats, pigs or horses for the collection, processing, freezing, storage, importation, transfer and distribution of semen and embryos. These centres distribute fresh, chilled or frozen semen or embryos directly to semen and embryo centres, subcentres, inseminators, veterinarians and farmers.

As stated in *Minimum Health Standards* (AQIS 1988), licensed/approved AB centres must comply with the following criteria.

- (a) Be a quarantine area, securely double fenced by fences at least three metres apart. The wall of a building within the centre may replace all or part of the internal fence.
- (b) Be under veterinary supervision to the satisfaction of the relevant Chief Veterinary Officer (CVO).
- (c) Have the following facilities within the fully health-tested area of the centre:
 - (i) accommodation facilities for stock that have passed the prescribed health tests;
 - (ii) facilities for the collection of semen from these stock; and
 - (iii) a processing laboratory and storage facilities for semen from these stock.
- (d) Provide an admission area for stock under test before entry to the 'fully health tested' area. The admission area shall be an additional quarantine area, preferably adjacent to the fully health tested area of the centre. The admission area shall be separate from the fully health tested area and from other adjacent areas by the buffer strip as described in (a).
- (e) Provide for the admission of stock to the fully health-tested area only after completion of health tests that are carried out within the admission area.
- (f) Provide for all stock in the centre to remain within its boundaries at all times and in isolation from all stock not in the centre.
- (g) Provide that, where a terminal for inseminators or other persons associated with stock outside a centre, the facilities used by these personnel will have separate access to that of the centre proper.
- (h) Provide that samples collected from sires under test and equipment used for collection shall not be taken into the semen laboratory, or alternatively, that arrangements satisfactory to the CVO shall be made to ensure the separation of materials that have been in contact with untested stock, from stock also on the centre.
- (i) Ensure that semen from unlicensed sires may not be collected, processed, or used at a licensed/approved artificial breeding centre. It may be stored at such centre in a separate isolated container.

The entry and quarantine facilities, semen collection facilities, and hospital facilities on licensed AB centres may be used for multiple species, subject to the satisfaction of the CVO. Special entry and maintenance testing procedures may be added to the minimum health standard for each species if one species is to be maintained alongside another species on the licensed AB centre.

Embryo production is accepted on licensed/approved centres subject to donors meeting standards for females as described in the *Minimum Health Standards*.

Imported frozen semen or embryos received from overseas or from licensed/approved AB centres in Australia are admitted into licensed storage facilities on an AB centre.

The AB centres conduct a service for collection and processing and distribution of semen or embryos collected outside licensed AB centres. These products can be stored in an unlicensed area in tanks not containing any licensed semen or embryos.

The AB centre can supply liquid nitrogen and AI equipment to those involved in AI services. They can also provide service and delivery of semen or embryos to farms by AI inseminators operating from the AB centre.

1.1.2 AB semen and embryo centres

These centres are licensed for the importation, storage and dispatch of frozen semen or embryos from overseas or fresh, chilled or frozen semen or embryos from licensed Australian AB centres. Semen or embryos collected outside licensed premises can be stored here but must be kept in separate containers and in isolation from licensed products. These centres are also licensed for the supply and dispatch of liquid nitrogen and AI equipment.

No animals are held or maintained on AB semen and embryo centres and no inseminators operate from the centres.

1.1.3 AB subcentres

These are licensed centres for the receiving, storage, and dispatch of fresh, chilled or frozen semen or embryos from licensed Australian or overseas AB centres.

Unlicensed/on-farm collected and frozen semen or embryos can be stored, in separate isolated storage, at these subcentres on behalf of owner farmers. These centres are able to supply and dispatch liquid nitrogen and AI equipment.

Inseminators may operate from these centres to deliver semen and embryos to farms.

Veterinarians and technical AI staff may operate an on-farm service for breeders for the collection, processing, freezing, storage and transfer of semen and embryos of animals held on farms outside licensed AB centres.

No animals are held or maintained on these subcentres.

1.1.4 Inseminators

Licensed inseminators or veterinarians may operate an on-farm service for the collection, processing, freezing, storage and transfer of semen and embryos of animals held on farms outside the AB centre.

Such inseminators or veterinarians can receive semen and embryos from AB centres and overseas, for storage or transfer to farm animals, or for distribution to other centres or to on-farm storage units. Inseminators are able to supply liquid nitrogen and AI equipment to farms.

1.1.5 On-farm semen and embryo facilities and centres

These are unlicensed facilities on farms used for the collection and processing of fresh, chilled or frozen semen or embryos. The storage or distribution to other farms or storage facilities, and the transfer of semen or embryos to animals on this property (or other properties), occurs throughout Australia.

The semen or embryos collected at these on-farm facilities is unlicensed and is not available for direct sale or transfer to breeders not listed as owners of the animals (although conditions

may vary between States). Unlicensed semen or embryos must be stored in isolation and separate from licensed semen or embryos.

1.1.6 On-farm semen/embryo storage and farmer AI services

This refers to licensed and unlicensed semen or embryos stored on-farm in a single container for on-farm AI or embryo transfer programs.

Licensed semen stored with unlicensed semen becomes classified as unlicensed and as such cannot be returned to be stored in AB centre storage facilities as licensed semen.

On-farm AI or embryo transfer programs can be implemented by the farmer, his staff, licensed inseminators or veterinarians.

1.2 Emergency diseases of concern

1.2.1 Major emergency diseases affecting the relevant species

The following list describes the main features of the emergency diseases covered by AUSVETPLAN. Information on the transmission of the virus (or disease agent) in semen or embryos is given in Section 1.5, Table 1.

African horse sickness

An infectious insect-borne viral disease of horses and mules with other equines only slightly affected. It is frequently fatal in susceptible horses, with clinical signs and lesions resulting from selective increased vascular permeability, resulting in an impairment of the respiratory and circulatory systems. In nature the virus is transmitted by midges (*Culicoides* spp) causing a seasonal incidence in temperate climates.

African swine fever

A highly contagious, generalised viral disease of pigs. No other mammalian hosts occur. It is transmitted by direct contact, inanimate objects and ticks. The virus is very resistant to inactivation. The acute form of the disease is characterised by pronounced haemorrhage of internal organs and a death rate of up to 100% in infected herds. Milder forms of the disease also occur.

Aujeszky's disease

Also known as pseudo-rabies, this disease is caused by a herpesvirus that infects the nervous system and other organs such as the respiratory tract in virtually all mammals except humans and the tailless apes. It is primarily associated with swine, which may remain latently infected following clinical recovery.

Virulent avian influenza (fowl plague)

A lethal, generalised disease of poultry caused by specific types of avian influenza virus. Disease outbreaks occur most frequently in chickens and turkeys. Many wild bird species, particularly waterbirds, are also susceptible, but infections in these birds are generally subclinical.

Bluetongue

A viral disease of ruminants transmitted only by specific species of biting midges (*Culicoides* spp). Sheep are the most severely infected, the disease being characterised by inflammation of the mucous membranes, widespread haemorrhages and oedema. Naturally occurring disease has not been seen in Australia, although some serotypes of the virus, some pathogenic, have been detected in northern and eastern Australia.

Bovine spongiform encephalopathy (BSE)

A fatal neurological disease of adult cattle, characterised by a long incubation period, followed by progressive degeneration. Typical signs are abnormal posture, development of

violent behaviour, heightened sensory perception, decreased milk production, weight loss (despite a good appetite) and death.

The disease was first recognised in the United Kingdom in 1986, and probably arose because changed practices in processing meatmeal permitted transmission of the scrapie agent to cattle.

Classical swine fever (hog cholera)

A highly contagious disease capable of spreading rapidly in susceptible pig populations. In the acute form, the disease is characterised by fever, severe depression, multiple haemorrhages, and rapid deaths. Strains of the virus of lower virulence cause subacute and chronic forms of the disease that include complications of pneumonia and diarrhoea.

Equine influenza

An acute respiratory viral disease, that may cause rapidly spreading outbreaks in congregated horses. It is caused by two members of the genus *Influenzavirus*. Other equines are susceptible, but the disease is seen mainly in horses.

Foot-and-mouth disease

An acute, highly contagious viral infection of domestic and wild cloven-hoofed animals. It is characterised by fever and vesicles in the mouth, nose, feet and teats. Serious production losses can occur, but deaths are unlikely except among young animals.

Japanese encephalitis

Is a mosquito-borne viral disease of humans and animals and occurs throughout much of Asia causing encephalitis in humans in some cases. Adult pigs normally show no clinical signs but pregnant sows may abort or produce mummified foetuses, stillborn or weak piglets. In horses the clinical signs may vary from a mild transient fever to high fever, blindness, collapse and deaths ranging from 5% to as high as 30-40%.

Lumpy skin disease

An acute, generalised viral skin disease of cattle. It is highly infectious and is characterised by fever, ocular and nasal discharges, the eruption of cutaneous nodules, swelling of superficial lymph nodes and oedema of the limbs. It is caused by the same virus — capripox — that causes sheep and goat pox.

Newcastle disease

A highly contagious lethal viral disease of chickens, turkeys and other birds. Virus strains vary widely in their virulence. Severe strains cause rapid death and are characterised in chickens by respiratory distress and swelling of the head around the eyes.

Peste des petits ruminants (PPR)

PPR in sheep and goats resembles rinderpest of cattle and is caused by a virus closely related to the virus of rinderpest. It is characterised by fever, enteritis, high morbidity and mortality.

Rabies

An almost invariably fatal viral encephalitis affecting all warm-blooded animals. It has a long and variable incubation and is transmitted by the bite of a rabid animal. The main reservoir hosts include members of the *Canidae* (dogs, foxes).

Rift Valley fever

This is a mosquito-borne disease of cattle, sheep, goats and humans, characterised by high rates of abortions and high rates of mortalities in young animals. Severe disease can occur in man thereby requiring special safety precautions.

Rinderpest

An acute highly contagious disease principally of cattle ('cattle plague'). Characterised by high fever, nasal and ocular discharges, laboured breathing, severe often bloody diarrhoea and death. The virus is related to measles, canine distemper, and peste des petits ruminants. The virus is not stable in the environment.

Scrapie

Scrapie occurs in sheep and goats. Infection is usually passed from ewe to lamb and can occur between unrelated animals, especially when lambing occurs in confined areas. Scrapie has a prolonged incubation from 1–3 years or longer. Clinical signs of pruritus and incoordination progress to depression, recumbency and death. Animals that never develop clinical signs can still be a source of infection to others.

Screw-worm fly

Myiasis caused by larvae of the screw-worm fly is characterised by larvae feeding on **living** tissues in open wounds of any warm-blooded animal host, resulting in debility and some deaths. The flies prefer warm moist conditions and temperature ranges from 16–30°C.

Sheep and goat pox

A highly contagious viral diseases of small ruminants. Characterised by generalised pox lesions throughout the skin and mucous membranes, fever, pneumonia and often a high death rate. The degree of host specificity varies. The virus is very resistant to inactivation in the environment.

Swine vesicular disease

Swine vesicular disease is caused by an enterovirus closely related to the human Coxsackievirus B5. It is characterised by fever and lameness due to vesicles and erosions on the feet. It is clinically indistinguishable from foot-and-mouth disease.

Transmissible gastroenteritis

An enteric virus disease of pigs, caused by a coronavirus that results in rapid dehydration, profuse diarrhoea and rapid death in piglets under three weeks of age.

Vesicular exanthema

An acute disease characterised by vesicles on the snout, in the mouth and on the feet. The clinical disease is indistinguishable from foot-and-mouth disease. The vesicular exanthema virus is very closely related to viruses isolated from marine animals and has been associated with the feeding of contaminated food scraps containing marine animal product.

Vesicular stomatitis

Vesicular stomatitis is principally a disease of cattle, horses and pigs. It can cause signs indistinguishable from foot-and-mouth disease, except horses are also infected. The disease has only been seen in North, Central and South America. The epidemiology of the disease is still unclear, but transmission cycles between insects and small wild ruminants is known to occur.

1.2.2 Occupational health issues

Some diseases pose a potential risk to anyone handling infected animals or tissues. People responsible for the handling of infected or suspect animals must maintain due care and maximum personal hygiene at all times to limit the risk of becoming infected.

Those diseases presenting the most risk include rabies, foot-and-mouth, screw-worm fly, vesicular stomatitis, and Rift Valley fever.

1.2.3 AUSVETPLAN strategy and OIE requirements for each disease.

A concise summary of the proposed strategy in Australia if there is an outbreak of one of the emergency diseases covered by AUSVETPLAN may be found in the **Summary Document**. More details are provided in the individual **Disease Strategies**. Some of the diseases are covered by a cost-sharing agreement whereby the Commonwealth and States/Territories share the eradication and compensation costs (see the **Summary Document, Appendix 3**).

The Office International des Epizooties (OIE) is the world organisation for animal health. The OIE, established in 1924 in order to promote world animal health, provides guidelines and standards for health regulations in the international trade of animals and animal products.

Diseases that spread rapidly, have particularly serious socioeconomic or public health consequences and are of major importance in international trade, have been designated by OIE as List A diseases. List B diseases are similar to List A, but are considered less invasive across political borders, and to be 'significant' diseases only for international trade considerations. The OIE International Animal Health Code for each disease is shown in Appendix 3 of the individual AUSVETPLAN Disease Strategies..

The incubation period for diseases mentioned in this text are listed in the OIE Code. For this manual, we have selected an incubation period of 30 days as a standard, however this may vary depending on the disease of concern.

1.3 Inputs

AB centres operate as an intensive concentrated holding centre for various animal species. The premium value of these animals is significant both as an elite genetic resource and as highly valued or expensive animals.

Most of the resources needed to maintain animals and to process and store semen or embryos on AB centres or on adjoining testing properties or holding farms are delivered to the premises.

1.3.1 Animals

Cattle, sheep, pigs, goats and horses arrive at varying times for collection and processing of semen/embryos.

1.3.2 Products

Animal feed, in the form of baled or rolled hay, grains and feed concentrates, processed formulated feeds, feed supplements, bedding material and water, and dry milk powder and eggs for the processing of semen and embryos.

Imported or Australian processed and frozen semen and embryos, which include semen and embryos collected and processed on AB centres, and those collected and processed at on-farm facilities and centres.

1.3.3 Biological products and drugs

- Biological products used in the testing and treatment of animals and for the processing of embryos including such products as bovine serum, reproductive hormones and assay test kits based on animal products.
- Drugs required for the treatment of animals and those required for the processing of semen or embryos.

1.3.4 Liquid nitrogen

AB centres receive a regular supply of liquid nitrogen for the maintenance of frozen semen and embryo storage tanks, for the process of freezing and for distribution. There is also receipt of new and used liquid nitrogen storage containers from overseas, AB centres, inseminators and from farms.

1.3.5 Equipment and vehicles

AI equipment, embryo collection and transfer equipment, animal husbandry and farm centre equipment.

AB centre vehicles and those of the inseminators, AB centre staff, veterinary staff, visitors, liquid nitrogen delivery, livestock transport feed delivery and general goods delivery vehicles.

1.3.6 Personnel

These are diverse and include AB centre staff, veterinarians, inseminators, farmers, government inspectors, maintenance contractors, builders, local and overseas visitors, agents, and family members of AB centre staff.

1.3.7 Miscellaneous animals or products entering AB centres

Although AB centres maintain a closed quarantine status, entry of other animal species or products can occur. These include:

- pets — dogs and cats;
- working dogs and horses;
- food products — staff meals and waste;
- feral animals — foxes, possums, birds, bats, rats, mice, wombats;
- water — streams, effluent run-off, waste.

1.4 Outputs

The major components produced and distributed from all classes of AB centres are semen and embryos, and the resources required to facilitate their distribution from the centres, ie liquid nitrogen and containers.

1.4.1 Animals

The actual transfer of animals is minimal and restricted to the return of stud animals to farms of origin.

Animals released from quarantine and returned to farms do offer the potential for the transfer of infection. The likelihood of this occurring with the continuous supervision and limited release of animals from AB centres is low.

The critical period would be during the incubation period before the appearance of clinical signs. In the case of foot-and-mouth disease, this is 2 to 8 days.

1.4.2 Semen and embryos

Semen and embryos from cattle, sheep, goats, pigs and horses are collected and processed on AB centres before being distributed as fresh, chilled or frozen product to other centres, inseminators or farmers.

Frozen semen and embryos are stored and transported in liquid nitrogen held in specialised cryogenic tanks. The semen and embryos are usually processed into 0.5 mL or 0.25 mL plastic straws, which are packed into plastic or metal goblets. These goblets are then packed into individual metal canisters in the storage tank.

The fresh and chilled processing and distribution of semen or embryos does not require liquid nitrogen or liquid nitrogen containers. These are normally distributed in polystyrene containers, thermos flasks, or specially designed cooling units, ie equitainers.

Infection could be transferred via various semen or embryo transport containers, although the risk and probability of this occurring in an AB centre is extremely low.

1.4.3 Liquid nitrogen

Liquid nitrogen supplies required by inseminators and farmers are transported to the farmer or inseminator from AB centres in portable storage tanks to the farmer or inseminator.

The transfer and survival of infective organisms in liquid nitrogen, is high if the liquid nitrogen has become contaminated with these agents, however unless semen is processed into pellets and stored in open bulk goblets, the risk of infections being introduced into an AB centre via liquid nitrogen is extremely low.

1.4.4 Equipment

New AI equipment is supplied to inseminators and farmers and no possible risks of disease transfer are involved.

Embryo collection and transfer equipment is cleaned and sterilised before leaving an AB centre therefore there are no risks involved in the transfer of disease via this equipment.

1.4.5 Personnel

Veterinarians, AB centre staff, inseminators, visitors and others who leave the centre following direct contact and access to the animals or animal quarters do offer a potential risk in the spread of infection.

1.4.6 Biological products/specimens

Blood samples, urine or faecal samples, milk, biopsy and tissue samples removed from the AB centre and transferred to laboratories or other centres holding animals are potentially high risk items for the possible spread of infection.

1.4.7 Waste products

Effluent, water runoff, manure, slurry, soiled bedding, waste feed concentrates or hay and bags all are potentially high risk items for the possible spread of infection from the AB centre.

1.4.8 Miscellaneous animals or products leaving AB centre

Various animals or animal products or wastes can cause the spread of infection. These include: pets (dogs and cats); working dogs and horses; food products (contaminated food waste); feral animals (foxes, possums, birds, bats, rats, mice, wombats); water (streams, runoff) and other infected products, or by-products that may accidentally be removed from the AB centre.

1.5 Risks of spread of disease

The risk of the rapid spread of an emergency viral disease due to the collection and transfer of semen or embryos from animals in a viraemic preclinical phase of infection or in a nonclinical carrier state is extremely significant.

The risk is increased if the semen or embryos are processed and transferred in a fresh or chilled state. For frozen semen or embryos, the risk of transfer of infection is also high because freezing can maintain infectious organisms indefinitely. However, it is usual for frozen materials to be stored before being dispatched to inseminators or farmers, thus reducing the risk of infection being present due to a current outbreak.

Table 1 defines the current evidence and data relating to the possible presence and transfer of disease via semen and embryos in cattle, sheep, goats, pigs and horses. The evidence detailed in Table 1 suggests that the majority of infective viral agents responsible for these diseases will be present in semen and attached to, or in the media collected with, embryos. The potential transmission of disease via AI is possible in many cases but less likely with embryo transfer.

Embryo transfer technology offers the greatest security for the transfer of genetic resources in a restricted zone where the movement of sires is restricted and it is impossible to guarantee the safety of semen. The basis of this is that:

- proper washing is effective in removing virus particles from the collection fluid or as attached to the embryo if the zona pellucida is intact; and
- the zona pellucida is a very effective barrier in preventing the entry of virus particles into the embryo.

Due to the nature of the AB centre enterprise and its operational systems, with reserve stocks of frozen product, **it is feasible to adopt an approach of temporarily closing down the processing and services operations of the AB centre and AI services.** Initially, on the declaration of an emergency disease in the area of an AB centre, this will be the recommended approach. The extent of the ongoing restrictions or regulations will depend on whether the AB centre is declared an infected, dangerous contact or suspect premises, or is merely within a restricted or control area, and the nature and extent of the disease.

Table 1 Transmission of emergency diseases by semen or embryos

Disease	Transmission by semen or embryos
African horse sickness	The virus is present in semen and embryos and may be transferred this way although there is no documentation to support transmission in either.
African swine fever	The virus is present in semen and can be transferred in this way. Preliminary evidence shows risk of transmission via embryos is negligible if the embryos are handled correctly between collection and transfer. Additional data is required to substantiate the preliminary findings.
Aujeszky's disease	Acutely infected boars can transmit virus through semen and carriers must also be expected to excrete the virus intermittently. Acutely and chronically-infected sows can be expected to excrete the virus into the reproductive tract. Washing will not remove all of the virus attached to the embryo but trypsin treatment will remove residual attached virus. It is highly unlikely that the virus can be transmitted under natural circumstances by embryo transfer (ET).
Bluetongue	Virus may (rarely) be excreted in the semen when males are viraemic. Excretion is more likely if there is inflammation of the genital tract, if the animal is aged or if the virus has been laboratory adapted (as in live vaccines or experimental infection). There is much evidence from in vitro and in vivo work that embryos from infected donors washed to International Embryo Transfer Society (IETS) protocols do not transmit the virus. This is despite virus presence in uterine washings of donors and even with the use of infected semen.
Bovine spongiform encephalopathy	The agent is not known to be transferred in semen or embryos, however preliminary work is still in progress.
Sheep and goat pox Classical swine fever	No information, therefore consider as for lumpy skin disease. The virus is present in semen and likely to be transmitted. Washing of embryos has no effect in removing the virus attached to the embryo, but virus is removed or inactivated by trypsin treatment. Therefore, there should be no risk when standard IETS methods are followed.
Equine influenza	No information available but transmission is unlikely to occur by this route.
Foot-and-mouth disease	In bovine and small ruminants virus is present in semen and can be transmitted in this manner. Virus has been found in bull semen 4 days before, during, and up to at least 37 days after the appearance of clinical signs In cattle, sufficient evidence has been accrued to show the risk of transmission via embryos is negligible provided the embryos are carefully handled between collection and transfer. For sheep and goats substantial evidence has shown the same as for cattle. In pigs virus is present in and can be transmitted by semen. Transmission via ET is as for sheep and goats.

contd...

Disease	Transmission by semen or embryos
Japanese encephalitis	Virus has been transmitted in semen from experimentally-infected boars.
Lumpy skin disease	Virus has been detected in semen up to 22 days after infection. There is no information on transmission but the possibility is likely due to the nature of the pox virus. Similarly little information is available on presence in, and transmission via, embryos.
Peste des petits ruminants	The virus is present in semen and embryos and likely to be transmitted in this way.
Rabies	No evidence exists for transmission in semen for embryos. Transmission through dog's semen is considered to be extremely unlikely.
Rift Valley fever	The virus is likely to be present in semen and it is possible transmission may occur. It is known to be present in ova but is most probably not transmitted.
Rinderpest	The virus is present in all secretions and semen transmission was demonstrated by very early work. Very little rinderpest virus is excreted into the reproductive tract of cows. This level is considered insufficient to adhere to embryos and thus ET is not considered to constitute a risk. Additional in vitro and in vivo experimental data is required to substantiate these findings.
Scrapie	The disease agent is not present in semen. Work is still being carried out on transmission via embryo transfer.
Screw-worm fly	The vector is not present in semen or ova.
Swine vesicular disease	Spread via semen is unlikely. Preliminary evidence shows transmission via embryos is unlikely if correct handling and transfer procedures are followed, however additional experimental work is necessary to substantiate these findings.
Transmissible gastroenteritis	The virus has not been reported in semen and is most probably not present in ova.
Vesicular exanthema	The virus is present in and can be transmitted via semen. It is possibly in ova and could be transmitted this way.
Vesicular stomatitis	In bovines transmission is thought possible via semen. Transmission is not considered likely via embryos though additional experimental work is necessary. In pigs and horses the virus is present in and can be transmitted via semen if the semen is contaminated with vesicular fluid. It is known to be present in ova but transmission is considered unlikely. There is no viraemia in vesicular stomatitis infection, so there can be no haematogenous contamination of semen or embryos with virus.

Source: Manual of the International Embryo Transfer Society (1987)

2 RISK REDUCTION AND CONTINGENCY PLANNING

The reputation and responsibility of the AB industry depends on the quality and disease-free status of the service. It is essential that this is maintained. The potential capacity for the rapid and diverse spread of an emergency disease through the AB operations or AI services in rural Australia is significant.

In addition to the *Minimum Health Standards for Stock Standing on Licensed or Approved Artificial Breeding Centres in Australia* and the *Code of Practice for Australian Livestock Artificial Breeding Centres*, (AQIS 1988) the *OIE International Animal Health Code* (OIE 1992) contains recommended procedures for management of bulls, semen collection, handling of semen and the preparation of semen doses in the laboratory; and for the handling and treatment of embryos before transfer or freezing.

There are several procedures that can be implemented by AB centres to reduce the risks associated with the introduction or spread of disease, maximise the identification and detection of diseased animals and assist in the disease strategy control programs. These are discussed briefly below.

2.1 Livestock

- Where possible, the number of animal species resident on an AB centre should be limited. If more than two species are admitted these should be maintained in isolated areas.
- Regular veterinary health inspections of all animals should be carried out.
- Sick animals should be placed in immediate isolation and subjected to detailed veterinary examination.
- Dead animals should be removed to a suitable facility off the AB centre for postmortem examination before disposal.

2.2 Semen

- No semen should be collected from a sick animal. Collections may be made from a recovered animal with veterinary clearance.
- There should be limited use of biological products in media for processing fresh, chilled or frozen semen.
- All semen should be identifiable to the donor and the day of production.
- Fresh and chilled semen distribution should be restricted during a disease outbreak until the cause of the outbreak has been determined. Further action will depend on the results of the investigations.

2.3 Embryos

- No embryos should be collected from a sick animal. Collections may be made from a recovered animal with veterinary clearance.
- The use of biological products in media for processing fresh, chilled or frozen embryos should be limited.

- Embryos should be washed and handled according to the International Embryo Transfer Society manual (IETS 1987) and have intact zona pellucida before and after washing.
- Frozen embryos should be stored in a temporary liquid nitrogen storage container for 30 days before transfer to permanent storage or transfer to recipients.
- Embryos entering AB centres for use within the AB centre should be restricted to embryos collected, washed and handled in line with IETS protocols direction.

2.4 Personnel

- The entry of visitors should always be strictly controlled and staff at the centre should be technically competent and observe high standards of personal hygiene to preclude the introduction or spread of pathogenic organisms. Protective clothing and footwear for use only at the centre should be provided.
- Staff should be encouraged to limit contact with animals residing off the centre, especially those of the same or similar species. Where this is not possible, suitable hygienic procedures should be maintained.
- Inseminators and veterinarians should be restricted from access or contact with the animals at the AB centre unless they change into clean protective clothing and footwear provided at the quarantine entry points.

2.5 Training of staff

The AB centre veterinarians and the emergency disease training officer of the relevant State/Territory department of agriculture should conduct an emergency disease awareness and training course every year for all AB centre staff and inseminators, incorporated wherever possible with other activities. These courses should cover:

- diseases involved;
- early recognition of signs of disease;
- emergency strategies for control;
- role and responsibilities of staff; and
- significance of an outbreak to the operations of the AB industry and the Australian primary industry.

2.6 Unlicensed semen and embryos

Semen or embryos collected on farms from animals that have had no health testing, present a great risk to the potential transfer of infection. To reduce the risks associated with this common practice it is recommended that:

- donor sires or dams are health tested and certified free of disease for the 30 days before collections;
- semen or embryos collected from these donors should only be transferred to other animals owned by the owners of the donors; and
- frozen semen and embryos are stored in separate containers in isolation from licensed semen and embryos.

There is increased potential for the transmission of diseases through unlicensed semen or embryos. In the event of an emergency disease outbreak any licensed semen or embryos stored in contact with suspicious material and considered to have been contaminated would be destroyed.

2.7 Record keeping

Concise, accurate and accessible records, recording details of all animal, semen and embryo transfers from AB centres are normally required by State legislation, artificial breeding organisations and breed societies, and must be maintained by the AB centres. In addition, it is advisable to record the daily movement of staff and dispatch of all animal products leaving the AB centres.

These records would enable the local disease control centre (LDCC) in the event of an emergency disease outbreak to rapidly trace all transfers of potential infected or suspect animal, animal product or people, thereby limiting possible contamination and to prevent the unnecessary destruction of animals or animal product not deemed infected or highly suspect. Such records must include the following details.

Animals:

- breed, sex and age
- identification, tattoo, tag, brands, photo
- dates in AB centre
- date of removal, method of transfer
- location of transfer

People:

- name
- date of movements
- animal contacts
- sites visited and procedures involved

Fresh and chilled semen or embryos:

- breed, and age of donor
- identification, tattoo, tag, brands, photo of donor
- dates of collection
- number and doses collected and processed
- date and means of dispatch
- location of transfer, details of recipients

Frozen semen and embryos:

- breed, and age of donor
- identification, tattoo, tag, brands, photo of donor
- dates of collection
- numbers and doses collected and processed
- storage location
- dispatch details — numbers, date, destination, all straws to be identified by animal's reference identification, date of collection and centre of collection

2.8 Media and public relations

The **Public Relations Manual** contains detailed information on media and public relations activities that would occur in the event of an emergency disease outbreak. Enterprises such as AB centres could become a target for media interest. Information fact sheets for each of the diseases covered by AUSVETPLAN are contained in the **Summary Document**.

3 Response plans for AB centres in a declared area

3.1 Introduction

This section addresses the situation where an AB centre, although not having any clinical or suspected cases of an emergency disease itself, is within either a restricted area or control area due to an outbreak on another property.

3.1.1 Declared areas

The term *declared area* is used to cover both *restricted areas* and *control areas*. Certain paragraphs may require specific references to restricted and control areas because the procedures are likely to be different for some diseases. Generic definitions are provided below. Definitions may vary or such areas may not be necessary for specific diseases. A *restricted area* (RA) is a relatively small area around an infected premises that is subject to intense surveillance and movement controls. Movement out of the area will in general be prohibited, while movement into the restricted area would only be by permit. Multiple *restricted areas* may exist within one *control area* (CA). Guidelines for establishing restricted areas are provided in Appendix 1 of each disease control strategy.

A CA will be a buffer between the RA and the unrestricted area, where restrictions will reduce the chance of the disease spreading further afield. The control area should be reduced in size as confidence about the extent of the outbreak becomes clearer, but must remain consistent with OIE codes. In principle, animals and specified product will only be able to be moved out of the control area into the free area by permit.

3.1.2 Local disease control centre

In the event of an outbreak of emergency disease, each State or Territory is responsible for its own disease control activities under the direction of the State/Territory CVO. An LDCC will be established and will be responsible for all activities within the declared area, including disease investigation, collection of specimens, quarantine of properties, valuation, slaughtering and disposal of livestock, and decontamination of properties.

AB centres, subcentres, inseminators and on-farm services should be in contact with the LDCC controller. All centre and support staff must be fully aware of LDCC requirements and of all arrangements to avoid the risk of spread of disease.

3.2 Can the AB centre continue to operate in a declared area?

On receipt of advice from the CVO, the director of an AB centre should immediately implement the work practices recommended in Section 3.3 as well as the movement controls and other restrictions shown in Tables 3 and 4.

These recommended practices and restrictions are considered essential safety measures to prevent the risk of introducing the disease to the centre or spreading the infection. **These are considered to be temporary measures that will remain in force while the diagnosis, disease risk and population affected are clarified.**

Once the disease status is determined, the CVO, through the LDCC, will review the temporary restrictions initially adopted by the AB centre. Operations that present no risk for the spread of infection, will be permitted to resume under direct supervision of the LDCC. On the declaration of an emergency disease, the AB centres within the restricted area must immediately cease operations and implement the recommended procedures and work

practices to reduce the risk of spread of the infection into the centre or through the AI service activities.

Resumption of activities will depend on the emergency disease and animal species involved, and will be authorised by the CVO through the LDCC in line with the AUSVETPLAN

Disease Strategies.

In the event of an outbreak of a highly infectious vesicular diseases or those highly likely to be transmitted by semen or embryos, those AB centres with animals and regular AI services (other than approved under permit), would cease semen or embryo collections, processing or transfer operations until the CVO removes the restricted area declaration. AB centres with or without animals can safely continue operations involving the transport, storage and distribution of frozen semen and embryos collected and processed 30 days before the outbreak.

Diseases such as lumpy skin disease, rabies or screw-worm fly pose little risk, thereby allowing for the early resumption of regular AB centre operations and field AI services.

3.3 Minimisation of risks associated with operation

On the declaration of the outbreak of an emergency disease it is essential that all AB centres within the area adopt procedures to strictly maintain and enforce the status of the centres as isolated quarantine centres.

It is the responsibility of AB centres to continually maintain a policy program that meets the codes of practice stated in the *Minimum Health Standard* and the *Codes of Practice* (AQIS 1988), and that of the OIE recommendations (OIE 1992), with the objective of preventing the contamination of centres by infected agents.

The site location and geographic area for the location of AB centres away from areas of concentrated animal populations, minimal insect population vectors and in protected areas free from possible pollution or water runoff are important considerations in the siting and establishment of AB operations.

All quarantine restrictions must be strictly enforced. To ensure this is achieved, restricted entry signs need to be erected at all entrances, gates to be locked and fences maintained to control all animal movements.

The specific recommended procedures to limit risk of infection entering an AB centre in a declared area are described in Tables 3 and 4..

Table 3 Potential movement controls in a restricted area

Proposed movement/activity	Controls/restrictions
Movements	
Livestock	Total prohibition of the movement of all animals in or out of the AB centre. Restricted movement of stock within the centre.
Within the AB centre	All AI operations on the AB centre to cease.
People	Prohibition of entry to the laboratory, storage, processing sites, animal quarters, for all people not directly responsible for particular operations. No access to visitors or staff working with animals outside the AB centre.
Equipment	AB centre staff observe full decontamination and disinfection procedures when leaving/entering the centre (see Appendix 3). No introduction of equipment into the AB centre other than from outside the restricted area.
Vehicles	No vehicles to enter or leave the AB centre quarantine area.
Fodder, feed or bedding	Normal access to the office and semen/liquid nitrogen facilities. No introductions of fodder, feed, bedding, etc. into the AB centre from locations within the restricted area. No dispatch of these items from the centre.
Semen/embryo collection	
Semen or embryos	Total prohibition of the dispatch of semen or embryos from the AB centre.
Semen	All collection, processing and freezing of semen to cease immediately.
Embryos	All collection and transfer of embryos on the AB centre to cease.
Semen and embryos collected within the last 30 days	All semen and embryos processed and frozen within the last 30 days are to be identified, recorded and transferred to a clean, empty liquid nitrogen storage tank. This tank will be sealed and isolated until directed by the CVO or LDCC.
AI procedures	
On farm AI services by inseminators	Initially all AI services would be totally suspended to curtail any possible spread between farms by inseminators. Once the extent of the outbreak has been evaluated, the CVO may issue permits for inseminators to undertake urgent commercial operations and individual visits to farms not covered by quarantine restrictions, but not multiple farm visits. Inseminators will be restricted to semen collected and frozen at AB centres in the restricted or control area 30 days prior to the disease outbreak, or semen received from outside these areas. No fresh or chilled semen is to be used.
Trace-back and trace-forward	All imports and dispatches of semen, embryos, livestock, biological material, and service farm visits by AI staff, technicians or veterinarians over the last 30 days are to be tabulated and records made available to the LDCC.

Table 4 Potential movement controls and restrictions in a control area

Proposed movement/activity	Controls/restrictions
Movements	
Livestock	Limitations on animal movements; no livestock to be admitted to the isolation testing centre for pre-AB admittance from the RA; no animal to be returned to infected or suspect farms within the RA.
Semen or embryos	Restricted to frozen semen or embryos collected and processed 30 days before the declaration of the emergency disease outbreak. Dispatches only allowed to the RA and CA.
People	Total restriction on visits to the AB centre from IPs, DCPs or farms within the RA. AB centre staff responsible for handling, care, or servicing of animals at the AB centre should be totally prohibited from visiting farms in the restricted area. AB centre staff to observe full decontamination and disinfection procedures when leaving/entering the AB centre (see Appendix 3).
Equipment	No entry of any equipment from farms in the RA.
Vehicles	Access permitted for vehicles from the CA or outside the CA; no access for vehicles from within the restricted area.
Fodder, feed or bedding	No introductions of fodder, feed, bedding, etc into the AB centre from locations within the RA; introductions to be limited to locations in or out of the CA.
Semen/embryo collection	
Semen	The collection and processing of fresh or chilled semen for immediate dispatch and insemination to cease. Collection and processing of semen for freezing and storage can continue. Semen to be stored in isolated tanks and held for 30 days before release.
Embryos	Collection and transfer of embryos for immediate fresh transfers within the AB centre can continue. These animals must remain at centre for 30 days following transfers. Transfers of embryos to farms quarantined within the RA to cease.
Semen and embryos received into the AB centre in last 30 days	All semen-containing straws and embryos received into the AB centre during the last 30 days from within the restricted area are to be identified, recorded and transferred to a clean empty liquid nitrogen storage tank. This tank will be sealed and isolated until further directed by the CVO or LDCC.
AI procedures	
Within the AB centre	Procedures can continue using semen collected 30 days before the declaration of the disease outbreak.
On-farm AI services by inseminators	Unrestricted services to be continued with frozen semen collected and processed at AB centres in the control area 30 days before the outbreak or held for 30 days before release, or with semen from outside the restricted area.
Tracing	
Trace-back and trace-forward	All imports of semen, embryos, biological material, livestock or service farm visits by AI staff, technicians or veterinarians from within the RA in the last 30 days to be tabulated and records sent to the LDCC.

3.3.1 Livestock

The requirements for the introduction of animals onto licensed/approved AB centres requires initial on-farm health testing and certification of disease status of the farm of origin. This is followed by intensive health testing at an approved pre-admission centre. These requirements must be strictly adhered to and no animal whatsoever is admitted to the AB centre without this extensive testing procedure. The AQIS *Minimum Health Standards* state that there must be no mixing or contact between animal species during testing or on admittance to the centre.

In an outbreak no animals can be tested on-farm from within the declared area, and animals currently in pre-admission centres must remain in these centres until this area is declared free of disease.

3.3.2 Semen and embryos

No semen or embryos from any source within the RA are to enter the AB centre.

All semen and embryos initially originating from any property within the RA in the preceding 30 days, or such semen or embryos that have been in direct contact with these (ie within the same goblet or canister), should be identified and relocated in a separate storage tank. This tank should remain sealed and not released until it has been assessed that this semen has not originated from an infected or dangerous contact premises.

3.3.3 Liquid nitrogen tanks and liquid nitrogen

Liquid nitrogen/cryogenic containers used for the transport of semen, embryos or liquid nitrogen within the last 30 days or those in contact with these tanks, from AB centres, inseminators, veterinarians or farmers within the restricted area must be identified and disinfected.

Liquid nitrogen remaining in these containers must be disposed of in a ground pit, which can then be covered.

Crate covers or containers that cannot be efficiently decontaminated should be destroyed and disposed of on the premises. Transport tanks returning to AB centres should remain located in the dispatch facilities with no contact with the on-centre storage facilities.

3.3.4 Livestock feed, bedding, hay

All food items, animal bedding and hay identified as originating from the restricted area within the last 30 days should be identified along with in-contact items and isolated or, if expedient, destroyed.

Such items must only be introduced from sources outside the RA.

3.3.5 Personnel

All AB centre staff should be assembled at the earliest possible convenient time to be briefed as to the current disease situation, the specific disease involved, risks of spread, personal care and hygiene and the proposed strategies, by the AB centre's director, veterinarian and, if possible, a representative of the LDCC.

Staff should observe high standards of personal hygiene to preclude the introduction of any pathogenic organism. Protective clothing and footwear for use only on the centre should be provided and they must observe standard decontamination and disinfection directives on entering or leaving (see the **Decontamination Manual, Section 4.1**).

AB centre staff and inseminators attached to these centres should restrict all farm visits, while those staff residing on farms in a restricted area should remain at their residence until the area is declared disease free.

3.3.6 Semen collection and embryo transfer equipment and processing media

All equipment and media used within the restricted area within the last 30 days, and such equipment or facilities in contact or used for its transport or storage must be identified, decontaminated, and remain on the premises. Minor items would likely be destroyed.

Technical equipment including microscopes, equipment for embryo splitting or manipulations must be decontaminated and preferably remain on the property.

Such equipment and media used off the licensed AB centre in the control area should be restricted from the security quarantine areas of AB centres unless decontaminated and sterilised.

3.3.7 Vehicles

Restricted access to the animal quarantine area should be maintained at all times. Those vehicles entering the AB centre from the restricted area over the last 30 days and currently located in the centre must be isolated and decontaminated.

All non-essential vehicles will be restricted entry to the AB centre. Where possible, goods entering the AB centre could be off-loaded at the boundary sites and transferred into the centre facilities by relay vehicles residing on the centre. Those essential vehicles delivering animals or feed, hay, bedding, collecting dead animals or to remove waste materials should originate from outside the restricted area and be subjected to standard disinfection procedures on entry and exit as described in the **Decontamination Manual, Section 4.3**.

3.3.8 Water (streams, runoff, seepage)

AB centre contamination via water resources from surrounding farming lands via runoff is possible and should be prevented by diverting or blocking such areas around the AB centre perimeter.

3.3.9 Building and structures

Regular cleaning programs of buildings, yards and surrounding areas, especially the removal of manure, blood or faecal contamination must be enforced and maintained. Feed and hay storage areas should be kept clean, vermin-proof and secure. Muddy, swamp waste or runoff areas must be prevented or controlled by ensuring adequate drainage and fail-safe watering systems.

3.3.10 Vermin and feral animals

- Rigid maintenance of netting boundary fences will be required.
- Possible areas of access, ie storage areas or animal feed troughs, should be controlled.
- Possible areas for bird nesting or night roosting areas in sheds or surrounding trees should be eradicated.
- Pest control program must be regularly maintained using baits, traps and fumigation.
- Access of all dogs, cats, horses, small animal pets or birds to the centre must be banned.
- Insects (flies, mosquitos, etc) should be controlled by fumigation, traps, electrical destruction units or by chemical control programs as appropriate.

3.4 Other precautions

3.4.1 Storage of infected or suspect semen and embryos

No fresh or chilled semen or embryos collected from quarantined properties should be permitted to enter an AB centre.

The CVO, under exceptional circumstances, may authorise the transfer of frozen semen and embryos derived from quarantined properties for isolated storage in a liquid nitrogen container. Such semen or embryos cannot be transferred or stored on the AB centre's licensed premises. However, it can be transferred and repacked or stored in the unlicensed

semen storage area. Equipment used for handling this material requires cleaning and sterilisation following each procedure.

3.4.2 Product decontamination

Semen and embryos

Fresh, chilled or frozen semen or embryos received at the time a property was considered infected premises (IP) or a dangerous contact premises (DCP) cannot be decontaminated and must be identified and destroyed as described in Section 4.4.2.

Liquid nitrogen and liquid nitrogen containers

Liquid nitrogen containers used for transport of semen, embryos or liquid nitrogen from an IP or DCP must be emptied, the liquid nitrogen disposed of in a deep dry pit and the container washed and sterilised using Virkon disinfectant wash before being reused or stored at an AB centre.

Fresh and chilled semen shipping containers

All disposable products and low-cost containers, such as eskies, cool boxes, thermoses, used for the transport of infected fresh and chilled semen or embryos should be destroyed by burning or burial. Items that can be safely sterilised must be washed and disinfected in Virkon solution.

4 RESPONSE PLANS IN AN INFECTED PREMISES OR DANGEROUS CONTACT PREMISES

4.1 Introduction

This section covers the situation where an AB centre either has infected animals on the premises or has animals that have been in direct contact with infected animals.

Declared premises, which are proclaimed in the event of an outbreak of an emergency disease by the State/Territory CVO under the relevant State diseases legislation, are described below.

Infected premises (IP): defined as the 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.

Dangerous contact premises (DCP): defined as premises containing animals showing no clinical signs of disease but which, by reason of its probable exposure to disease, will be subjected to disease control measures.

Suspect premises (SP): defined as an area containing animals that have possibly been exposed to an emergency disease through contact with infected animals or facilities, people, equipment, semen or embryos, and currently show no symptoms; OR where the disease symptoms are evident, but the diagnosis is as yet to be confirmed.

The declaration by the CVO of an IP, DCP or SP is determined by the policy set out in the AUSVETPLAN **Disease Strategies** in order to minimise the spread of disease.

4.2 Can the AB centre continue to operate if declared an infected or dangerous contact premises?

On receipt of advice from the CVO, the director of an AB centre should close down normal operations and immediately implement the work practices recommended in Section 4.3 as well as the movement controls and other restrictions outlined in Table 5.

These recommended practices and restrictions are considered essential to prevent the risk of spreading the infection. **These are considered as temporary measures that will remain in force pending diagnosis and assessment of the disease risk and population affected.**

The CVO, through the LDCC, will review these restrictions initially adopted by the AB centre, once the disease status is determined. Such operations that present no risk of the spread of infection will be permitted to resume under direct supervision of the LDCC.

4.3 Elimination of the agent

The disease control or eradication strategies will relate to the specific emergency disease and the animal species infected. Information on each disease is in the specific AUSVETPLAN **Disease Strategies**.

Table 5 Movement controls and restrictions for IPs and DCPs

<i>Proposed movement/activity</i>	<i>Controls/restrictions</i>
Movements	
Livestock	Total prohibition of the movement of all animals in or out of the AB centre. No movement of stock within the AB centre and containment of infected or suspect animals in closed sheds and away from perimeter boundaries.
People	Initially all staff are directed to remain at their appointed work stations and all movement around the AB centre is restricted to essential welfare work. Non-essential work to cease. Prohibition of entry into the laboratory, storage, processing centres and animal quarters for all people not directly responsible for their particular operations. No staff shall enter or leave the licensed/approved quarantine centre. Staff currently in the non-quarantine facilities shall also remain within these facilities. No visitors, inseminators, farmers or delivery people shall be admitted to any facility operated by the AB centre that has been declared infected. Appropriate cleaning and decontamination measures will be implemented as soon as possible (see the Decontamination Manual, Section 4.1), to allow the orderly exit of staff.
Equipment	No entry or dispatch of equipment to or from the AB centre.
Vehicles	No vehicles allowed to enter or leave the AB centre. No deliveries of semen, embryos, nitrogen containers, feed, hay or liquid nitrogen.
Fodder, feed or bedding	No entry or dispatch of fodder, feed, bedding etc.
Semen/embryo collection	
Semen or embryos	Total prohibition of the dispatch or receipt of semen or embryos from or into the AB centre.
Semen or embryos and processing	All collection of semen and embryos to cease immediately. Processing or freezing in process to be stopped.
Semen and embryos collected within the last 30 days	All semen straws and embryos processed within the last 30 days to be identified, recorded, and transferred to a clean empty liquid nitrogen storage tank to be sealed and isolated until further direction by the CVO.
AI procedures	
Within the AB centre	All AI operations at the AB centre to cease.
On farm AI services by AI inseminators operating from the AB centre	Totally prohibited; inseminators currently operating in the field should be contacted and directed to remain on that farm until further notice.
Tracing	
Trace-back or trace-forward	All imports and dispatches of semen, embryos, livestock, biological material, vehicles, equipment and service farm visits by inseminators, technicians and veterinarians over the last 30 days are to be tabulated and records made available to the LDCC.

4.3.1 Livestock

The strategy for the specific disease may require all animals infected or suspected of being infected (dangerous contact animals) to be destroyed.

Those animals not required to be destroyed, as in the case of rabies, screw-worm fly or lumpy skin disease, could be salvaged and be maintained in the AB centre for future production.

4.3.2 Semen and embryos

Fresh, chilled or frozen semen or embryos collected and processed within the previous 30 days, along with semen or embryos in direct contact, are classed as infected or suspect and are required to be destroyed.

Frozen semen and embryos collected and processed in straws or vials 30 days before the declaration, and held in isolated storage tanks or held in storage tanks along with infected or suspect semen or embryos processed in straws or vials (but not in the same goblet or canister) can be preserved and salvaged.

Frozen semen or embryos stored in liquid nitrogen next to semen processed as pellets (and not totally sealed in a vial or capsule) would be classified as contaminated. Such frozen material could not be salvaged and would have to be destroyed.

Frozen semen or embryos processed in straws or vials during the last 30 days in the course of AI on-farm services, which have been on an infected premises while in transit stored in a transportable liquid nitrogen tank, can be preserved if no semen, embryos or liquid nitrogen has been added to this tank while on an infected premises.

Semen or embryos originating from an infected or dangerous contact premises, and such semen or embryos that have been in direct contact with them, should be destroyed under supervision following evaluation for compensation.

4.4 Decontamination

The **Decontamination Manual** and **Disposal Procedures Manual** specifically define the techniques for treatment of IPs and disposal of carcasses and other products. Procedures specifically relating to limiting the spread of contamination on the IP and to achieving effective decontamination of AB centres are described below. Note, as compensation may be available approval and valuation must be sought before items are destroyed.

4.4.1 Livestock

Destruction and disposal or removal of carcasses must occur with as little movement or possible contamination of surrounding areas as possible.

4.4.2 Semen and embryos

Fresh or chilled semen or embryos require immediate isolation and sterilisation in a 2% solution of sodium hydroxide and sealing before burial or burning along with all disposal containers and equipment not capable of being sterilised.

Infected or suspect frozen semen and embryos should be identified and isolated in separate storage tanks and sealed. These products present no immediate risk before being thawed and sterilised in a 2% solution of sodium hydroxide before being buried or destroyed along with the liquid nitrogen from these tanks.

4.4.3 Biological products

Processing media containing biological products (milk, eggs, bovine serum), along with any biological samples collected from animals on the AB centre during the previous 30 days must be isolated and, once approved, destroyed by burial, burning or chemical sterilisation.

Biological samples can include blood, urine, milk, faeces, or semen samples for slide assessment or animal tissues not required by the LDCC diagnostic team.

4.4.4 Drugs and drenches

Drugs, drenches or such products opened and used for any animal treatment or procedure within the last 30 days must be identified and destroyed by burial, burning or chemical sterilisation. In-contact unopened bottles or containers must be cleaned and sterilised.

4.4.5 Semen and embryo collection, processing and transfer equipment and veterinary equipment

All items of specialised equipment used for semen and embryo collection and processing, or in the course of veterinary procedures within the last 30 days to be identified and isolated. Disposable used or in-contact equipment is to be destroyed by burial or burning while other such equipment is to be chemical or heat sterilised.

4.4.6 Liquid nitrogen containers and liquid nitrogen

Liquid nitrogen containers used for transport of semen, embryos or liquid nitrogen within or on infected premises and such in-contact tanks, must be emptied and sterilised using Virkon disinfectant. The liquid nitrogen should be disposed of in a deep dry pit.

Used wooden, cloth or cardboard boxes or crates used to protect these containers in transport are to be burnt or buried while solid plastic containers can be disinfected using a suitable compound (see the **Decontamination Manual, Table 2**).

4.4.7 Laboratory, veterinary facilities and semen storage centre

Facilities used for the collection and handling of biological specimens; semen/embryo processing, evaluation or manipulation; or storage equipment and drugs that were used in animal procedures must be isolated and sealed before cleaning and disinfection. Where facilities are available, formaldehyde fumigation may be used (see **Decontamination Manual, Appendix 3**).

4.4.8 AB centre personnel

Strategically located personnel decontamination areas would be established at all entry and exit points of the AB centre, along with areas within the AB centre to include entry and exit of animal holding areas, animal handling facilities, feed storage centre, and entry and exit to laboratory and veterinary facilities.

4.4.9 Miscellaneous

Standard strategic procedures apply for the elimination of potential contamination of:

- feed, bedding and hay;
- manure, effluent, water, urine;
- vehicles and machinery;
- vermin and feral animals; and
- yards, pens, sheds, and feed storage silos or bins.

For further details see the **Decontamination Manual, Sections 4.2, 4.3 and 5**.

4.5 Tracing livestock, semen, embryos and personnel movements

The most likely routes of probable transfer of infection from an infected AB centre are via:

- animals;
- fresh or chilled semen or embryos;
- people, staff and technical service operators; and
- frozen semen and embryos.

Although the spread of infection from the AB centres via vehicles, waste, liquid nitrogen tanks, liquid nitrogen, biological specimens to laboratories, dead animals, AI and ET equipment, is possible, it is considered unlikely providing reasonable precautions are taken.

On the declaration of an AB centre as an infected or dangerous contact premises, the records of the operations or services of the AB centre in the last 30 days would be processed, recorded and passed to the LDCC (see Section 2.7).

The LDCC should also be advised in detail of the removal of:

- dead animals;
- manure, feed or bedding waste;
- biological samples;
- soil; and
- building material, that has been transferred or removed from the AB centre during the last 30 days.

4.6 Proof of freedom of disease

The declaration by the CVO that an infected AB centre premises is free of disease and can resume normal operations and services, or that the centre is now considered free of contamination and that animals can be re-admitted is based on the AUSVETPLAN **Disease Strategy** for each individual disease.

4.7 Media and public relations

Maintaining an appropriate channel of communication with the media during an emergency disease outbreak is an important function of the local disease control centre LDCC. This would be made very difficult if other information comes from elsewhere that conflicts with advice given by the LDCC. The AB centre will need to advise clients of the situation, as it affects their provision of services. Public relations information given to the media by AB centres should be restricted to that directly relating to the centre. General inquiries about the particular disease or the control activities that are being undertaken in the area should be directed to the LDCC.

APPENDIX 1 List of AUSVETPLAN diseases

African horse sickness
African swine fever
Aujeszky's disease
Avian influenza
Bluetongue
Bovine spongiform encephalopathy (BSE)
Classical swine fever (hog cholera*)
Equine influenza
Foot-and-mouth disease
Japanese encephalitis
Lumpy skin disease
Newcastle disease
Peste des petits ruminants
Rabies
Rift Valley fever
Rinderpest
Scrapie
Screw-worm fly
Sheep and goat pox
Swine vesicular disease
Transmissible gastroenteritis
Vesicular exanthema
Vesicular stomatitis
Bee diseases:
Braula fly (*Braula coeca*)
tracheal mite (*Acarapis woodi*)
tropilaelaps mite (*Tropilaelaps clarae*)
Varroa mite (*Varroa jacobsoni*)

* this term is not used in AUSVETPLAN

APPENDIX 2 Code of work practice

(A) AB centre staff

Code of practice to be observed by AB centre staff in a restricted or control area during an outbreak of an emergency disease:

- maintain accurate records of all animals, semen and embryos received, collected, processed, transferred, dispatched and inseminated and all farm visits;
- observe and maintain high standards of personal cleanliness and hygiene;
- decontaminate of vehicles, equipment, clothing, footwear and persons both on entering and leaving the AB centre;
- do not permit entry of staff residing on a farm with livestock to the AB centre in a restricted area during the disease declaration;
- AB centre staff should not move from a control to a restricted area unless they intend to remain located in the restricted area;
- defined roles and locations to designated staff within the AB centre, ie animal attendant, or laboratory technician to observe strict limitations on all movement outside their respective areas;
- do not introduce pets, animal products, feeds, waste products, equipment or such items into the AB centre unless approved by the director or the LDCC.

(B) AI technicians

Code of practice to be observed by AI technicians in a restricted or control area during an outbreak of an emergency disease:

- maintain accurate records of all semen and embryos received, dispatched and inseminated, and all farm visits;
- observe and maintain high standards of personal cleanliness and hygiene;
- decontaminate vehicles, equipment, clothing, footwear and persons both on entering and leaving an AB centre, distribution facility, AB subcentre or farm;
- use disposable equipment where possible (soiled disposables to be appropriately disposed of on the farm before leaving);
- do not permit any AI inseminator residing on a farm with livestock to continue to operate an on-farm AI service within a restricted area;
- do not permit dispatch of semen, permitted embryos, equipment, liquid nitrogen tanks or supplies from the restricted area unless to other locations within the restricted area;
- do not permit entry to an AB centre's quarantine facility that maintains animals;
- identify and isolate all semen and embryos received from an infected premises, along with such semen or embryos in direct contact with these items within the last 30 days and in consultation with the LDCC arrange for this tank to be sealed pending possible destruction;

- within a restricted area, all non-disposable AI equipment and liquid nitrogen transport tanks must be emptied, washed, disinfected and sterilised following an on-farm visit.

(C) On-farm semen and embryo transfer veterinarians and technicians

Code of practice to be observed by semen and ET veterinarians and technicians in a restricted or control area during an outbreak of an emergency disease:

- maintain accurate records of all animals, semen and embryos received, collected, processed, transferred, dispatched and inseminated. Licensed frozen semen or embryos held on the farm in isolation can be transferred to other facilities within the restricted area;
- observe and maintain high standards of personal cleanliness and hygiene;
- decontaminate vehicles, equipment, clothing, footwear, and persons both on entering and leaving a farm or centre;
- transfer or inseminate into animals on the farm, or else store on the farm of collection, all semen or embryos collected on that farm; no transfer of semen or embryos is allowed;
- restrict veterinarians and technicians working on farms from access to AB centres;
- use disposable equipment where possible (soiled disposables to be disposed of on the farm before leaving);
- empty, wash, disinfect and sterilise, all non-disposable AI equipment and liquid nitrogen tanks must be emptied, washed, disinfected and sterilised following an on-farm visit within a restricted area;
- dispose of media, biological products and partially-used drugs on the farm;
- do not allow movement from the restricted area to occur; entry from the control area is open, but re-entry from the restricted area is prohibited;
- restrict service operations to a minimal and limit non-essential visits to farms within the restricted area.

APPENDIX 3 Personal decontamination

The following is provided as information specific for an artificial breeding operation. General material is contained in the **Decontamination Manual, Section 4.1**.

The aim of personal decontamination is to safely remove any contamination of the body or items of clothing.

The process ensures that there is no risk of cross-contamination in the clean state and that any person can then leave from a contaminated environment confident that there will be no spread of the infective disease organism.

Personal decontamination site

The personal decontamination site must:

- be located at the exit, or entry point of a facility;
- be located on the boundary of an area that can be easily and safely disinfected;
- have an impervious surface and include a building with water and drainage supply; the building should not have been used by animals or be contaminated.
- be sprayed with a disinfectant applicable to the disease, see **Decontamination Manual, Tables 2.1 - 2.15**.

If no hard standing area is available, a plastic ground cover 10 metres x 10 metres can be used. Hessian sacking and star pickets around the area can be used to maintain privacy for changing.

Drainage: water runoff from the contaminated area must not flow to the clean area (where drainage is inadequate, a ground pit is required to store drainage waste).

Clothing: each person needs a change of clean clothes or overalls held in plastic bags at the site.

Equipment: a number of heavy gauge plastic garbage bags and buckets of the approved disinfectant.

Procedure

- wash or sponge hair with proprietary shampoo;
- decontaminate disposable gloves before discarding; reusable gloves to be decontaminated before reusing;
- wash and scrub hands in warm soapy water;
- wash plastic overalls and place into a disinfectant bucket; cotton overalls and contaminated underwear are removed into disinfectant;
- clean, scrub and remove boots after walking over to the clean area through a footbath;
- remove clothing for disposal (or not for reuse the next day) from the disinfectant and place in sealed plastic bags, which are then disinfected;
- wash body in clean, warm soapy water;
- change into clean overalls or clothes and shoes and leave the premises directly;
- on returning home, have a long hot bath or shower;

People should not have contact with susceptible animals for a period of three days after leaving the property.

Disinfectants

The recommended base range of disinfectants include:

- formalin 8%
- sodium hydroxide 2%
- citric acid 0.2%
- Virkon® 2%

AB centres are advised to maintain a supply of the following disinfectants:

- *citric acid* — used for personal decontamination, and for clothing;
- *sodium hydroxide* — for decontaminating animal housing, yards, drains, effluent waste pits and sewage collection areas;
- *formalin* — for the sterilisation of semen, embryos, media, partially-used drugs and drenches, etc
 - for footbaths on the entry or exit of the AB centre or quarantine animal housing areas,
 - for vehicle tyre baths before entry to AB centre; and
- *Virkon®* — used for washing and sterilising liquid nitrogen containers and crates.

GLOSSARY

Agent	see Disease agent.
Animal products	Meat products and products of animal origin (eg eggs, milk) for human consumption or for use in animal feeding.
Animal by-products	Products of animal origin destined for industrial use, eg raw hides and skins, fur, wool, hair, feathers, hooves, bones, fertiliser.
ANEMIS	<i>Animal Health Emergency Information System</i> . A system for the collection, assimilation, actioning and dissemination of essential disease control information using paper documentation and a computer database.
AUSVETPLAN	A series of documents that describes the Australian response to emergency animal diseases; linking policy, strategies, operations, coordination and emergency management plans.
Chief veterinary officer	The senior veterinarian of each State or Territory animal health authority who has responsibility for emergency animal disease control in that State or Territory.
Chief Veterinary Officer of Australia	The nominated senior Commonwealth veterinarian in the Department of Primary Industries and Energy who manages Australia's international animal health commitments and the Commonwealth's response to an emergency animal disease incursion.
Consultative Committee on Emergency Animal Diseases	A committee of Commonwealth and State/Territory CVOs and CSIRO/AAHL, chaired by the Australian CVO (Cwlth), to consult in emergencies due to the introduction of an emergency disease of livestock, or serious epizootics of Australian origin.
Control area	An area bigger than a restricted area (possibly initially as big as the State) where restrictions will reduce the chance of the disease spreading further afield. The control area may reduce in size as confidence about the extent of the outbreak becomes clearer but must remain consistent with OIE codes. In principle, animals and specified product will only be able to be moved out of the control area into the free area by permit.
Cost-sharing agreement	Commonwealth/States cost-sharing agreement for the eradication of certain emergency animal diseases.
Dangerous contact animal	An animal showing no clinical signs of disease but which, by reason of its probable exposure to disease, will be subjected to disease control measures.
Dangerous contact premises	Premises that contains a dangerous contact animal(s).

Decontamination	Includes all stages of cleaning and disinfection.
Declared area	A defined tract of land for the time being subject to disease control restrictions under emergency disease legislation. Types of declared areas include <i>restricted area</i> ; <i>control area</i> ; <i>infected premises</i> ; and <i>dangerous contact premises</i>
Disease agent	The pathogen, such as a virus that causes disease in the host.
Disinfection	The process of destroying infectious agents.
Disposal	Sanitary removal of animal carcasses and things by burial, burning or some other process so as to prevent the spread of disease.
Enterprise	<i>see</i> Risk enterprise.
Emergency animal disease	Includes exotic animal diseases and endemic diseases that warrant a national emergency response
Exotic animal disease	A disease affecting animals that does not normally occur in Australia. Also called foreign animal disease.
Forward command post	A field operations centre, subsidiary to a local disease control centre.
Infected premises	A defined area (which may be all or part of a property) in which an emergency disease or agent exists, or is believed to exist.
Job card	A written list of tasks to be carried out by an individual in the early stages of an emergency response.
Local disease control centre	An emergency operations centre responsible for the command and control of field operations in a defined area.
Movement control	Restrictions placed on movement of animals, people and things to prevent spread of disease.
National disease control headquarters	A centre established in Canberra from which national disease control actions are coordinated in an emergency animal disease emergency.
Phases of activation and deactivation	<i>see</i> Stages of activation.
Quarantine	Legal restrictions imposed on a place, animal, vehicle or other things limiting movement.
Rehabilitation	Process of adjustment to circumstances prevailing in the aftermath of an emergency disease outbreak.
Restricted area	A relatively small declared area (compared to a <i>control area</i>) around an infected premises that is subject to intense surveillance and movement controls. Movement out of the area will in general be prohibited, while movement into the restricted area would only be by permit. Multiple <i>restricted areas</i> may exist within one <i>control area</i> .
Ring vaccination	Vaccination of susceptible animals around a focus of infection to provide a buffer against the spread of disease.

Risk enterprise	Livestock-related enterprise with a high potential for disease spread or economic loss.
Role description	Statement of functions of a position within the overall operation.
Salvage	Recovery of some (but not full) market value by treatment and use of products, according to disease circumstances.
Sentinel animals	Animals of known health status monitored for the purpose of detecting the presence of a specific emergency disease agent.
Stages of activation and deactivation	Investigation, alert, operational, stand-down.
– investigation	exists when a report assessed of a possible emergency disease is being investigated by animal health authorities.
– alert	exists when a high probability that an emergency disease is present or is confirmed in another State.
– operational	when the CVO determines that an animal disease emergency exists in the State, and operations to contain control or eradicate the disease are implemented.
– stand-down	when the CVO determines that an animal disease emergency no longer exists and operations are wound down.
Stamping out	Eradication procedures based on quarantine and slaughter of all infected animals and animals exposed to infection.
State/Territory disease control headquarters	The emergency operations centre that directs the disease control operations to be undertaken in the State.
Surveillance	A systematic examination and testing of animals or things of unknown disease status to determine the presence or absence of an emergency disease.
Susceptible animals	Animals that can be infected with the 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, are warranted; OR an animal not known to have been exposed to a disease agent but showing clinical signs requiring differential diagnosis.
Suspect material or things	Materials or things suspected of being contaminated by an emergency disease agent.
Suspect premises	Premises containing suspect animals that will be subject to surveillance.
Swill	Food scraps of placental mammal origin that have not been obtained from approved slaughter facilities or treated by an approved process.
Swill feeding	Swill feeding is the feeding of swill to pigs; unlicensed swill feeding is illegal in Australia.

Tracing	The process of locating animals, persons or things that may be implicated in the spread of disease.
Vector	A living organism (frequently an arthropod) that transmits an infectious agent from one host to another. A <i>biological</i> vector is one in which the infectious agent must develop or multiply before becoming infective to a recipient host. A <i>mechanical</i> vector is one that transmits an infectious agent from one host to another but is not essential to the life cycle of the agent.
Vector control area	An area in which containment, control or reduction of specified vector populations is conducted.
Zona pellucida	A thick transparent membrane surrounding the fully formed ovum in a Graafian follicle.
Zoning	The process of defining disease-free and infected zones in accord with OIE guidelines and surveillance, in order to facilitate trade.
Zoonosis	Disease of animals which may be transmitted to humans.

Abbreviations

AAHL	Australian Animal Health Laboratory (CSIRO), Geelong Victoria
AB	Artificial breeding
AFFA	Department of Agriculture Fisheries and Forestry – Australia
AI	Artificial insemination
ANEMIS	Animal Health <i>Emergency Information System</i>
AQIS	Australian Quarantine and Inspection Service
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AUSVETPLAN	Australian Veterinary Emergency Plan
BSE	Bovine spongiform encephalopathy
CA	Control area
CCEAD	Consultative Committee on Emergency Animal Diseases
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CVO	Chief veterinary officer
DCP	Dangerous contact premises
ET	Embryo transfer
IETS	International Embryo Transfer Society
IP	Infected premises
LDCC	Local disease control centre
OIE	Office International des Epizooties (World Organisation for Animal Health)
RA	Restricted area
SP	Suspect premises

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Training resources

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

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Enterprises looking to quickly build an enterprise AI capability may be seduced by the shortcut of hiring a number of ML and/or deep learning PhDs to staff a center of excellence. Taking that approach, however, will just yield overwhelmed and ineffective experts. The figure below from Microsoft illustrates some quotes when that approach is taken. This section uses a case study format to explore how five large enterprises applied Artificial Intelligence technologies in varied problem domains. The case studies discuss the challenges they faced, the decisions they made, the capabilities that they built and the lessons that they learned. The five sections cover