AUSTRALIAN VETERINARY EMERGENCY PLAN

AUSVETPLAN

2000

Operational Procedures Manual

Decontamination

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

Agriculture and Resource Management Council of Australia and New Zealand

This Operational Procedures Manual forms part of:

AUSVETPLAN Edition 2.0, 1996

[AUSVETPLAN Edition 1.0, was published in 1991]

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

Record of amendments to this manual:

Version 2.1, published May 2000, updates Appendix 2 'Suppliers and Distributors of Disinfectants'

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PREFACE

This **Operational Procedures Manual** for **decontamination** is an integral part of the Australian Veterinary Emergency Plan, AUSVETPLAN (Edition 2.0). AUSVETPLAN structures and functions are described in the **Summary Document**.

This manual sets out the disease control procedures which were approved in February 1991 by the then Australian Agricultural Council out-of-session at meeting 135 for use in an animal health emergency in Australia. The information has been updated and approved by the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) out-of-session in January 1996.

Detailed information on each of the exotic diseases covered by AUSVETPLAN is set out in the individual **Disease Strategies,** which give specific decontamination requirements. This manual details decontamination procedures to be carried out in the field. The structures and procedures for managing decontamination operations are set out in the **Control Centres Management Manual**.

Cross reference to strategies, manuals and other AUSVETPLAN documents are expressed in the form:

Document Name, Section no.
For example, **Public Relations Manual, Section 3**

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

The manual will be reviewed regularly. Suggestions and recommendations for amendments should be forwarded to:

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

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1 INTRODUCTION

Decontamination is the combination of physical and chemical processes that kills or removes pathogenic microorganisms and is vital for disease eradication. Thorough decontamination involves *close cooperation* between property owners and all personnel involved in the cleaning and disinfection procedures, but it will reduce the period between slaughter and restocking on contaminated and affected properties.

This manual provides guidelines for the decontamination of premises where animals infected with an exotic disease agent have been held. Most of the exotic diseases covered by AUSVETPLAN are viral diseases, which is reflected in the recommendations provided in this manual. Twelve of the exotic diseases form the basis of the current Commonwealth/States cost-sharing agreement for the eradication of certain exotic diseases. These are foot-and-mouth disease; rinderpest; vesicular stomatitis; swine vesicular disease; vesicular exanthema; classical swine fever; African swine fever; bluetongue; rabies; screw-worm fly; virulent avian influenza and virulent Newcastle disease.

Identification of the disease agent is fundamental for designing an appropriate decontamination strategy. A sound understanding of the agent's biological properties and how the disease spreads can then form the basis for strategic planning. Importance is placed on the adoption of the basic microbiological principles of isolation of the source of infection and decontamination of personnel, equipment, vehicles and sites. Personal decontamination procedures, when properly carried out, permit the safe movement of personnel from property to property in the extensive surveillance activities which form a large and vital part of any eradication campaign. Preliminary cleaning is invariably needed before any chemical disinfectants are used and this aspect cannot be overemphasised. Mechanical brushing of surfaces with a detergent solution is highly effective in removing contaminating viruses and is fundamental for achieving subsequent effective chemical decontamination. **Procedures described may appear simple and tedious, however, persistence and attention to detail is vital for successful elimination of the disease agent.**

This manual concentrates on a relatively narrow range of disinfectants and other chemicals fitting into six general groups:

(1) soaps and detergents

(2) oxidising agents

(3) alkalis

(4) acids

(5) aldehydes

(6) insecticides

All the above disinfectants are effective against a broad range of viruses. Consequently, disinfectants are recommended that are generally available in large quantities in all parts of Australia.

Note: Common chemical names are used because they are easily understood by all personnel with basic scientific knowledge. Clear instructions are given for the dilution and application of these disinfectants (see Table 4).

How to use the manual

This manual has a series of simple tables that clearly and simply set out information on cleaning, disinfection and safety precautions regarding exotic animal disease agents.

- to check the best type of disinfectant for each virus see **Tables 1 and 4** ..... pp 4, 50
- to check the best type of disinfectant to use on a variety of objects for each disease see **Table 2** ..... pp 7
- to understand the disease you are facing see **Figure 1** ..... pp 43
- to understand the decontamination principles for each disease see **Table 3** ..... pp 23
- to check the concentration and dilution of disinfectants see **Table 4** ..... pp 50
- to check safety concerns see **Table 5**..... pp53
- to read about decontamination principles see **Sections 4 and 5**

2 KNOW THE ENEMY – the exotic disease agent

In order to eliminate disease viruses/agents from clothing, vehicles, tools, carcases or the environment, there must be a good understanding of the general properties of each infectious agent and the subtle ways each may persist in the environment and infect other animals. The following tables and graphs quickly show the individual characteristics of each disease.

The set of tables and figures presented in this section categorise the viruses and agents according to their physical characteristics to show clearly which disinfectant is best used for inactivation.

2.1 Disinfectant susceptibilities of exotic viruses

The viruses/disease agents responsible for exotic diseases can be categorised according to their size and whether or not they contain lipid. On this basis three categories of viruses can be identified as follows:

- *Category A* Lipid-containing viruses; intermediate to large size
- *Category B* No lipid in virus; small size
- *Category C* No lipid in virus; intermediate size

Table 1 shows the virus families, species affected, main mode of transmission and category of the infective agents in the exotic animal diseases covered by AUSVETPLAN and a number of other diseases that are also considered important in the context of Australian primary industry.

Table 1 Disinfectant susceptibilities of exotic viruses

Virus family	Structure[1]	Diseases	Species affected	Trans-mission	Category of virus[2]
Birnaviridae	Medium-sized, dsRNA; non-enveloped	Infectious pancreatic necrosis	Fish	Ingestion	C
Bunyaviridae	Moderate sized, ssRNA, enveloped	Rift Valley fever[3]	Ruminants, humans, dogs	Insect vectors	A
		Nairobi sheep disease	Sheep, goats	Insect vectors	
Caliciviridae	Small-sized, ssRNA, non-enveloped	Vesicular exanthema	Swine	Ingestion	B
		San Miguel sealion virus	Marine mammals		
		Rabbit haemorr-hagic disease	Rabbits		
Coronaviridae	Medium sized, ssRNA, enveloped	Transmissible gastroenteritis	Swine	Ingestion, contact	A
Flaviviridae	Moderate sized, ssRNA, enveloped.	Wesselsbron disease	Ruminants	Insect vectors	A
		Japanese encephalitis	Swine, humans		
Herpesviridae	Large sized, dsDNA, enveloped	Aujeszky's disease	Swine	Contact, ingestion	A
		Equine herpesvirus	Equidae	Aerosols, contact venereal	
		Duck plague	Ducks, geese, swans	Contact, ingestion	
Iridoviridae	Large sized, dsDNA, non-enveloped.	African swine fever	Swine	Ingestion, contact, ticks (*Ornitho-dorus*)	A
Orthomyxoviridae	Medium sized, ssRNA enveloped	Avian influenza	Avian species	Aerosols, ingestion	A
		Equine influenza	Equidae	Aerosols, ingestion	
		Swine influenza	Swine	Aerosols, ingestion	

Virus family	Structure[1]	Diseases	Species affected	Trans-mission	Category of virus[2]
Paramyxoviridae	Medium sized, ssRNA, enveloped	Newcastle disease	Avian species	Aerosols, ingestion	A
		Rinderpest	Ruminants, cattle	Aerosols, ingestion	
		Peste des petits ruminants	Small ruminant		
Picornaviridae	Small sized, ssRNA, non-enveloped	Foot-and-mouth disease[3]	Ruminants, swine	Aerosols, ingestion	B
		Swine vesicular disease	Swine	Aerosols, ingestion	
		Duck virus hepatitis	Ducks	Aerosols, ingestion	
Poxviridae	Large sized, dsDNA, non-enveloped	Sheep/goat pox	Sheep and goats	Contact, insect vectors	A
		Lumpy skin disease	Cattle		
Reoviridae	Medium sized, dsRNA, non-enveloped	African horse sickness[3]	Equidae, dogs	Insect vectors	C
		Bluetongue	Ruminants		
		Epizootic haemorrhagic disease	Deer		
Retroviridae	Medium sized, ssRNA, enveloped	Maedi visna	Sheep, goats	Contact	A
		Pulmonary adenomatosis	Sheep, goats	Contact	
Rhabdoviridae	Medium sized, ssRNA, enveloped	Rabies, rabies-like viruses	All species	Infected animals	A
		Infectious haemopoetic necrosis	Fish	Vertical and gill pouches	
		Vesicular stomatitis	Ruminants, horses, swine humans	Insect vectors	

Virus family	Structure[1]	Diseases	Species affected	Trans-mission	Category of virus[2]
Prions	Non-viral – special definitions apply.	Scrapie	Sheep, goats	Contact (prenatal/perinatal)	Special inactivation necessary[4]
		Bovine spongiform encephalopathy	Cattle	Ingestion	
Togaviridae	Medium sized, ssRNA, enveloped	Eastern, Western and Venezuelan equine viral encephalitis	Equidae, humans	Insect, humans	A
		Classical swine fever	Swine, ruminants	Contact, ingestion	
		Equine viral arteritis	Equidae	Insect vectors	
		Porcine respiratory and reproductive syndrome	Swine	Contact, aerosols	

KEY

1 ds = double stranded; ss = single stranded

2 Category A–best disinfectants are detergents, hyphochlorites, alkalis, Virkon®, glutaraldehyde

Category B–best disinfectants are hypochlorites, alkalis, Virkon®, glutaraldehyde;

Acids effective for foot-and-mouth disease virus

Classical bactericides like quaternary ammonium compounds and phenolics are not effective against these viruses

Category C–these viruses fall between Categories A and B in sensitivity to the best disinfectants such as hypochlorites, alkalis, Virkon®, glutaraldehyde

3 ACIDIC disinfectants have traditionally been used for these pathogens.

4 See the **Laboratory Preparedness Manual, Appendix 7**

Note: Details of concentrations and applications of specific disinfectants are found in Table 4.

2.2 Disinfectant/chemical selections for particular viruses

Table 2 (2.1–2.15) shows how to select a disinfectant/chemical to disinfect a range of commonly contaminated items for each disease or group of diseases. The list of disinfectant groups has been kept as short and as simple as possible. All disinfectants in this table are available in Australia. Where a common decontamination/disinfection strategy is recommended, diseases are grouped. Each disinfectant table gives a list of items that could be contaminated during a disease outbreak and then lists the best disinfectants or procedures to be used on each item. The list aims to give the operator more than one choice of disinfectant. A key to the disinfectants is given with each section of the table for ease of reference.

There are five groups of disinfectants **(soaps and detergents, oxidising agents, alkalis, acids and aldehydes)**. These are explained in more detail in Section 3. The sixth group (Insecticides) only applies to diseases that are insect-vector borne.

A key to the recommended disinfectants/chemicals is shown under each section of Table 2. Diseases with similar disinfection procedures are grouped together (eg African swine fever and classical swine fever [2.2]).

Table 2.1 Disinfectant/chemical selections and procedures — African horse sickness

Category C virus

Item to be disinfected	Disinfectant/chemical/procedure
Live animals	Euthanase if moribund, vaccinate with insect control
Carcases	Bury or render, not for petfood
Animal housing/equipment	2, 4 and 6a or 6b for insect control
Environs	2, 4 and 6a or 6b for insect control
Humans	2c
Electrical equipment	5
Water –tanks, dams	decrease vector insect habitat
Feed	Bury only if contaminated with blood
Effluent, manure	Insect control 6a or 6b
Human housing	2, 4 if necessary
Machinery, vehicles	2, 4 if necessary
Clothing	2
Aircraft	2, 4

N/A = not applicable

KEY

1	**Soaps and detergents**	
2	**Oxidising agents:**	
	a. Sodium hypochlorite	
	b. Calcium hypochlorite	
	c. Virkon®	
3	**Alkalis:**	
	a. Sodium hydroxide (caustic soda)(NaOH);	Do not use with aluminium and like alloys
	b. Sodium carbonate anhydrous (Na_2CO_3) washing soda ($Na_2CO_3.10H_20$)	
4	**Acids:**	
	a. Hydrochloric acid	
	b. Citric acid	
5	**Aldehydes:**	
	a. Glutaraldehyde	Glutaraldehyde is not too corrosive on metals but must not be used on humans and animals
	b. Formalin	
	c. Formaldehyde gas	Gaseous formaldehyde is dangerous and subject to error; it should only be used by experienced personnel and in controlled conditions
6	**Insecticides:**	
	a. Organophosphates	
	b. Synthetic pyrethroids	
	c. Ivermectin	
	d. Phostoxin	

Table 2.2 Disinfectant/chemical selections and procedures — African swine fever and classical swine fever

Category A viruses

Item to be disinfected	Disinfectant/chemical/procedure
Live animals	Euthanase
Carcases	Bury or burn
Animal housing/equipment	1, 2a, 2b or 2c, 3
Environs	Consider 6a or 6b for tick eradication, otherwise N/A
Humans	1
Electrical equipment	5c
Water –tanks –dams	 Drain N/A
Feed	Bury or burn
Effluent, manure	Bury or burn, 4, 3
Human housing	1, 2a, 2b, or 2c
Machinery	1, 3
Vehicles	1, 3
Clothing	1, 2a, 2b or 2c, 3
Aircraft	1, 2c

N/A = not applicable

KEY

1 Soaps and detergents

2 Oxidising agents:
- **a**. Sodium hypochlorite
- **b**. Calcium hypochlorite
- **c**. Virkon®

3 Alkalis:
- **a**. Sodium hydroxide (caustic soda)(NaOH); — Do not use with aluminium and like alloys
- **b**. Sodium carbonate anhydrous (Na_2CO_3) washing soda ($Na_2CO_3.10H_20$)

4 Acids:
- **a**. Hydrochloric acid
- **b**. Citric acid

5 Aldehydes:
- **a**. Glutaraldehyde — Glutaraldehyde is not too corrosive on metals but must not be used on humans and animals
- **b**. Formalin
- **c**. Formaldehyde gas — Gaseous formaldehyde is dangerous and subject to error; it should only be used by experienced personnel and in controlled conditions

6 Insecticides:
- **a**. Organophosphates
- **b**. Synthetic pyrethroids
- **c**. Ivermectin
- **d**. Phostoxin

Table 2.3 Disinfectant/chemical selections and procedures — Aujeszky's disease

Category A virus

Item to be disinfected	Disinfectant/chemical/procedure
Live animals	Quarantine then depopulation options
Carcases	Bury or process
Animal housing/equipment	1 (to clean) followed by 2 or 3
Environs	1, 2 or 3
Humans	1, 2c, or 3b
Electrical equipment	5
Water –tanks, dams	2, 3
Feed	Bury or burn if contaminated
Effluent	Quarantine > 3 days
Manure	Bury
Human housing	1, 2 or 3
Machinery, vehicles	1, 2 or 3
Clothing	1, 2 or 3
Aircraft	1, 2 or mild 3

N/A = not applicable

KEY

1 Soaps and detergents

2 Oxidising agents:
a. Sodium hypochlorite
b. Calcium hypochlorite
c. Virkon®

3 Alkalis:
a. Sodium hydroxide (caustic soda)(NaOH); — Do not use with aluminium and like alloys
b. Sodium carbonate anhydrous (Na_2CO_3) washing soda ($Na_2CO_3.10H_20$)

4 Acids:
a. Hydrochloric acid
b. Citric acid

5 Aldehydes:
a. Glutaraldehyde — Glutaraldehyde is not too corrosive on metals but must not be used on humans and animals
b. Formalin
c. Formaldehyde gas — Gaseous formaldehyde is dangerous and subject to error; it should only be used by experienced personnel and in controlled conditions

Table 2.4 Disinfectant/chemical selections and procedures — Avian influenza and Newcastle disease

Category A viruses

Item to be disinfected	Disinfectant/chemical/procedure
Live birds	Euthanase
Carcases	Bury or burn
Animal housing/equipment	1, 2a, 2b, 2c, 3
Environs	N/A
Humans	1
Electrical equipment	5c
Water –tanks –dams	 Drain to pasture where possible Drain to pasture if practicable, otherwise N/A.
Feed	Bury.
Effluent, manure	Bury or burn, 4, 3
Human housing	1, 2a, 2b, 2c
Machinery, vehicles	1, 3
Clothing	1, 2a, 2b, 2c, 3
Aircraft	1, 2c

N/A = not applicable

KEY

1 Soaps and detergents

2 Oxidising agents:
a. Sodium hypochlorite
b. Calcium hypochlorite
c. Virkon®

3 Alkalis:
a. Sodium hydroxide (caustic soda)(NaOH); — Do not use with aluminium and like alloys
b. Sodium carbonate anhydrous (Na_2CO_3) washing soda ($Na_2CO_3.10H_20$)

4 Acids:
a. Hydrochloric acid
b. Citric acid

5 Aldehydes:
a. Glutaraldehyde — Glutaraldehyde is not too corrosive on metals but must not be used on humans and animals
b. Formalin
c. Formaldehyde gas — Gaseous formaldehyde is dangerous and subject to error; it should only be used by experienced personnel and in controlled conditions

Table 2.5 Disinfectant/chemical selections and procedures — bluetongue

Category C virus

Item to be disinfected	Disinfectant/chemical/procedure
Live animals	See the **Bluetongue Disease Strategy**
Carcases	Bury or burn normally, but this has no effect on virus spread
Animal housing/equipment	6a, 6b if insect knockdown warranted
Environs	Decrease vector insect habitats
Humans	1
Electrical equipment	N/A
Water –tanks, dams	Decrease vector insect habitats
Feed	N/A
Effluent, manure	Bury or 6a or 6b to prevent insect breeding
Human housing	N/A
Machinery	N/A
Vehicles, aircraft	6a or 6b for aircraft disinsection if necessary
Clothing	1

N/A = not applicable

KEY

1 Soaps and detergents

2 Oxidising agents:
- **a**. Sodium hypochlorite
- **b**. Calcium hypochlorite
- **c**. Virkon®

3 Alkalis:
- **a**. Sodium hydroxide (caustic soda)(NaOH); — Do not use with aluminium and like alloys
- **b**. Sodium carbonate anhydrous (Na_2CO_3) washing soda ($Na_2CO_3.10H_20$)

4 Acids:
- **a**. Hydrochloric acid
- **b**. Citric acid

5 Aldehydes:
- **a**. Glutaraldehyde — Glutaraldehyde is not too corrosive on metals but must not be used on humans and animals
- **b**. Formalin
- **c**. Formaldehyde gas — Gaseous formaldehyde is dangerous and subject to error; it should only be used by experienced personnel and in controlled conditions

6 Insecticides:
- **a**. Organophosphates
- **b**. Synthetic pyrethroids
- **c**. Ivermectin
- **d**. Phostoxin

Table 2.6 Disinfectant/chemical selections and procedures — BSE and scrapie
Non-viral disease agent — prions; special inactivation necessary (see **Laboratory Preparedness Manual, Appendix 7 and Table 1**)

Item to be disinfected	Disinfectant/chemical/procedure
Live animals	Quarantine then euthanase according to disease strategy
Carcases	Bury with care or burn
Animal housing/equipment	Bury or burn all contaminating birth materials, manure or carcases. 1 then 2a
Humans	See the **BSE or Scrapie Disease Strategies - Section 2.2.8**
Electrical equipment	N/A
Water –tanks, dams	N/A
Feed	Bury, burn only if contaminated with birth material, manure or carcases
Effluent, manure	Bury/burn
Human housing	1 then 2a
Machinery, vehicles	2a
Clothing	Burn if heavily contaminated
Aircraft	Clean plane with 1 but follow up with corrosive disinfectants is inappropriate for aircraft.

N/A = not applicable

KEY

1 Soaps and detergents

2 Oxidising agents:
- **a**. Sodium hypochlorite
- **b**. Calcium hypochlorite
- **c**. Virkon®

3 Alkalis:
- **a**. Sodium hydroxide (caustic soda)(NaOH); — Do not use with aluminium and like alloys
- **b**. Sodium carbonate anhydrous (Na_2CO_3) washing soda ($Na_2CO_3.10H_20$)

4 Acids:
- **a**. Hydrochloric acid
- **b**. Citric acid

5 Aldehydes:
- **a**. Glutaraldehyde — Glutaraldehyde is not too corrosive on metals but must not be used on humans and animals
- **b**. Formalin
- **c**. Formaldehyde gas — Gaseous formaldehyde is dangerous and subject to error; it should only be used by experienced personnel and in controlled conditions

Table 2.7 Disinfectant/chemical selections and procedures — equine influenza Category A virus

Item to be disinfected	Disinfectant/chemical/procedure
Live animals	Quarantine and vaccination
Carcases	Bury or knackery disposal
Animal housing/equipment	1, 2, 3 and 6a or 6b for insect control
Environs	1, 2, 3 and 6a or 6b for insect control
Humans	1, 2, 3
Electrical equipment	5 if necessary
Water –tanks, dams	N/A
Feed	Bury only if heavily contaminated
Effluent, manure	6a or 6b for insect control
Human housing	Unnecessary
Machinery, vehicles	1, 2, 3
Clothing	1, 2
Aircraft	1, 2 or mild 3

N/A = not applicable

KEY

1 Soaps and detergents

2 Oxidising agents:
- **a**. Sodium hypochlorite
- **b**. Calcium hypochlorite
- **c**. Virkon®

3 Alkalis:
- **a**. Sodium hydroxide (caustic soda)(NaOH); — Do not use with aluminium and like alloys
- **b**. Sodium carbonate anhydrous (Na_2CO_3) washing soda ($Na_2CO_3.10H_20$)

4 Acids:
- **a**. Hydrochloric acid
- **b**. Citric acid

5 Aldehydes:
- **a**. Glutaraldehyde — Glutaraldehyde is not too corrosive on metals but must not be used on humans and animals
- **b**. Formalin
- **c**. Formaldehyde gas — Gaseous formaldehyde is dangerous and subject to error; it should only be used by experienced personnel and in controlled conditions

6 Insecticides:
- **a**. Organophosphates
- **b**. Synthetic pyrethroids
- **c**. Ivermectin
- **d**. Phostoxin

Table 2.8 Disinfectant/chemical selections and procedures — Foot-and-mouth disease, swine vesicular disease and vesicular exanthema

All of these vesicular diseases are **Category B viruses**.

Item to be disinfected	Disinfectant/chemical/procedure[1]
Live animals	Euthanase
Carcases	Bury or burn, 3, 4
Animal housing/equipment	2, 3
Environs	3
Humans	1, 4b
Electrical equipment	5c
Water –tanks, dams	3
Feed	Bury or 5b
Effluent, manure	Bury or 4
Human housing	2, 4b
Machinery	2c, 3, 4
Vehicles	2c, 3, 4
Clothing	2, 2c, 3, 4b
Aircraft	2c

1 = Acids are usually preferred for FMDV

KEY

1 Soaps and detergents:

2 Oxidising agents:
- **a**. Sodium hypochlorite
- **b**. Calcium hypochlorite
- **c**. Virkon

3 Alkalis: Do not use with aluminium and like alloys
- **a**. Sodium hydroxide (caustic soda) (NaOH)
- **b**. Sodium carbonate
  - -anhydrous (Na_2CO_3)
  - -washing soda ($Na_2CO_3.10\ H_20$)

4 Acids:
- **a**. Hydrochloric acid
- **b**. Citric acid

5 Aldehydes:
- **a**. Glutaraldehyde — Glutaraldehyde is not too corrosive on metals but must not be used on humans and animals.
- **b**. Formalin
- **c**. Formaldehyde gas — Gaseous formaldehyde is dangerous and subject to error. It should only be used by experienced personnel and in controlled conditions.

Table 2.9 Disinfectant/chemical selections and procedures — lumpy skin and sheep and goat pox

Category A viruses

Item to be disinfected	Disinfectant/chemical/procedure
Live animals	Euthanase
Carcases	Bury or burn
Animal housing/equipment	1 (to clean) followed by 2, or 3 or 4b or 5
Environs	2 or 3 or 4b
Humans	1, 2, 3b or 4b
Electrical equipment	5c
Water –tanks, dams	Decrease vector insect habitat
Feed	Bury or burn
Effluent, manure	Bury and 6a or 6b for insect control
Human housing	1 followed by 2, 3 or 4b
Machinery, vehicles	1 followed by 2, 3 or 4b
Clothing	Destroy if not valuable, or 2, 3 or 4b
Aircraft	1 followed by 2 or mild 3, or 4b

N/A = not applicable

KEY

1 Soaps and detergents

2 Oxidising agents:
- **a**. Sodium hypochlorite
- **b**. Calcium hypochlorite
- **c**. Virkon®

3 Alkalis:
- **a**. Sodium hydroxide (caustic soda)(NaOH); — Do not use with aluminium and like alloys
- **b**. Sodium carbonate anhydrous (Na_2CO_3) washing soda ($Na_2CO_3.10H_20$)

4 Acids:
- **a**. Hydrochloric acid
- **b**. Citric acid

5 Aldehydes:
- **a**. Glutaraldehyde — Glutaraldehyde is not too corrosive on metals but must not be used on humans and animals
- **b**. Formalin
- **c**. Formaldehyde gas — Gaseous formaldehyde is dangerous and subject to error; it should only be used by experienced personnel and in controlled conditions

6 Insecticides:
- **a**. Organophosphates
- **b**. Synthetic pyrethroids
- **c**. Ivermectin
- **d**. Phostoxin

Table 2.10 Disinfectant/chemical selections and procedures — peste des petits ruminants and rinderpest

Category A viruses

Item to be disinfected	Disinfectant/chemical/procedure
Live animals	Euthanase
Carcases	Bury or burn
Animal housing/equipment	1 (to clean) followed by 2a, 2b, 2c or 3 if necessary
Environs	2 or 3
Humans	1, 2c or 4b
Electrical equipment	5c
Water – tanks, dams	Drain to pasture where possible
Feed	Bury contaminated feed
Effluent, manure	2, 3, 4 then bury
Human housing	1 (to clean) followed by 2a, 2b, 2c or 3 if necessary
Machinery, vehicles	1 (to clean) followed by 2a, 2b, 2c or 3 if necessary
Clothing	1 (to clean) followed by 2a, 2b, 2c or 3 if necessary
Aircraft	1 (to clean) followed by 2a, 2b, 2c or 3 if necessary

N/A = not applicable

KEY

1 Soaps and detergents

2 Oxidising agents:
- **a**. Sodium hypochlorite
- **b**. Calcium hypochlorite
- **c**. Virkon®

3 Alkalis:
- **a**. Sodium hydroxide (caustic soda)(NaOH); — Do not use with aluminium and like alloys
- **b**. Sodium carbonate anhydrous (Na_2CO_3) washing soda ($Na_2CO_3.10H_20$)

4 Acids:
- **a**. Hydrochloric acid
- **b**. Citric acid

5 Aldehydes:
- **a**. Glutaraldehyde — Glutaraldehyde is not too corrosive on metals but must not be used on humans and animals
- **b**. Formalin
- **c**. Formaldehyde gas — Gaseous formaldehyde is dangerous and subject to error; it should only be used by experienced personnel and in controlled conditions

Table 2.11 Disinfectant/chemical selections and procedures — rabies

Category A virus

Item to be disinfected	Disinfectant/chemical/procedure
Live animals	Destroy without, if possible, damaging head. Beware of being bitten.
Dead animals	Submit head to high security laboratory (AAHL) in an appropriate infectious goods container for confirmation of infection. Burn or bury the remainder of the carcase.
Animal housing/equipment	1 (to clean) followed by 2
Environs	N/A
Humans	Bites should be thoroughly washed with 1 then cleaned with a disinfectant suitable for human wounds, see **Rabies Disease Strategy Appendix 5**. The offending animal should be euthanased and the head sent for confirmation of infection. Unless the animal can be conclusively shown to be free from infection, a post-exposure course of human diploid cell vaccine (HDCV) and human immunoglobulin (RIGH) should be started.
Electrical equipment, machinery	N/A
Water – tanks, dams	N/A
Feed,	N/A
Effluent/manure	Burn or bury
Human housing, clothing	1 (to clean) followed by 2
Vehicles, aircraft	1 (to clean) followed by 2

N/A = not applicable

KEY

1 Soaps and detergents

2 Oxidising agents:
- **a**. Sodium hypochlorite
- **b**. Calcium hypochlorite
- **c**. Virkon®

3 Alkalis:
- **a**. Sodium hydroxide (caustic soda)(NaOH); — Do not use with aluminium and like alloys
- **b**. Sodium carbonate anhydrous (Na_2CO_3) washing soda ($Na_2CO_3.10H_20$)

4 Acids:
- **a**. Hydrochloric acid
- **b**. Citric acid

5 Aldehydes:
- **a**. Glutaraldehyde — Glutaraldehyde is not too corrosive on metals but must not be used on humans and animals
- **b**. Formalin
- **c**. Formaldehyde gas — Gaseous formaldehyde is dangerous and subject to error; it should only be used by experienced personnel and in controlled conditions

Table 2.12 Disinfectant/chemical selections and procedures — Rift Valley fever

Category A virus

Item to be disinfected	Disinfectant/chemical/procedure
Live animals	Quarantine, then decrease insect vectors 6a or 6b
Carcases	Bury or burn. Take extreme care and guard against blood splash, aerosols, fomites contacting humans
Animal housing/equipment	1 (to clean) followed by 2 or 4
Environs	2 or 4 and insect control 6a or 6b
Humans	2c or 4b
Electrical equipment	5 if necessary
Water –tanks, dams	Decrease vector insect habitat
Feed	Bury feed contaminated by blood, aerosols, fomites
Effluent/manure	Drain to pit/bury and 6a or 6b for insect control
Human housing, clothing	1 (to clean) followed by 2 or 4
Machinery, vehicles	1 (to clean) followed by 2 or 4
Aircraft	1 (to clean) followed by 2 or 4

KEY

1 Soaps and detergents

2 Oxidising agents:
- **a**. Sodium hypochlorite
- **b**. Calcium hypochlorite
- **c**. Virkon®

3 Alkalis:
- **a**. Sodium hydroxide (caustic soda)(NaOH); — Do not use with aluminium and like alloys
- **b**. Sodium carbonate anhydrous (Na_2CO_3) washing soda ($Na_2CO_3.10H_20$)

4 Acids:
- **a**. Hydrochloric acid
- **b**. Citric acid

5 Aldehydes:
- **a**. Glutaraldehyde — Glutaraldehyde is not too corrosive on metals but must not be used on humans and animals
- **b**. Formalin
- **c**. Formaldehyde gas — Gaseous formaldehyde is dangerous and subject to error; it should only be used by experienced personnel and in controlled conditions

6 Insecticides:
- **a**. Organophosphates
- **b**. Synthetic pyrethroids
- **c**. Ivermectin
- **d**. Phostoxin

Table 2.13 Disinfectant/chemical selections and procedures — screw-worm fly

The aim of disinsection/decontamination procedures is to prevent larvae developing to the third instar stage, leaving the host and pupating in the ground. The following table relates to handling of the first case(s), before spread.

Item to be disinfected	Disinfectant/chemical/procedure
Live animals	6c, 6a keep on concrete platform with 150 mm lip until wounds healed to prevent escape of mature larvae.
Carcases	Treat animals with 6a, 6b, or 6c **Do not bury untreated carcases**
Animal housing/equipment	Clean every 3 days and burn sweepings
Environs	N/A
Humans	Refer wounds to medical practitioner, otherwise N/A
Electrical equipment	N/A
Water – tanks, dams	N/A
Feed	N/A
Effluent, manure	Steam cleaning
Human housing, machinery, vehicles, aircraft	Spraying of vehicle with insecticide (see **Screw-worm fly Disease Strategy, Section 2.2.8**)
Clothing	Wash

N/A = not applicable

KEY

6 **Insecticides:**
a. Organophosphates
b. Synthetic pyrethroids
c. Ivermectin
d. Phostoxin

Table 2.14 Disinfectant/chemical selections and procedures — transmissible gastroenteritis

Category A virus

Item to be disinfected	Disinfectant/chemical/procedure
Live animals	Quarantine then select option (see **Transmissible Gastroenteritis Disease Strategy**)
Carcases	Rendering or processing
Animal housing/equipment	1 followed by 2, 3 or 5
Environs	2, 3 or 5 plus vertebrate and invertebrate pest controls
Humans	1 followed by 2, 3 or 5
Electrical equipment	5c if necessary
Water –tanks, dams	Decrease vector insect habitat
Feed	Bury/burn only if heavily contaminated and disease risk outweighs replacement cost, otherwise quarantine
Effluent/manure	Bury
Human housing, clothing	1 followed by 2, 3 or 5
Machinery, vehicles	1 followed by 2, 3 or 5
Aircraft	1 followed by 2 or mild 3 or 5

KEY

1 Soaps and detergents

2 Oxidising agents:
- **a**. Sodium hypochlorite
- **b**. Calcium hypochlorite
- **c**. Virkon®

3 Alkalis:
- **a**. Sodium hydroxide (caustic soda)(NaOH); — Do not use with aluminium and like alloys
- **b**. Sodium carbonate anhydrous (Na_2CO_3) washing soda ($Na_2CO_3.10H_20$)

4 Acids:
- **a**. Hydrochloric acid
- **b**. Citric acid

5 Aldehydes:
- **a**. Glutaraldehyde — Glutaraldehyde is not too corrosive on metals but must not be used on humans and animals
- **b**. Formalin
- **c**. Formaldehyde gas — Gaseous formaldehyde is dangerous and subject to error; it should only be used by experienced personnel and in controlled conditions

Table 2.15 Disinfectant/chemical selections and procedures — vesicular stomatitis

Category A virus

Item to be disinfected	Disinfectant/chemical/procedure
Live animals	Treat those in buffer zone with 6c (to prevent insects breeding in manure) and 6a or 6b (to prevent insects biting)
Carcases	Bury or burn
Animal housing/equipment	6a, 6b (to kill insects) 1 (to remove virus) 2, 3 also effective
Environs	6a
Humans, clothing	1
Electrical equipment	5c
Water –tanks, dams	Drain to pasture where possible; decrease vector insect habitat
Feed	6d
Effluent, manure	Bury or 6a
Human housing	6a, 6b (to kill insects) 1 (to remove virus)
Machinery, vehicles, aircraft	6b (to kill insects) 1 (to remove virus)

KEY

1 Soaps and detergents

2 Oxidising agents:
- **a**. Sodium hypochlorite
- **b**. Calcium hypochlorite
- **c**. Virkon®

3 Alkalis:
- **a**. Sodium hydroxide (caustic soda)(NaOH); — Do not use with aluminium and like alloys
- **b**. Sodium carbonate anhydrous (Na_2CO_3) washing soda ($Na_2CO_3.10H_20$)

4 Acids:
- **a**. Hydrochloric acid
- **b**. Citric acid

5 Aldehydes:
- **a**. Glutaraldehyde — Glutaraldehyde is not too corrosive on metals but must not be used on humans and animals
- **b**. Formalin
- **c**. Formaldehyde gas — Gaseous formaldehyde is dangerous and subject to error; it should only be used by experienced personnel and in controlled conditions

6 Insecticides:
- **a**. Organophosphates
- **b**. Synthetic pyrethroids
- **c**. Ivermectin
- **d**. Phostoxin

2.3 Epidemiological considerations affecting decontamination procedures for particular viruses

Table 3 (3.1-3.21) summarises epidemiological factors that govern the extent of procedures to be employed in removing the exotic disease agent. The table covers each of the current AUSVETPLAN exotic diseases. Note that in some areas of Australia, the causal organism may be affected by our severe environmental conditions (low humidity, direct, hot, sunlight) therefore the extent of decontamination procedures may be reduced. More information on each disease is given in the individual AUSVETPLAN **Disease Strategies**.

NB The recommended disinfectants and chemicals applicable to elimination of each disease agent are listed in Tables 2.1–2.15 and appropriate procedures are in Sections 3, 4 and 5.

Table 3.1 Epidemiological considerations — African horse sickness

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	An acute or sub-acute insect-borne viral disease affecting mainly Equidae. Dogs also susceptible	*See* disinfectants applicable to Category C viruses (Section 3)
	REOVIRIDAE (CATEGORY C VIRUS) with 9 known serotypes	
	Optimal pH for survival of the virus is 7.0–8.5	*see* Table 2.1
	Resistant to detergents. Acid disinfectants most suitable for decontamination	
Incubation period	Usually 5–9 days, may be shorter in the acute disease. Incubation periods up to 21 days have been recorded	Decontamination procedures are determined by an incubation period of 40 days (OIE Code)
Transmission	Transmitted between susceptible animals by biting midges. Dogs can become infected by eating infected fresh uncooked horse meat	
Airborne spread	There is no aerosol spread of AHS. There may be windborne spread of infected vectors	
Persistence in the environment	Virus very stable outside the host	*see* Section 4
	Not destroyed by putrefaction and may retain infectivity in putrid blood for more than 2 years	
Wildlife	Feral horses and donkeys can become infected	*see* Wild Animal Control Manual, in press
Arthropod vectors	Biting midges of the family *Culicoides* are recognised as the most important vectors. Experimentally three species of mosquitoes, the brown dog tick and the camel tick have transmitted the virus	*see* Section 3
Zoonosis	Humans are not affected	

Table 3.2 Epidemiological considerations — African swine fever

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	A highly contagious viral disease of pigs IRIDOVIRIDAE (CATEGORY A VIRUS) Virus stable over wide pH range from pH 4–10	See disinfectants applicable to Category A viruses (Section 3) Disinfectants of choice would be ACIDIC
Incubation period	Incubation period 5–15 days	Decontamination procedures are determined by an incubation period of 40 days (OIE Code)
Transmission	ASF virus is excreted in faeces urine and all secretions in high concentration Virus is transmitted readily by direct contact or ingestion of infected pigmeat; illegal swill feeding is a potent source Recovered animals when slaughtered at abattoirs will retain virus Transfer on infected vehicles, fomites and people	
Airborne spread	Not a factor, occurring only over very short distances	
Persistence in the environment	Pigs that recover from ASF may remain carriers for up to 12 months. There is heavy environmental contamination Will survive in infected blood at 4°C for 18 months; frozen carcases for several years; in hams for 6 months; in pig pens for at least 1 month	*see* Section 4
Wildlife	Feral pigs could be infected	*see* Wild Animal Control Manual (in press)
Arthropod vectors	Sylvatic life cycle between wild porcines and *Ornithodorus* sp. of tick which can spread virus to domestic pigs Blood-sucking pig parasites are implicated in the spread of ASF within pig herds	Where applicable, identify tick species and spray defined area with insecticide
Zoonosis	Humans are not affected	

Table 3.3 Epidemiological considerations — Aujeszky's disease

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	A contagious viral disease for which the pig is the only natural host. Sporadic cases occur in cattle, sheep, goats, dogs, cats, mink, foxes, deer, rabbits, mice and rats	See disinfectants applicable to Category A viruses (Section 3)
	HERPESVIRIDAE (CATEGORY A VIRUS) only 1 serotype but strains vary in pathogenicity	*see* Table 2.3
	Infectivity remains fairly stable between pH 5–9 but extreme acidity and alkalinity have a rapid inactivating effect	
Incubation period	In young pigs can be as short as 2–4 days, in older pigs 3–6 days	OIE Code does not specify a maximum incubation period.
Transmission	Principally spread via the respiratory route. Other methods of spread are via semen or vaginal secretions, transplacental or colostrum	
Airborne spread	Can occur if specific conditions prevail–large amounts of virus, correct strain of virus, low temperature and high humidity and close proximity of pig herds	*see* Section 3
Persistence in the environment	Rapidly inactivated at 37°C, in sunlight and dry conditions	*see* Section 4
	Survives for extended periods under winter conditions below 4°C	
Wildlife	Feral pigs present a risk	*see* Wild Animal Control Manual, in press
	Rats and wildlife may have some role as reservoirs	
Arthropod vectors	There are no insect vectors	
Zoonosis	No reports of human infection	

Table 3.4 Epidemiological considerations — avian influenza (fowl plague)

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	A highly contagious generalised viral disease of poultry and other birds	See disinfectants applicable to Category A viruses (Section 3)
	ORTHOMYXOVIRIDAE (CATEGORY A VIRUS) with strains of varying virulence.	
	Virus is relatively stable but is rapidly inactivated at pH 2.5	see Table 2.4
Incubation period	Incubation period is variable from a few hours to 3 days	Decontamination procedures are determined by an incubation period of 21 days (OIE Code)
Transmission	AI virus is shed from the respiratory tract and in faeces for 30 days post infection in recovered birds	
	The disease spreads rapidly within the flock by direct contact	
	Indirect spread occurs via contaminated people, articles, feed and vehicles	
Airborne spread	Rapid within the flock but is not important between flocks	*see* Section 3
Persistence in the environment	Remains viable in water and faeces for 32 days and under a wide variety of environmental conditions at pH 7–8	*see* Section 4
Persistence in products	AI virus survives only a few days in carcases at ambient temperatures and up to 23 days when refrigerated	*see* Virulent avian influenza Disease Strategy and Poultry Enterprise manual
	Packaging and drip from infected carcases can be contaminated with virus	
	Eggs laid in the early phase of disease could have AI virus in albumen, yolk and on the surface	
	AI virus can penetrate intact egg shell and has been isolated from fertile eggs	
	Poultry offal meals should be rendered but recontamination could be a problem	
Arthropod vectors	Not applicable	
Wild birds	Water fowl and many species of wild birds are reservoirs for the virus, without showing significant disease, and the opportunity exists for mutation of virus to virulent pathogenic strains	*see* Wild Animal Control Manual, in press
Zoonosis	Humans are not affected	

Table 3.5 Epidemiological considerations — bluetongue

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	Arthropod-borne viral disease of mainly sheep, goats and deer	There are no requirements for any procedures to be employed
	REOVIRIDAE (CATEGORY C VIRUS) 24 serotypes comprising countless strains of varying virulence	
	Infection of cattle, though subclinical, is of great epidemiological significance	
Arthropod vectors	The disease is transmitted by *Culicoides* spp. insects but is NOT a contagious disease in the sense of spreading from animal to animal	Disinsection would be impractical in most circumstances
	Cattle are the main amplifying hosts	
	More detailed life cycle and epidemiology can be found in the AUSVETPLAN Disease Strategy for Bluetongue	*see* Table 2.5
Airborne spread	Disease could move to new areas with the aerial drift of infected *Culicoides* spp.	
Wildlife	Feral cattle goats and deer could maintain a reservoir of infection	*see* Wild Animal Control Manual, in press
Zoonosis	Humans are not affected	

Table 3.6 Epidemiological considerations — Bovine spongiform encephalopathy

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	A transmissible spongiform encephalopathy of cattle caused by an unconventional agent.	
	PRION (SPECIAL INACTIVATION REQUIRED)	*see* Table 2.6
	Most common disinfectants are not effective against the BSE agent	
Incubation period	Prolonged, most cases occur in cattle aged between 3 and 7 years	OIE Code does not specify a maximum incubation period.
Transmission	Ingestion of meatmeal contaminated with high concentrations of the scrapie agent	
Airborne spread	Not applicable	
Persistence in the environment	Can persist for very long periods in the environment (presumed to act in similar way to scrapie agent)	*see* BSE Disease Strategy
Wildlife	Spongiform encephalopathies have been reported in antelopes in British zoos and in large and small cats	
Arthropod vectors	Not applicable	
Zoonosis	There is no evidence that the BSE agent is transmissible to humans	

Table 3.7 Epidemiological considerations — classical swine fever (hog cholera)

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	Contagious generalised viral disease of pigs	*See* disinfectants applicable to Category A viruses (Section 3)
	TOGAVIRIDAE (CATEGORY A VIRUS) strains of varying virulence	
	Virus is stable at pH 4–10 but rapidly inactivated below pH 3	*see* Table 2.2
	Virus is relatively heat stable but is sensitive to desiccation, ultraviolet light and putrefaction	
Incubation period	Incubation period usually 6–11 days	Decontamination procedures are determined by an incubation period of 40 days (OIE Code) and by epidemiology
Transmission	Disseminated by direct contact with infected pigs	
	Infected pigs excrete virus in faeces, urine, nasal and lachrymal secretions. Virus is shed before symptoms are seen	
	The disease can spread rapidly within pig populations	
	The 'carrier sow' is an important source of infection. Swine fever virus can be transferred across the placenta and large amounts of virus are shed at farrowing	
	Movement of infected pigs via sales and contaminated vehicles	
	Indirect contact with contaminated articles people fomites feed	Discard needles and partially used bottles
	Illegal feeding of swill	
	Multiple use of hypodermic needles and vaccine	
Airborne spread	Not applicable	
Persistence in the environment	Sensitive to ultraviolet radiation and will survive in contaminated pig pens only a few days	*see* Section 4
Persistence in products	Pigmeat products can maintain the virus for up to 2–4 months in salted or brined meat	*see* the Disease Strategy for Classical swine fever
	CSF virus survives up to 52 months in frozen products	
Wild animals	Feral pigs could be a problem if exposed. Transmission of disease could be in both directions	*see* Wild Animal Control Manual, in press
Vectors	Generally unimportant. Two species of stable fly and mosquitoes have been shown capable of mechanically transmitting CSF virus	
Zoonosis	Not applicable	

Table 3.8 Epidemiological considerations — equine influenza

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	An influenza virus infecting all Equidae ORTHOMYXOVIRIDAE (CATEGORY A VIRUS) The virus is easily killed by cleaning and disinfection	See disinfectants applicable to Category A viruses (Section 3) *see* Table 2.7
Incubation period	Usually short, 1–5 days Maximum is 14 days	OIE Code does not specify a maximum incubation period.
Transmission	Principally by aerosol from the virus-laden cough. Commonly spread is by movement of infected horses to and from sales, shows, events, meetings	
Airborne spread	A single cough can spread virus over 35 metres in stables. Windborne spread over distances up to 8 metres has been reported	*see* Section 3
Persistence in the environment	The virus can persist for 8–36 hours in the environment It can persist in urine for 5 days and in water at 22°C for 18 days	
Wildlife	Rodents, if abundant, might act as passive transfer agents	*see* Section 4.2.2
Arthropod vectors	Stable and other flies, if abundant, might act as passive transfer agents	
Zoonosis	Mild respiratory symptoms has been suspected in people handling horses	*see* Section 4

Table 3.9 Epidemiological considerations — foot-and-mouth disease

DISEASE STRATEGIES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	Highly contagious, viral, vesicular disease of cloven-footed animals	*See* disinfectants applicable to Category B viruses (Section 3)
	PICORNAVIRIDAE (CATEGORY B VIRUS) 7 serotypes with 60 + subtypes	Acid, alkali and chlorine-based disinfectants can be used (provided CARE is taken that they are not mixed together)
	The virus is varyingly stable at pH 6.7–9.5; rapidly inactivated below pH 5 and above pH 11	
	The virus is stable at low temperatures and when the relative humidity is above 60%	
	The virus is moderately susceptible to ultraviolet light and rapidly inactivated at temperatures above 50°C	*see* Table 2.8
Incubation period	Incubation period USUALLY 3–5 days	Decontamination procedures are determined by an incubation period of 14 days (OIE Code)
	FMD virus is excreted 1–5 days prior to clinical signs depending on incubation period	
Transmission	Virus is excreted from nasal passage, saliva, milk, semen, faeces, urine and in vast amounts from ruptured vesicles	All procedures listed in this manual should be observed. Personal decontamination is important (*see* Section 4)**
	Pigs excrete up to 3000 times more virus than other animals	
	The disease is rapidly spread by direct contact especially at shows and sales	Preliminary pre slaughter spraying should be carried out especially in piggeries and enclosed animal houses
	Indirect contact with contaminated people, fomites, milk, manure vehicles and illegal swill feeding is well documented	
	Cattle remain carriers for at least 27 months, sheep for 9 months but pigs are NOT long-term carriers	
Persistence in the environment	FMD virus may remain infective in the environment for several weeks, possibly longer in the presence of soil, manure, dried animal secretions, straw, hair and leather	*see* Section 4
Persistence in products	FMD virus is inactivated in 'setting' meat (NOT pigmeat) but is NOT inactivated in offal, bone marrow, lymph nodes and blood clots	These facts determine the extent of operations following tracing of stock during a disease outbreak
	FMD virus survives in salted/cured meats, hides milk, dairy products, wool and semen	*see* Foot-and-mouth Disease Strategy
Airborne spread	Can be extremely widespread over long distances if conditions of temperature, wind speed, humidity, terrain, atmosphere and viral concentration are right. Cattle are usually the INDICATOR since they ventilate 10 x more air than other species	Preliminary spray of buildings
Wildlife	Feral and wild animals have potential to be an important risk in perpetuating or disseminating FMD virus	*see* Wild Animal Control Manual, in press

Arthropod vectors	Not applicable. Mechanical transfer could occur.	
Zoonosis	Very rarely zoonotic. It is known to cause vesicles on hands and lips	If a person is affected, they must NOT have contact with susceptible animals until cleared of infection
	Human nasal passages can mechanically harbour the virus for 24–27 hours despite masks and noseblowing	Recommend no contact with susceptible stock for 72 hours

****Note: Where light contamination has occurred, especially in dry, hot areas the intensity of decontamination necessary can be assessed by the local disease control centre (LDCC).**

Table 3.10 Epidemiological considerations — lumpy skin disease

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	An acute highly infectious skin disease of cattle.	*See* disinfectants applicable to Category A virus (Section 3).
	POXVIRIDAE (CATEGORY A VIRUS)	
	Inactivated after heating for 1 hour at 55°C. Susceptible to a wide range of disinfectants	*see* Table 2.9
Incubation period	In naturally-infected animals incubation period is 2–4 weeks; in experimental infections 5 days	Decontamination procedures are determined by an incubation period of 21 days (OIE Code).
Transmission	Mostly the result of insect transmission, with many types of biting insects implicated. The virus could be transmitted in milk, semen, blood and lesions in cattle hides	
Airborne spread	Windborne spread of the insect vector only	
Persistence in the environment	The virus is very resistant and can remain viable for long periods on or off the animal host	
	It survives well at cold temperatures but is susceptible to sunlight	
Wildlife	Vermin, predators and wild birds might act as mechanical carriers of the virus	*see* Wild Animal Control Manual, in press
Arthropod vectors	Stable and blow flies are important in spread. Biting insects such as mosquitoes, midges and tse-tse fly may play some role in the spread.	
Zoonosis	Humans are generally regarded as being non-susceptible	

Table 3.11 Epidemiological considerations — Newcastle disease (fowl pest)

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	Highly contagious, generalised, viral disease of domestic poultry, cage birds, wild birds PARAMYXOVIRIDAE (CATEGORY A VIRUS) strains vary in virulence. VELOGENIC (high) MESOGENIC (moderate) LENTOGENIC (low)	*See* disinfectants applicable to Category A viruses (Section 3)
Incubation period	Incubation period 2–6 days but can be as long as 15 days	Decontamination procedures are determined by an incubation period of 21 days (OIE Code)
Transmission	Depending on viral strain birds can die without showing symptoms Virus is shed via respiratory tract and in faeces and is rapidly spread in the flock Disease disseminated by direct contact and "carrier" state birds up to 120 days after infection Indirectly by contaminated people, articles, fomites, manure, feed and vehicles	Preliminary aerial spray of buildings
Airborne spread	Given the right environmental conditions ND virus has been known to disseminate over a wide area	Close down fans and ventilators. Preliminary aerial spray of building interior
Persistence in the environment	Virus is inactivated by heat and direct sunlight (30 minutes) but can remain 21 days in cool weather in poultry litter and sheds	
Persistence in products	Viable virus remains in the carcase until decomposition is well advanced Isolated from bone marrow after several days at 30°C Virus will remain viable in carcase meat for more than 250 days at 14°C Eggs laid in the early phase could contain ND virus on the surface; egg pulp likely to be infected	Procedures for decontamination of buildings, hatcheries, slaughter houses as above
Wild birds	Could be reservoir, become infected in an outbreak or transmit mechanically — 'carrier' state can exist up to one year	*see* Wild Animal Control Manual, in press
Arthropod vectors	'Flies' are thought to transmit ND virus mechanically	
Zoonosis	Headache and flu-like symptoms can occur in humans. Conjunctivitis usually mild but can occasionally become severe and cause impairment of vision. It is suspected that person-to-person transmission may occur	Infected people to have no contact with susceptible stock until cleared of virus (AAHL refers)

Table 3.12 Epidemiological considerations — rabies

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	An almost invariably fatal viral encephalitis affecting all warm blooded mammals RHABDOVIRIDAE (CATEGORY A VIRUS)	See disinfectants applicable to Category A viruses (Section 3)
Incubation period	Incubation period is very variable from 4 days to 6 months or more depending on a number of factors Virus can be excreted in saliva up to 7 days prior to symptoms appearing	Incubation period is not a determinant of decontamination procedures, more from initial clinical signs (OIE Code maximum incubation period is 6 months)
Transmission	Rabies virus is transmitted directly by the bite of a rabid animal or contamination of a fresh wound with infected saliva or contamination of mucous membranes Virus cannot invade intact skin Respiratory and oral transmission can occur exceptionally	When a known rabid animal has dripped saliva, the immediate environment can be disinfected for cosmetic reasons or to allay public concern
Airborne spread	Not applicable except in an extreme situation (as above)	
Persistence in the environment	Rabies virus is fragile outside the host and is not viable for long. Environmental contamination is of very little significance other than aerosol contamination in bat caves Rabies virus is inactivated by exposure to sunlight and temperature above 56°C	Departmental officers must be aware of the danger of viral contamination if handling rabid animals and they must be fully aware of personal decontamination procedures
Persistence in products	Milk from rabid cows contains virus but obviously will not be used for human consumption. If milk from incubating cows is processed pasteurisation will kill the virus	
Vectors	Not applicable	
Wildlife	Could definitely be a problem with all warm-blooded animals (see epidemiology section in the Rabies Disease Strategy)	*see* Wild Animal Control Manual, in press
Zoonosis	Most important and can arouse hysteria in human population	Initial first aid is to scrub wound with hot water and soap

Note: Decontamination procedures are minimal with this disease. It is recommended that the AUSVETPLAN Disease Strategy for Rabies should be studied for a more complete understanding of the epidemiology of this disease.

Table 3.13 Epidemiological considerations — Rift Valley fever

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	An acute insect-borne viral disease affecting mainly ruminants and humans. BUNYAVIRIDAE (CATEGORY A VIRUS) Virus very susceptible to acid pH and readily inactivated below pH 6.2. Most stable within pH 7–8	*See* disinfectants applicable to Category A viruses (Section 3) *see* Table 2.12
Incubation period	Usually 2–6 days	Decontamination procedures are determined by an incubation period of 30 days (OIE Code)
Transmission	Predominantly a vector-borne disease. Aerosol transmission an important means of spread to humans as is contact with infected carcases	
Airborne spread	Windborne dispersal of infected vectors is a means of spread of RVF.	*see* Section 3
Persistence in the environment	The virus is destroyed by strong sunlight/ultraviolet radiation Stable in aerosol form at 24°C and relative humidities of 50%–85% Can survive in dried blood for up to 3 months	
Wildlife	Species most likely to harbour the virus are goats, camels and buffalo	*see* Wild Animal Control Manual, in press
Arthropod vectors	Major vectors are certain species of mosquitoes. Ticks and biting midges have been implicated.	
Zoonosis	Humans can be affected	*see* Section 4

Table 3.14 Epidemiological considerations — rinderpest/peste des petits ruminants (PPR)

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	Contagious generalised viral disease mainly of cattle (usually fatal) PPR mirrors rinderpest in all respects but is specific to sheep and goats; Asian pigs are more susceptible to rinderpest than European pigs PARAMYXOVIRIDAE (CATEGORY A virus) PPR virus is stable between pH 7.2–7.9 but is rapidly inactivated at pH values less than 5.6 or greater than 9.6	*See* disinfectants applicable to Category A viruses (Section 3) *see* Table 2.10
Incubation period	2–6 days but may be as long as 15 days Virus appears in blood excretions and secretions 1–2 days before clinical signs	Decontamination procedures are determined by an incubation period of 21 days (OIE Code)
Transmission	Transmission is via the respiratory tract and close contact. Virus present in saliva, faeces, urine, milk and products of abortion In the few animals that do recover, there is no carrier state as such but milk may be infectious 45 days after clinical recovery Disease transmitted by movement of cattle and indirectly by contaminated clothing articles and vehicles though not very likely due to low persistence of virus in environment	Suggest that preliminary disinfection and clean up only is done
Airborne spread	Is possible over several hundred metres, mainly at night. High and low humidity aid survival but virus rapidly destroyed at relative humidity 50–60%	No action if control measures in place
Persistence in the environment	Rinderpest/PPR virus is not very stable and does not survive more than two or three days Because of viral emission, saleyards and abattoirs could be contaminated Contaminated pastures would be non-infective after 6–24 hours depending on shading	
Persistence in products	Rinderpest/PPR virus is rapidly inactivated by putrefaction. 'Setting' meat would be expected to inactivate the virus	*see* Rinderpest and PPR Disease Strategies
Wild animals	Buffalo, feral cattle probably deer depending on stock density and degree of contact. Feral pig should not be a problem but Asian pigs and warthog can be affected	*see* Wild Animal Control Manual, in press
Arthropod vectors	Not considered applicable	
Zoonosis	Humans are not affected	

Table 3.15 Epidemiological considerations — Scrapie

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	A transmissible spongiform encephalopathy of sheep and goats caused by an unconventional agent	
	PRION (SPECIAL INACTIVATION REQUIRED)	*see* Table 2.6
	The agent is resistant to most common disinfectants	
Incubation period	Prolonged incubation	OIE Code does not specify a maximum incubation period
	Occurs most frequently between 2 and 5 years of age in sheep with a peak incidence of 3.5 years in sheep and somewhat less in goats	
Transmission	Primarily from ewe (doe) to offspring probably via contaminated uterine fluids	
Airborne spread	Not applicable	
Persistence in the environment	The agent is very persistent in the environment surviving in a desiccated state for at least 30 months.	*see* Scrapie Disease Strategy
	Some infectivity remains after exposure to dry heat for 24 hours at 160°C	
Wildlife	Not applicable	
Arthropod vectors	No documented evidence	
Zoonosis	No evidence that the scrapie agent is transmissible to humans	

Table 3.16 Epidemiological considerations — screw-worm fly

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	Disease caused by larval "strike" (myiasis) by the larva of two species of fly. *Chrysomya bezziana* (Old World) and *Cochliomyia hominivorax* (New World) Old World screw worm fly is most important threat to Australia	For recommended chemicals *see* Screw-Worm Fly Disease Strategy**
	All wild and domestic animals are susceptible	
	Larvae are obligate parasites of warm blooded animals, striking any fresh wound however small or naturally induced (eg navel of newborn)	
Transmission	For life cycle of screw worm fly *see* the Screw-worm fly Disease Strategy	It is assumed that the sterile insect technique (SIT) of control will be initiated
	Where animals are examined at specific areas or are transported within a known SWF infected area, the vehicle will be decontaminated with proprietary insecticides	
Wild animals	Any warm-blooded animal can be infected	*see* Wild Animal Control Manual, in press
Zoonosis	Can affect any warm-blooded animal	Seek medical attention

**Note: Decontamination procedures do not apply to this disease. Wound treatment and prevention of disease are dependent on animal management procedures and supervision. Prevention and treatment can be achieved with proprietary compounds and chemicals. Ivermectin chemicals are effective.

Table 3.17 Epidemiological considerations — Sheep and goat pox

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	A highly contagious viral disease of small ruminants POXVIRIDAE (CATEGORY A VIRUS) Susceptible to a wide range of disinfectants including detergents Inactivated after heating for 1 hour at 55°C	See disinfectants applicable to Category A viruses (Section 3) *see* Table 2.9
Incubation period	Usually 12 days but varies from 2 to 14 days	Decontamination procedures are determined by an incubation period of 21 days (OIE Code)
Transmission	Most transmission is by direct contact via the respiratory system. Contact and mechanical transmission by insects can occur	
Airborne spread	Short distance aerosol transmission from nasal secretions and saliva is an important method of spread	
Persistence in the environment	The virus is very resistant and can remain viable for long periods on or off the animal host Virus susceptible to sunlight but survives well at cold temperatures May persist for up to 6 months in a suitable environment	
Wildlife	Feral goats would pose a risk and vermin, predators and wild birds might act as mechanical carriers	*see* Wild Animal Control Manual, in press
Arthropod vectors	Insects can act as mechanical vectors over short distances	
Zoonosis	Humans are generally regarded as not being susceptible	

Table 3.18 Epidemiological considerations — swine vesicular disease

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	Contagious viral disease of pigs clinically indistinguishable from FMD	*See* disinfectants applicable to Category B viruses (Section 3)
	PICORNAVIRIDAE but an ENTEROVIRUS (CATEGORY B VIRUS)	
	The virus is very resistant to inactivation and is stable over a pH range of 2–12	*see* Table 2.8
	Relatively resistant to heating and drying	
Incubation period	Incubation period 2–7 days	Decontamination procedures are determined by incubation period of 28 days (OIE Code)
Transmission	Virus excreted from ruptured vesicles for up to 10 days and in faeces for more than 3 weeks but a prolonged "carrier" state does not occur	All procedures in the Decontamination manual pertaining to contaminated persons buildings, vehicles and articles must be rigorously pursued
	Spread by direct contact between animals	
	Indirect spread by contaminated vehicles, fomites, people and illegal swill feeding	
	Recrudescence of disease is well known	
Persistence in the environment	Can survive in pig faeces at least 5 months	
Persistence in products	Survives in salami and frozen carcases more than one year and in intestinal casings for at least 780 days	*see* Swine Vesicular Disease Strategy
	The virus is NOT destroyed by 'setting' meat	
Airborne spread	Not a factor. Aerial drift can occur over short distances due to mechanical effluent spreading	
Wildlife	Feral pigs could be a problem especially if allowed access to piggeries dumps of discarded food waste or effluent run off. Progress of the disease in feral pigs is unknown but probably would be erratic	*see* Wild Animal Control Manual, in press
Arthropod vectors	Not applicable. Mechanical transfer by flies and cockroaches is minimal	
Zoonosis	Not a factor but slight zoonotic capability is suspected	No action unless a suspect case is reported. Most likely to occur in staff highly exposed to lesions in an infected premises

Table 3.19 Epidemiological considerations — transmissible gastroenteritis

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	An acute highly contagious viral disease of pigs	*See* disinfectants applicable to Category A viruses (Section 3)
	CORONAVIRIDAE (CATEGORY A VIRUS), only 1 serotype	
	Stable at pH 3, inactivated by exposure to a wide variety of disinfectants and detergents	*see* Table 2.14
Incubation period	In natural infections 18 hours to 3 days	OIE Code does not specify a maximum incubation period but the infective period is given as 40 days
Transmission	Ingestion of infected faeces from in-contact pigs, inhalation or ingestion of droplets of faeces, transfer of carrier stock.	
	Indirect transmission on implements	
	Mechanical transmission by flies	
Airborne spread	Infective droplets may be spread by wind for a short distance	
Persistence in the environment	Can remain infective in the environment at 21°C for 3 days.	
	Extremely stable when frozen but labile at room temperature or above	
	Considered to be light sensitive	
Wildlife	Feral pigs may transmit the virus. It may also be transmitted passively in the gut of cats, dogs, foxes and starlings	*see* Wild Animal Control Manual, in press
Arthropod vectors	Mechanical transmission by flies	
Zoonosis	Humans are not affected	

Table 3.20 Epidemiological considerations — vesicular exanthema

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	Acute, contagious viral disease of pigs and marine mammals	*See* disinfectants applicable to Category B viruses (Section 3)
	CALICIVIRUS (CATEGORY B VIRUS) several different serotypes varying in virulence	
	Virus mutates readily	
	Marine mammals probably natural reservoir	*see* Table 2.8
	Virus is reasonably resistant to inactivation. It is inactivated at or below pH 3 and above pH 9	
Incubation period	In natural outbreaks, 1–3 days (12 hours–12 days)	Decontamination procedures are determined by an incubation period of 28 days (OIE Code) as no OIE code exists for VE
	Virus is shed 12 hours before vesicles appear	
Transmission	Virus is shed in large quantities from ruptured vesicles. Faeces and urine do NOT appear to be infected	
	Illegal feeding of swill is primary cause of spread	
	Feeding contaminated fishmeal would be important	
	Spread by direct contact and movement of infected pigs	
	Mechanical spread by way of infected articles is inconsistent, but cannot be ignored	
Persistence in the environment	Viral persistence in environment is uncertain but contaminated premises would be at risk for 3–4 months	
Persistence in products	Contaminated pigmeat remains infectious for 4 weeks at 7°C and for years when deep frozen. Cooking at 84°C under pressure does not destroy infectivity	*see* Vesicular Exanthema Disease Strategy
Airborne spread	Not a factor	
Wildlife	Feral pigs could be a problem in an outbreak. Feral pigs scavenging the shoreline could possibly pick up infection but the world distribution is centred on the west coast of America.	*see* Wild Animal Control Manual, in press
Arthropod vectors	Not applicable. Blood-sucking pig parasites may spread disease in acute phase within the pig herd	
Zoonosis	Humans are not affected	

Table 3.21 Epidemiological considerations — vesicular stomatitis

DISEASE FEATURES	EPIDEMIOLOGY	COMMENTS
Aetiology/general properties	A contagious viral disease of cattle pigs horses and possibly sheep and goats RHABDOVIRIDAE (CATEGORY A VIRUS) two distinct serotypes - Indiana and New Jersey	See disinfectants applicable to Category A viruses (Section 3)
Incubation period	Incubation period in natural outbreaks 1–3 days but can vary to 10 days	Decontamination procedures are determined by an incubation period of 21 days (OIE Code)
Transmission	Virus is shed in vesicular fluid and saliva for a few days only and has not been isolated from faeces and urine nor from saliva after lesions have healed Spread by direct contact The carrier animal state has NOT been demonstrated Much of the epidemiology is unresolved Domestic animals are probably NOT the primary host. The virus only enters through damaged skin and mucous membranes. Transmission enhanced by poor quality food (which may damage mucous membranes) Spread indirectly by fomites and people	Decontamination procedures would be limited to a preliminary disinfection and clean up.
Persistence in the environment	The virus is not very stable and survives no more than several days in premises	
Persistence in products	Virus is NOT found in edible animal tissue and would be destroyed by pasteurisation	*see* Vesicular Stomatitis Disease Strategy
Airborne spread	Not applicable	
Wild animals	In endemic areas many wild life species are susceptible, eg deer, rodents, bats, feral pigs (rabbits ferrets, cats experimentally); dogs appear resistant. Wild animals may act as reservoirs	*see* Wild Animal Control Manual, in press
Arthropod vectors	VS virus has been isolated from sandflies, mosquitoes gnats and flies. They are probably involved in transmission both by bite and mechanically (Indiana strain)	Disinsection would more than likely be impractical
Zoonosis	YES; human infection via the respiratory tract and conjunctiva and through skin abrasions. Disease symptoms similar to influenza	Infected humans should have no contact with susceptible stock

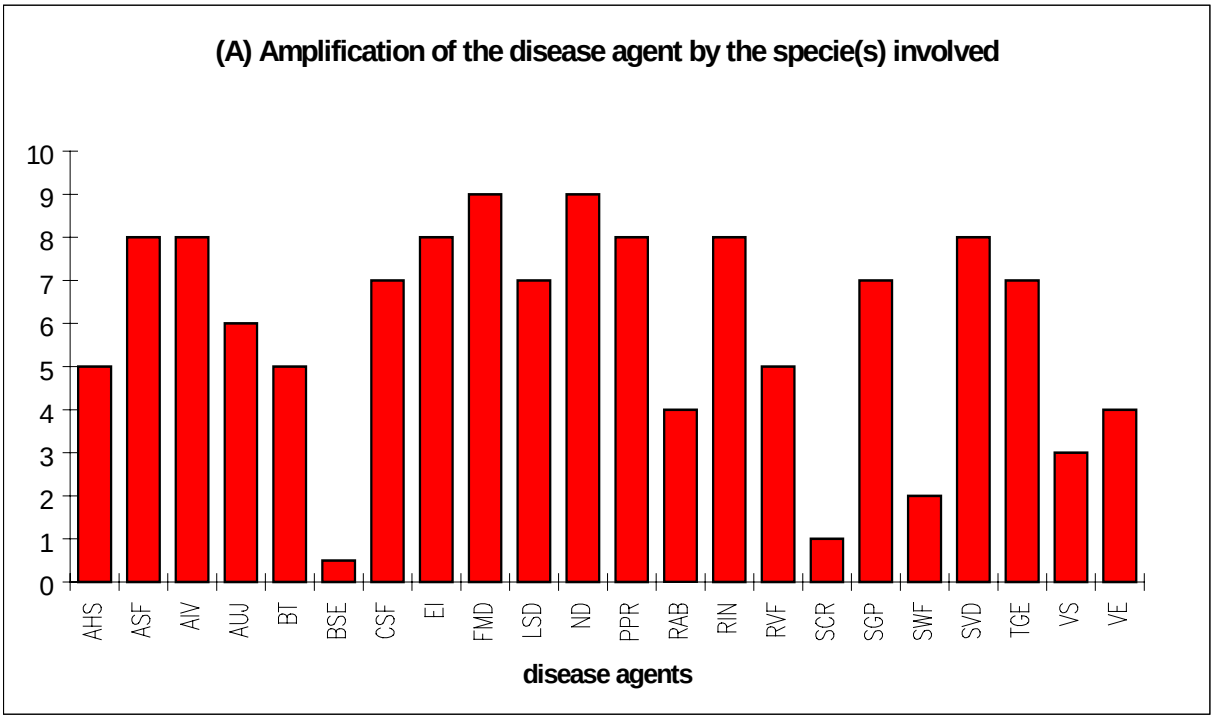
2.4 Comparison of amplification, persistence and resistance of the AUSVETPLAN exotic disease agents

Figure 1 compares the AUSVETPLAN exotic disease agents using three parameters relating to decontamination principles:

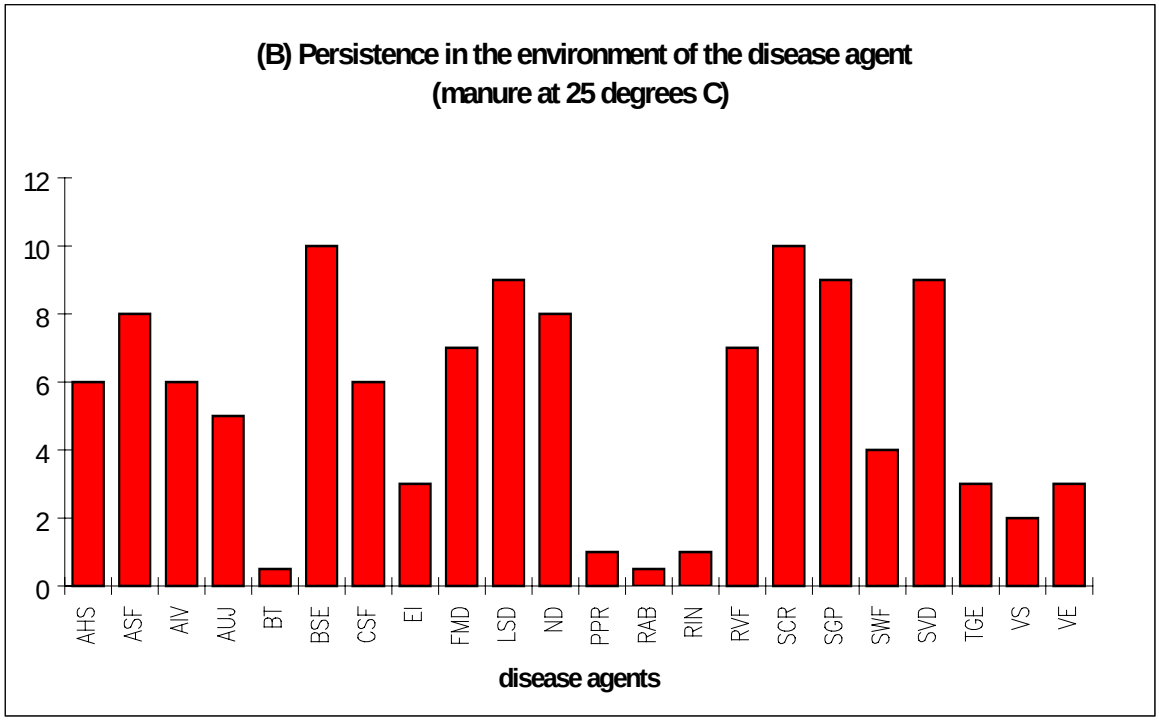
- amplification and release of the disease agent by the species involved;
- persistence in the environment of the disease agent (manure at 25°C); and
- resistance of the disease agent to inactivation.

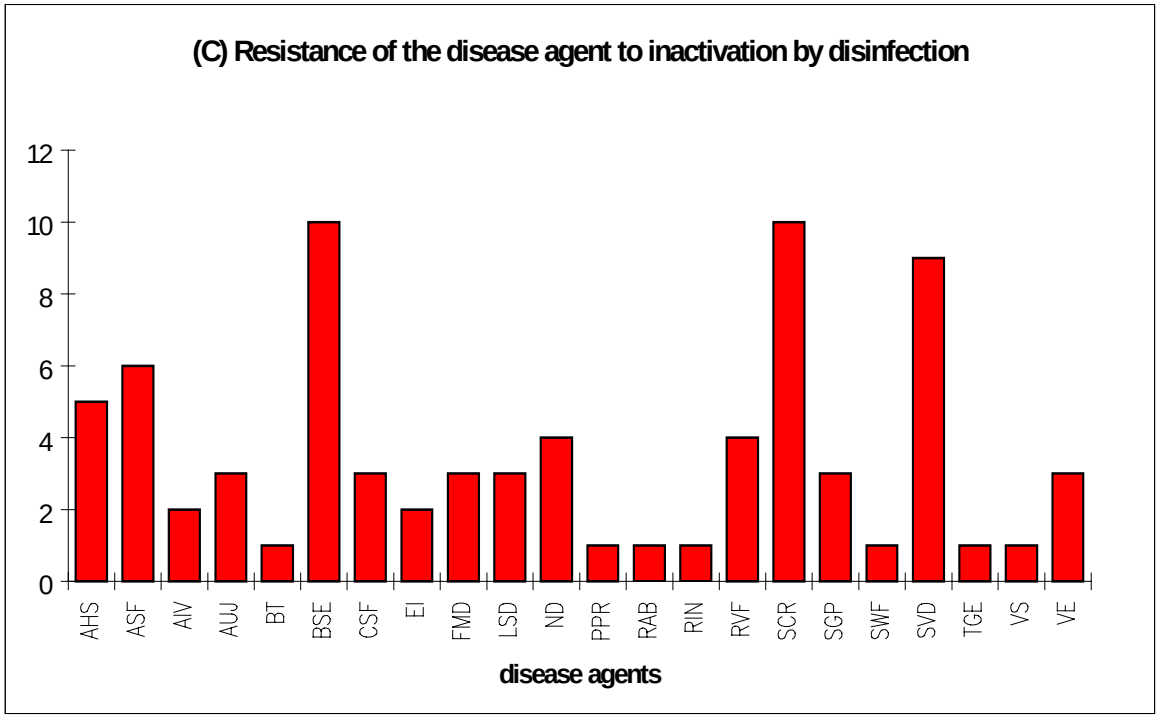
In the figure each of three parameters is given a qualitative grade from 0–10. The higher the grading the more difficult it is to eliminate the disease agent from the environment.

Figure 1 Comparative histograms for the AUSVETPLAN exotic disease agents showing (A) amplification; (B) persistence; and (C) resistance



AHS= African horse sickness
AI= avian influenza
ASF= African swine fever,
AUJ= Aujeszky's Disease
BSE= bovine spongiform encephalopathy
BT = bluetongue
CSF= classical swine fever
EI= equine influenza
FMD = foot-and-mouth disease
LSD= lumpy skin disease
ND= Newcastle disease
PPR= peste des petits ruminants
RAB= rabies
RIN= rinderpest
RVF= Rift Valley fever
SCR= scrapie
SGP= sheep/goat pox
SVD= swine vesicular disease
SWF= screw-worm fly
TGE= transmissible gastroenteritis
VE= vesicular exanthema
VS= vesicular stomatitis


(B) Persistence in the environment of the disease agent
(manure at 25 degrees C)
12
10
8
6
4
2
0
AHS
ASF
AIV
AUJ
BT
BSE
CSF
EI
FMD
LSD
ND
PPR
RAB
RIN
RVF
SCR
SGP
SWF
SVD
TGE
VS
VE
disease agents


(C) Resistance of the disease agent to inactivation by disinfection
12
10
8
6
4
2
0
AHS
ASF
AIV
AUJ
BT
BSE
CSF
EI
FMD
LSD
ND
PPR
RAB
RIN
RVF
SCR
SGP
SWF
SVD
TGE
VS
VE
disease agents

3 WEAPONS – disinfectants/chemicals for inactivation of exotic viruses and disease agents

3.1 Introduction

This section provides direct advice for the decontamination of premises where animals infected with an exotic disease agent have been held. Most exotic disease agents of consequence to pastoral industries in Australia are viruses and so the recommendations provided here are based accordingly. Specifically, the judgements and recommendations are planned to comprehensively cover the AUSVETPLAN exotic disease agents.

3.1.1 Decontamination

Decontamination is the combination of physical and chemical processes which kills or removes pathogenic microorganisms, but does not necessarily result in sterility. A disinfectant is a chemical or mixture of chemicals capable of killing pathogenic microorganisms associated with inanimate objects.

3.1.2 Basic assessments

The most important initial information is the presumptive identification of the exotic disease agent involved. Once established, the basic properties of the agent (most likely a virus) must be considered. What are the epidemiological characteristics of the spread of the virus? Has transmission occurred by aerosol spread, oral ingestion, close contact or insect vectors? From the information gathered, a plan can be devised to establish priorities for decontamination (Prince et al 1991). Such a plan usually includes buildings with wooden, metallic or masonry structures, machinery of mostly metallic components, pipework of various types, water tanks, animal food storage areas and sewage waste. Depending on the disease agent involved, different decontamination procedures and disinfectants are likely to be used for different sites on the property (Kostenbauder 1991).

In some cases where the disease agent does not spread directly from animal to animal (eg bluetongue) a comprehensive decontamination of a property is not warranted. In contrast, some viruses such as swine vesicular disease and foot-and-mouth disease, are relatively stable on inanimate objects and can be spread to remote animals on contaminated people, clothes, equipment, etc. Viruses that can be spread by such contact will require the most comprehensive decontamination programs.

Preliminary cleaning work is invariably needed before any chemical disinfectants are used. The natural processes of time, dehydration, warm temperature and sunlight will greatly assist the decontamination operation and should be considered in planning. A hot, dry, sunny day will cause rapid natural inactivation of an agent like Newcastle disease virus whereas cold, damp, overcast conditions will assist its persistence.

Simple cleaning of surfaces by brushing with a detergent solution is effective in removing contaminating viruses and is fundamental for achieving effective chemical decontamination. Most disinfectants have reduced effectiveness in the presence of fat, grease and organic dirt. Every effort should be made to remove such coverings from all surfaces to be decontaminated. Hot water and steam are effective in cleaning many cracks and crevices where pathogens are likely to linger. The insides of pipework can often only be cleaned

effectively by steam. If applied long enough for surfaces to approach 100ºC, the interior pipework will be effectively decontaminated.

Choice of disinfectant depends on the method of application and how an adequate wet contact time is to be maintained.

A knowledge of the properties of the contaminating virus is crucial in planning a decontamination strategy. Choosing the most appropriate disinfectant is dependent on the nature of the virus particles. Useful clues for predicting susceptibility are the presence or absence of lipid in the virus particles and the virus size (Klein and DeForest 1981). In this predictive system, viruses fall into three groups:

- *Category A* viruses are of intermediate to large size and contain lipid which makes them very susceptible to detergents, soaps and all of the disinfectants listed in Section 3.2, below. Such viruses are susceptible to dehydration and often do not persist long unless in cool, moist environments.
- *Category B* viruses (eg picornaviruses and parvoviruses) have no lipid, are smaller and more hydrophilic. Such viruses are relatively resistant to lipophilic disinfectants such as detergents. Although they are sensitive to all the other disinfectants listed in Section 3.2, below, they are less susceptible than viruses in Category A. Classical bactericides such as quaternary ammonium compounds and phenolics are not effective against these viruses.
- *Category C* viruses (eg adenoviruses and reoviruses) are intermediate in size and lack lipid. These viruses fall between Categories A and B in sensitivity to the best anti-viral disinfectants such as hypochlorites, alkalis, oxidising agents, eg Virkon® and aldehydes.

Table 1 in Section 2 groups viruses of veterinary significance in their families and also in terms of their susceptibilities to common disinfectants.

3.1.3 Precautions when using disinfectants

Chemicals usually kill microorganisms by toxic reactions, and effective disinfectants are often toxic for animal (and human) tissues as well. Virtually all disinfectants have to be used with care to avoid occupational injuries or health problems. Table 5 Section 4 provides some basic information about precautions and contraindications when using the recommended disinfectants.

3.2 Selection of disinfectants

AUSVETPLAN concentrates on a relatively narrow range of disinfectants that are effective against broad groups of viruses. Consequently, disinfectants are recommended that are generally available in large quantity throughout Australia. Remember that in any large-scale decontamination of a rural property, the cost of disinfectants will be relatively minor. Because labour and other operational costs will be high, it would be a false economy to use disinfectants at less than recommended concentrations. In any case, when disinfectants are watered down they invariably lose their effectiveness.

Flame guns may be useful supplements for drying decontaminated surfaces, but they are dangerous and the risk of fire and injury must always be considered. Flame guns are not recommended as a primary means of decontamination.

In general, chemical names of disinfecting substances are used because they are easily understood by all personnel with basic technical knowledge. This document generally avoids the use of brand or trade names because such products are subject to change or restriction in their distribution. However, Appendix 2 shows the names of trade products and the distributors from which supplies can be obtained. This list will be updated regularly.

To simplify determinations, disinfectants are grouped into five chemical categories. Insecticides make a sixth category:

(1) soaps and detergents
(2) oxidising agents
(3) alkalis
(4) acids
(5) aldehydes
(6) insecticides

Each of these classes of disinfectants is discussed briefly below and also shown in Table 4.

Commonly-used general disinfectants such as phenolics and quaternary ammonium compounds are very effective antibacterials, but have limited effectiveness against Category B and C viruses, and so are not included in Table 4.

Products effective for decontamination of viruses on the hands and the skin are limited. Virkon® is reported to have low toxicity and to be effective against members of all 17 virus families but it has not been approved for use on skin. Alternatively, citric acid or sodium carbonate may be added to washing water to induce antiviral conditions by lowering or raising the pH as appropriate for the agent to be inactivated.

3.2.1 Soaps and detergents

Soaps and detergents are essential components of cleaning procedures prior to many of the decontamination procedures described below. In most cases, the primary aim is the removal of organic material, dirt or grease from surfaces to be decontaminated. Most industrial and domestic brands of soaps and detergents are satisfactory. Hot water, brushing and scrubbing enhance the cleaning action. Similarly, steam improves the cleaning and decontamination process by raising the temperature and penetrating crevices. However, steam by itself can only be used as a decontaminant if the temperature of the surface can be raised to 100^{o}C and held there long enough for the inactivation of the agent of concern. Because of uncertainties regarding temperatures and times of contact, steam is only recommended as an adjunct to decontamination in this document.

In addition, the surfactant action of soaps and detergents is an effective decontaminant for all Category A viruses because of their outer lipid envelope. Thus, for decontamination procedures involving exotic viruses in Category A, soaps and detergents are effective disinfectants in their own right.

Many commonly-used disinfectants in hospitals, surgeries, dairies and food processing areas involve soapy combinations of phenolics or quaternary ammonium compounds. These agents are specifically antibacterials and are also effective against Category A viruses, but have limited activity against Category C viruses and in many cases, no activity against Category B viruses. Thus, although they may be useful for preparatory cleaning purposes during an exotic virus disease outbreak, they are not recommended in this manual as more effective cleaning agents and viral decontaminants are available.

Iodophors are combinations of solubilising agents and a carrier that releases free iodine. It is difficult to define active concentrations with certainty in all circumstances and so iodophors are not recommended in this manual for the inactivation of viruses.

3.2.2 Oxidising agents

These are the disinfectants recommended for most applications. *Chlorine* is released from hypochlorite solutions (either sodium or calcium) and is a powerful oxidising agent effective in killing all virus groups (Dychdala 1991). Scott (1980) found in the conditions of test that 0.175% sodium hypochlorite was the most effective and practical broad spectrum disinfectant of 22 products tested against a range of different viruses. However, the effectiveness of hypochlorite is highest in the pH range 6–9 and decreases markedly in the presence of organic material. Hypochlorite powders are readily available as swimming pool disinfectants or household bleaches, and can be diluted for use on site. Hypochlorite solutions are not chemically stable and decompose rapidly as temperatures rise above 15ºC.

Virkon® is a modern disinfectant with outstanding virucidal properties. Virkon® is reported to have low toxicity and to be effective against members of all 17 virus families but it has not been approved for use on skin. Its activity is based on a buffered synergised acid peroxygen system containing a high percentage of surfactant. It is relatively safe to use and comes in a powdered form ideal for dilution at the site of an exotic disease outbreak. It can be sprinkled in powdered form over wet or boggy areas, *but the concentration of disinfectant achieved by that kind of application cannot be accurately controlled*. Details of availability of this product are shown in Appendix 2.

3.2.3 Alkalis

Alkalis have long been used as effective disinfectants against a wide range of pathogens. Both *sodium hydroxide* (caustic soda) and *sodium carbonate* (washing soda) are widely available in large quantities at low cost and both have a natural saponifying action on fats and other types of organic matter which assists the cleaning process. Because they are virucidal under heavy burdens of organic material, they are ideal agents for decontaminating animal housing, yards, drains, effluent waste pits and sewage collection areas.

3.2.4 Acids

Acids are generally highly virucidal and with the correct choice of acid, or acid mixture, can be used under a wide variety of conditions ranging from liquid effluent to personal decontamination. *Hydrochloric acid* is a strong acid, widely available from hardware stores and less toxic than other strong acids. *Citric acid* is a milder acid available in solid form that is active against acid sensitive viruses and can be used safely for personnel and clothing decontamination. It is particularly useful when added to detergents for the inactivation of foot-and-mouth disease virus.

3.2.5 Aldehydes

Glutaraldehyde

A very effective disinfectant (Scott and Gorman 1991) active against all virus families (and other microorganisms) in concentrations of 1 to 2%. It remains effective in moderate concentrations of organic material, is chemically stable and only mildly corrosive for metals. However, for large-scale decontamination the cost is likely to be high.

Formalin

A 40% aqueous solution of formaldehyde gas and is a useful disinfectant. Formalin diluted with 12 volumes of water produces 8% formalin that is an active disinfectant against most virus families (but not against scrapie and BSE).

Gaseous formaldehyde

Gaseous formaldehyde can be used to decontaminate air spaces, equipment that must be kept dry (such as electronic devices), and the insides of motor vehicle cabins. However, the conditions must be carefully controlled in terms of gas concentration, temperature, humidity, time of contact and even distribution of the gas. Under emergency conditions on a contaminated property, it is unlikely that all parameters can be controlled adequately. In addition, the space to be decontaminated must be **completely** sealed to prevent gas escape as the most effective 'dwell' time for the inactivation is an overnight period (Quinn 1991). Other problems with the use of formaldehyde gas for general purposes include the toxicity of gas; the dangerous nature of its generation in non-laboratory conditions (potassium permanganate reacts violently with formalin); the environmental protection guidelines that prevent the release of formaldehyde gas to the atmosphere; and the difficulty of completely purging residual formaldehyde gas from confined spaces.

In general, unless no alternatives are available, the use of formaldehyde gas on rural properties is not recommended.

Unfortunately, no satisfactory alternative to formaldehyde for gaseous decontamination is available. Use of ethylene oxide or hydrogen peroxide for gaseous decontaminations must be restricted to carefully controlled laboratory environments.

For decontamination of vehicle cabins and electronic equipment on a farm, a clear-cut answer is not possible. A methodical and systematic approach based on first principles may have to be substituted. Cleaned vehicles and other machinery left in quarantine for a week in bright sunshine are likely to decontaminate naturally with respect to most pathogens. Because the parameters for effective formaldehyde decontamination are so difficult to establish on a farm premises, formaldehyde gas is unlikely to produce an absolute result or to be significantly more effective than thorough cleaning. Where gaseous decontamination of equipment or machinery is considered to be unavoidable, specialist advice should be sought (eg from the Australian Animal Health Laboratory), and the contaminated equipment kept in quarantine until that time. Further information on the practicalities of using formaldehyde gas are given in Appendix 3.

Table 4 shows which disinfectant should be used for inactivating each category of virus and what dilutions/concentration should be used.

3.2.6 Insecticides

Insecticides are used for control of insect vectors that carry exotic animal disease. For more information on vector control see each relevant AUSVETPLAN **Disease Strategy, Section 2.2.11**.

Insecticides are also used for control of larvae in screw-worm fly and to deter further adult fly oviposition. For more information on this see the **Screw-worm Fly Disease Strategy, Sections 2.2.4 and 2.2.8.**

Table 4 Recommended disinfectants and concentrations for inactivation of viruses

Disinfectant group	Form[1]	Strength[2]		Contact time[4]	Applications and virus category
		Usual dilution	Final[3]		
Soaps and detergents:	solids or liquids	as appro-priate		10 min	Thorough cleaning is an integral part of effective decontamination. Use for Category A viruses.
Oxidising agents:					
Sodium hypochlorite NaOCl	conc. liquid (10-12% available chlorine)	1:5	2–3% available chlorine (20,000 - 30,000 ppm)	10–30 min	Use for virus Categories A, B and C. Effective for most applications, except when in the presence of organic material. Less stable in warm, sunny conditions above 15°C.
Calcium hypochlorite $Ca(OCl)_2$	solid	30 g/litre	2–3% available chlorine (20,000 - 30,000 ppm)	10–30 min	
Virkon®	powder	20 g/litre	2% (w/v)	10 min	Excellent disinfectant active against all virus families.
Alkalis:					
Sodium hydroxide	pellets	20 g/litre	2%(w/v)	10 min	Very effective against virus Categories A, B & C. Do not use in the presence of aluminium and derived alloys.
Sodium carbonate – anhydrous (Na_2CO_3)	powder	40 g/litre	4%(w/v)	10 min	Recommended for use in the presence of high concentrations of organic material.
– washing soda ($Na_2CO_3.10H_20$)	crystals	100 g/litre	10%(w/v)	30 min	

contd.....

Disinfectant group	**Form[1]**	**Strength[2]**		**Contact time[4]**	**Applications and virus category**
		Usual dilution	**Final[3]**		
Acids:					
Hydrochloric acid	concen-trated acid (10 Molar)	1:50	2%(v/v)	10 min	Used only when better disinfectants not available. Corrosive for many metals and concrete.
Citric acid	powder	2 g/litre	0.2% (w/v)	30 min	Safe for clothes & body decontamination. Especially useful for FMD virus decontamination.
Aldehydes:					
Glutaraldehye	concen-trated solution	as appro-priate	2%(w/v)	10–30 min	Excellent disinfectant effective against virus categories A, B & C.
Formalin	40% formal-dehyde	1:12	8%(v/v)	10–30 min	Disinfectant releases irritating, toxic gas.
Formaldehyde gas	Special generation required			15–24 hours	Toxic gas, recommended only if other methods of decontamination cannot be used.

Notes:

1) Commonly used general disinfectants such as phenolics and quaternary ammonium compounds are very effective antibacterials, but have limited effectiveness against Category B and C viruses, and are not included in Table 4.

2) Products effective for decontamination of viruses on the hands and the skin are limited. Virkon® is reported to have low toxicity and to be effective against members of all 17 virus families but it has not been approved for use on skin. Alternatively, citric acid or sodium carbonate may be added to washing water to induce antiviral conditions by lowering or raising the pH as appropriate for the agent to be inactivated.

w/v = weight/volume (ie 2g/100mL)

1 usual form supplied
2 recommended working strength
3 final concentration
4 required contact time for inactivation of disease agents

Estimation of quantities required

The amount of decontaminating agent necessary for particular jobs varies considerably. For a polished, non-porous floor, 100 mL of disinfectant/chemical applied per square metre is probably sufficient. However, for porous surfaces such as concrete or wood, the volume may need to be doubled or tripled. Generalisations are not useful as application of liquids to ceilings or vertical walls cannot be well controlled.

It is most important to remember that, after having cleaned the surface, the time of contact is of critical importance. For most applications, disinfectant must flood the surface and keep it thoroughly wet for at least 10 minutes.

3.3 Safety precautions

3.3.1 General safety precautions

First aid boxes must be available on every infected premises (IP)/dangerous contact premises (DCP) or where hazardous chemicals are being used. It is essential to brief workers and the property owner on safety aspects before commencing operations, including the potentially harmful effects of chemicals on animals, humans and the environment.

The usage of any chemical or equipment should conform to the manufacturer's instructions and safety standards. All officers and workers must carry out their duties in accordance with current health and safety legislation. All accidents which require medical attention, however small, must be logged with details reported back to the LDCC.

3.3.2 Acids and alkalis

When diluting concentrated chemicals, the concentrate should ALWAYS be added to water, NEVER water to concentrate. Do not mix acid and alkali disinfectants. Apart from the resulting chemical reaction, the effectiveness of both chemicals is nullified. Contact with concentrates on exposed skin will cause severe burning. All workers engaged in mixing or applying disinfectants must wear boots, overalls, goggles and head covering for protection. Use a full face guard when applying the diluted chemical. Avoid the danger of inhalation by NOT applying a MIST spray.

If contact occurs:

- wash with copious amounts of water immediately;
- apply vinegar to caustic alkali burns OR apply bicarbonate of soda to acid burns; and
- refer for hospital treatment if necessary.

Eye damage should be irrigated copiously with eye wash solution and referred to hospital. Store concentrate containers in one place on the property away from the main area of work in order to remove the danger of containers being ruptured inadvertently. Check the containers each day for spillage of concentrate.

3.3.3 Aldehydes – formalin, glutaraldehyde and formaldehyde gas

These disinfectants should be used **only** when no alternatives exist, and then only by experienced personnel with appropriate safety equipment. **Gaseous formaldehyde** is applicable to:

(i) **all** enclosed spaces which can be made airtight (for example, grainbins, electrical fuse boxes covered in plastic);
(ii) as (i) which contains electronic or electrical machinery;
(iii) delicate equipment which can be enclosed in a plastic 'tent' and fumigated;
(iv) for some heavy machinery vehicle cabins; and
(v) poultry incubator rooms and egg rooms.

The safety of the operator is of greatest importance and the method of use of formaldehyde is based on the safety aspects (see Section 4). These substances **can kill operators and even small amounts** can have a detrimental effect on all living tissue. If the chemical enters the eye, any wound or abrasion it is extremely painful. The fumes damage all mucous membranes. Always wear a **protective face guard** when mixing.

This method should only be used when it is impossible to use other procedures. Warning notices should be fixed to the entrance of an area being fumigated. There should be two people involved in the operation — both equipped with **full face respirators** effective against formaldehyde gas.

3.3.4 Special considerations when using disinfectants

Table 5

DISINFECTANT	HEALTH ASPECTS	ENVIRONMENTAL PROBLEMS AND CONTRA-INDICATIONS
Hypochlorites	Toxic for eyes and skin	Strong bleach. Inhibited by high concentrations of organic matter. Corrosive for many metals.
Virkon®	Reasonable care necessary	
Sodium hydroxide	Caustic for eyes and skin	Avoid contact with strong acids. Cannot be used on aluminium or like alloys.
Sodium carbonate	Mildly caustic for eyes and skin	Avoid use with aluminium and like alloys.
Hydrochloric acid	Toxic for eyes, skin and respiratory passages	Corrosive for many metals and concrete. Avoid contact with strong alkalis.
Glutaraldehyde	Avoid eye and skin contact	
Formalin solution	Releases toxic gas; irritating for mucous membranes	
Formaldehyde gas	Very toxic for mucous membranes in concentrations down to 2 ppm	Cannot be used in presence of water, hypochlorites or chlorides. Cannot be released to atmosphere without neutralisation. Corrosive for some metals.

ppm = parts per million

4 BATTLEFIELD STRATEGY – disinfection procedures

4.1 Personal decontamination

The aim of personal decontamination is to safely remove any contamination of the body or clothing. The process minimises the risk of cross-contamination so that people can confidently remove themselves from a contaminated environment with nil/minimal dissemination of the disease organism. These procedures MUST be rigorously applied.

Heavy personal contamination may occur while working on infected premises or dangerous contact premises and when active disease is found by diagnostic and surveillance teams.

The heaviest contamination will occur:

- when living infected animals are physically inspected;
- when slaughtered animals are physically inspected and diagnostic samples taken;
- at the slaughter site on an IP or DCP;
- at the site of carcase disposal; and
- when removing the manure, bedding and detritus from buildings which housed infected stock.

4.1.1 Personal decontamination site

A site designated for personal decontamination (PDS) will be arranged near the exit point from an IP or DCP. This site may be moved further into the IP as necessary during decontamination. The site supervisor will be responsible for selecting the area.

Critical inspection and questioning of the owner/manager of the property will determine the extent of property contamination with regard to animal and effluent contact. The PDS will be placed on the limit of this contamination or in an area that can be easily and safely disinfected. It should allow for future expansion and may be in use over a considerable period of time. Once determined, the site area should be sprayed with a disinfectant applicable to the disease. It must be possible to leave the IP directly from this PDS without becoming recontaminated. Ideally it should be on an impervious surface and include a building with water and drainage supply. The building should not have been previously used by animals or have been grossly contaminated. If there is no hard standing available a plastic ground cover 10 metres by 10 metres can be used. Hessian sacking and star pickets round the area can be used to maintain privacy for changing. Each person should have a clean change of clothes kept in plastic bags or in the caravan at the outermost point of the area with a store of clean overalls in case of mishaps.

Other more effective equipment for personal decontamination are State/Territory emergency service shower vans and, in cold climates, two room vinyl marquees can be used for shelter, washing and privacy.

Consideration must be given to any sloping ground. Run off water from the contaminated area *must not* flow to the clean area. If no adequate drainage is available, a pit must be dug as soon as heavy machinery arrives, to ensure no effluent escapes beyond the decontamination site.

4.1.2 Personal decontamination – procedure

The following procedures will apply to ALL personnel before leaving an IP or DCP or any quarantined area which is grossly contaminated with the disease organism.

On arrival at the decontamination site a disinfectant solution safe for skin contact should be ready in buckets which is used throughout the operation. Antiviral disinfectants effective against all virus families and *approved for use on human skin* are *not* available. Therefore, warm soapy water is recommended for washing face, hair, skin, etc.

Alternatively, the pH of the washing solution can be raised (by adding sodium carbonate) or lowered (by adding citric acid) to enhance antiviral action, the latter being recommended for the decontamination of foot-and-mouth disease virus (Table 4). If other skin decontaminants are used, care must be taken to ensure they are effective against the virus of concern as many brand products containing quaternary ammonium compounds or phenolics are *not active* against Category B viruses.

Heavy gauge plastic garbage bags are used for disposable items which can be buried or burnt on the site or for items to be removed from the site for further disinfection and cleaning.

Industrial hard hats must be scrubbed and set aside. If a neck cloth is worn, it must be removed and soaked in disinfectant (eg 1% Virkon® for 10 minutes), wrung out and placed in a plastic bag. Hair should be washed/sponged down with a shampoo. Disposable gloves must be decontaminated before discarding; reusable gloves are decontaminated before reusing. Hands must be washed in disinfectant and scrubbed.

Plastic overalls

Using a sponge or low pressure pump, wash the overalls from top to toe to remove gross material paying particular attention to the back, under the collar, zip and fastenings and the inside of pockets. The jacket is removed and then placed in disinfectant. The trousers are treated similarly paying attention to crutch, pockets and the inside of the bottom of the trouser legs. The trousers are then removed, inspected and placed in disinfectant. Wellington boots are scrubbed down, particular attention being paid to the sole.

If the person is returning to the site the next day, hat, gloves and plastic overalls are removed from the disinfectant and can remain on site. If the person is not returning, the equipment is placed in plastic bags, and the outside of the bag disinfected. The person then walks across the area, treats the soles of the boots again, changes into street shoes and leave. If underclothing has been soiled especially above boot level, it must be removed and placed in a plastic bag, the skin washed and a clean pair of overalls used for leaving the site.

Cotton overalls

Wear minimal underclothing and always carry clean spares. If it is cold, wear two sets of overalls. If possible use thigh length fisherman's waders. The waders/boots are cleaned, with special attention to the soles, and removed. Overalls are simply removed, soaked in disinfectant, squeezed out and placed in a plastic bag for removal. Underclothes are similarly treated. The body is washed down. The person then walks across the area, washes feet in a footbath, changes into clean overalls and street shoes and leave directly without re-exposure to contaminated areas.

The plastic bags containing used overalls and other articles are sealed and given a second wash down in disinfectant and then placed at the outer limit of the area for collection by courier. These are then taken for cleaning. These garments should be autoclaved or treated

as contaminated clothing in a hospital laundry. It is a requirement of the LDCC resource personnel to provide a sufficient daily supply of clean overalls to the work site.

On returning to home or lodgings, the person should have a long hot bath or shower.
If people are leaving an IP or DCP for other duties they must not have contact with susceptible stock for a period of time as directed by the LDCC.

4.1.3 Personal decontamination in difficult circumstances

Visitors on properties where disease is suspected

It is possible that when a disease is suspected on a property, there will be visitors or private veterinarians present. Every argument must be used to ensure that these people remain on the property until a departmental officer arrives.

Visitors who have to leave a suspect property

There is no legal requirement which can force a person to remain on a property, but an inspector of stock can direct any person to undergo disinfection if they wish to leave the IP. If the person refuses they could face prosecution. If an individual has to leave a suspect property, before a departmental officer can reach the scene, or has to leave the property to report a suspect disease and there is enough circumstantial evidence to suggest that an exotic disease could exist, then common household chemicals can be used to reduce the likelihood of disease transmission.

These circumstances are more likely to arise in extensive area properties where communications could be difficult. The following information and advice can be given over the telephone.

- Name, address and occupation of the person concerned.
- Assess the degree of contact between the person and suspect disease.
- Advise a change of clothing and borrowed clean clothes if possible.
- The contaminated clothes to be placed in a plastic bag for appropriate decontamination.

Use of the following substances as personal disinfectants **can be recommended where no other approved disinfectant is available:**

- domestic washing soda (10 parts in 100 parts hot water);
- soap (or household detergent) and hot (60°C) water for scrubbing; and
- household concentrated *chlorine* bleach (1 part in 3 parts water to give 2–3% available chlorine). *This is not to be used on hands, face or skin.*

Any area of the body and parts of the vehicle contaminated with animal matter should be washed down using one of the above solutions. The person must not contact any animal and must be questioned in detail regarding movement from the time of contact with suspect disease to the time the officer requests the information. The person should be requested to dry clean/wash clothes on arriving home and to have a hot bath or shower. There must be no visits made to properties with livestock until the situation has been resolved. If the suspect property proves positive, the person will be directed to present the vehicle for appropriate decontamination.

Accident cases from an IP or DCP

The level of initial decontamination of a person injured while on an IP will vary with the extent of the injuries. Obviously, a human life must not be prejudiced and every care taken to minimise discomfort or pain.

If a risk of contamination is deemed to exist because of incomplete personnel/vehicle procedures, in an emergency situation, the LDCC must be informed and an officer dispatched to the ambulance destination. Hospital authorities should be informed of the risk and appropriate personal disinfection of the patient carried out as circumstances permit. Personal protective clothing worn by the casualty must be secured in plastic bags and any area thought to be contaminated, washed with approved disinfectant. The ambulance wheels, underside and interior should be washed with approved disinfectant. Personal clothing and boots of the ambulance attendants should be removed for dry cleaning and disinfection if they had to enter the IP or DCP.

4.2 Property decontamination

The IP site supervisor must ensure effective property decontamination, including decontamination of people, equipment and vehicles (*see* **Control Centres Management Manual Part 2, Role descriptions, IP 1**).

Efficient and effective property decontamination will only result from:

- a presumptive identification of the suspected exotic disease;
- assessment and recording of the contaminated areas, animals and articles;
- the selection of the most suitable decontamination techniques for each item and area;
- the acquisition of necessary equipment and materials and recruitment of personnel to undertake the tasks; and
- the adoption of an appropriate strategy.

The following regime is recommended.

1) Inspect the IP or DCP and prepare a map of the property.
2) Start a log book to record all events and recordings.
3) Indicate areas NOT requiring special decontamination action.
4) Indicate areas or sites requiring specific decontamination action (consult with the officers-in-charge of slaughter, disposal, and epidemiology).
5) List the proceedings to be undertaken in chronological order within each area.
6) Estimate a time-frame for the decontamination program.
7) Seek approval from the LDCC operations manager for the proposed program.
8) Implement the agreed decontamination plan, maintaining liaison with the IP operations manager at the LDCC and submitting a daily progress report.

The composition of a typical property decontamination program is listed as follows:

- presumptive identification of the disease agent
- property assessment
- preliminary disinfection
- first clean-up
- first disinfection.
- first inspection
- second disinfection
- final inspection

Continuous close liaison with the owner/manager is essential to achieve an effective program.

4.2.1 Property assessment

The initial property assessment must be detailed thoroughly. This assessment will be used throughout the decontamination process. Mark relevant details on the property map. Identify overhead high tension electricity power poles and lines, underground cables, telephone lines, electricity fuse box, power points and meter. Where applicable, **read the electricity meter** and note the reading for compensation at a later date. Identify the water supply and outlets with the quality and quantity of the supply. Where applicable, **read the water meter** and note the reading for compensation at a later date. Where necessary identify underground water pipes. Locate and mark all DRAINS and their run-off. Any drains which run free must be blocked with hessian or plastic bags and only allowed to run when the effluent has been thoroughly mixed with disinfectant. If effluent is running freely into creeks etc arrange to dig a pit or dam across the drainage line. **Where possible, check water authority drainage maps to determine subsequent flow of effluent.** If the drainage is to a septic tank, examine the tank, estimate the spare capacity and note this down. If the tank is full, block the drains.

Examine the DECONTAMINATION SITE. If a temporary one has been set up, it may require moving because of the potential increase in traffic or effluent overflow. The site must be delineated and disinfected. Detail an unloading area, outside the decontamination area where materials and equipment can be unloaded without having to decontaminate a vehicle. Detail an area where the workforce will eat or have tea breaks. There should be provision for heating water and preferably cover or shade, but NOT at the decontamination site.

Estimate the degree of contamination within the DWELLING HOUSE and its immediate surrounds. Detail disposal and/or cleaning to be done within the house to remove all source of contamination. Special attention should be paid to verandahs and office. If it is possible, and without prejudicing disease control, detail a decontamination procedure to allow the household to safely move off and on to the premises. This will depend on the siting of the house and the possibility of disinfecting to a point outside the designated contaminated area.

Arrange for 'INFECTED PREMISES' notices to be posted at the entrance to the property.

On intensive piggeries and poultry farms, turn off all extractor fans. **This is particularly important for disease agents that are easily dispersed as aerosols such as foot-and-mouth disease virus and Newcastle disease virus.**

Assess the amount of animal effluent to be removed for disposal. Assess the amount of food that will be needed for the animals. It may be necessary on welfare grounds to arrange delivery of more food before disposal of stock is completed. The delivery vehicle must be decontaminated before leaving.

Detail structures and articles that cannot effectively be decontaminated, such as wooden buildings, floors, doors and linings, roof insulation and cattle yards (timber). Assess the degree of contamination of non-animal areas — machinery sheds, workshops, grain and food stores. Assess the likely contamination of animal feed; open sacks of food, loose grain stores, hay and straw stacks especially if under-run with animal effluent. Detail specialist electrical and electronic equipment requiring decontamination with advice from electrical contractors. On extensive properties, designate an area at the airstrip as a small decontamination site for the pilot and any essential visitors. This can be a scaled down version of the decontamination site.

4.2.2 Preliminary disinfection

The aim of preliminary disinfection is to rapidly reduce the amount and distribution of the infective agent on the IP or DCP up to the time of the completion of slaughter and disposal when thorough disinfection can be undertaken.

Preliminary disinfection should be commenced as soon as possible after the presence of disease is confirmed on the property. Any area known to be contaminated is sprayed with disinfectant solution, thus reducing the chances of inadvertent spread of the infective agent. When the disease agent has the capability of airborne dissemination the importance of pre-slaughter spraying cannot be overemphasised. The process should continue area by area until the first clean-up operation starts. Particular attention should be paid to the roadway for entrance/exit of property for vehicle access, overflows of animal effluent onto roadways or tracks and dwelling house surrounds.

Slaughter site

This area should be disinfected at every long break—probably 5 times a day. This should include buildings and pens housing animals, and, as the animals are successively removed for slaughter, the area they occupied.

Disposal site

This area must be decontaminated thoroughly but only when disposal has been completed as wetting some soils makes traction difficult and would cause problems with vehicles on the site.

Allow all heavy machinery to return to a central point in the IP. Heavy machinery not required on the property after completion of carcase disposal must be carefully disinfected. Spray along the track to the disposal site and follow with a heavy spray where carcases have been slashed open. Where carcases are burnt, the spraying will have to wait until the fire has died down. When all the animals have been destroyed, any wood used for temporary slaughter pens must be buried or burned. All metal gates and panels at the slaughter site are to be scrubbed down with disinfectant and stacked for complete disinfection. The slaughter site can then be thoroughly decontaminated.

Rodent control

While the preliminary disinfection is being carried out, the IP site supervisor will arrange with the LDCC for the laying of baits for rodent control, if this is thought necessary to limit the spread of disease. This must be carried out before there is movement and/or disinfection of food stores.

4.2.3 Clean-up process

The aim of the clean-up process is to **remove all manure, dirt and debris and contaminated articles** that cannot be disinfected. The surfaces of all buildings, pens, fittings and equipment must be exposed ready for the first disinfection. This is the most important phase in the decontamination procedure because the presence of organic material reduces the effectiveness of disinfectant.

Encrusted dung, dirt and grease shield the underlying permanent surfaces from the effect of the disinfectant. Remove large accumulations of faeces, litter and bedding. Avoid the use of water or disinfectants at this stage. This material will have been lightly disinfected at the preliminary disinfection. This minimises the volume and weight of runout to be handled. The easiest method of disposal of solid and semi-solid faecal material is burial. When animal

houses have been cleared of dung, start cleaning the building from the roof working downwards.

All old insulation material (polystyrene, fibreglass and press boards) are removed for burial or burning unless they have sound impervious surfaces which can be effectively decontaminated. All unsound, rotten and underrun wooden fittings and flooring and other structures which cannot be effectively disinfected should be removed for burning or burial. Remember all material destroyed must first be valued. All fixtures and fittings should be dismantled and stacked for cleaning and disinfection. All delicate electronic equipment must be protected for later specialist treatment.

Earthen floors in buildings may need to be broken up and soaked in disinfectant. Concretions and encrustations of material on permanent surfaces are removed. This is most easily achieved by low pressure spraying with water, or water and detergent, using steam cleaners or scraping with hand tools. Particular attention should be paid to corners and wall/floor junctions. The surfaces are then washed down using a high pressure system and plain water. All permanent surfaces must be free of visible contamination. All feedstuff considered contaminated must be removed and buried after valuation. Feeding and water troughs are emptied and cleaned out.

4.2.4 First full disinfection

The aim of the first disinfection is to inactivate the disease agent using physical and chemical agents. **The necessity for any disinfection depends on the disease agent involved.** This process must be carried out in a systematic fashion to ensure that areas which have been disinfected are *not* recontaminated by people or machinery. **A recommended order of cleaning is: roof – wall – floor, and this should be adopted in each building.** When the disinfection of each building or area is completed it should be cordoned off with marking tape. Once an area is dry it will not be obvious where the disinfected area starts and finishes.

The disposal site is periodically inspected. Burial pits will emit large quantities of noxious gas and fluid. Once this emission has stopped, the ground around the site is broken up and liberally soaked with disinfectant. Treat cremation sites the same. Care must be taken to disinfect personnel, machinery and vehicles close to the site and not allow recontamination of previously disinfected areas near buildings.

4.2.5 First inspection

Depending on the disease agent involved, this may be the only inspection. The aim of the first inspection is to ensure that all tasks which were detailed on the property assessment have been performed. The property is inspected by the IP site supervisor from the LDCC.

Important aspects to be checked are that:

- all contaminated woodwork not able to be cleansed and disinfected has been completely disposed of;
- all fixtures and fittings have been dismantled where appropriate so that no organic material is left behind them;
- there are no observable encrustations on any exposed surface;
- all contaminated feedstuff has been destroyed, and remaining material made safe;

- all grossly contaminated sites (slaughter and disposal) have been effectively cleaned and disinfected;
- all fluid that has been disinfected has been released into drains or septic tank;
- the conditions of quarantine, especially at exit/entry points, and warning notices are being maintained.

4.2.6 Preparation for second disinfection

There can be a potential residue of contamination particularly under old cracked concrete and under rundown buildings.

Areas of underrun or loose concrete should be examined carefully and a cost assessment made whether they are to be re-rendered, repaired or the area destroyed. Earthen pathways and walls of animal houses which are constructed of porous brickwork or 'breeze block' should be similarly inspected and assessed.

If repair/re-rendering work is done, a written agreement with the owner on the work to be done must be obtained before any work is commenced.

4.2.7 Second full disinfection

The work detailed must be finished or in such an advanced stage of progress that it will not hinder the second disinfection process.

The second disinfection is a repeat of the first and can be started approximately 14 days after the first disinfection, depending on the disease agent involved and provided no rendering work needs to be done.

4.2.8 Final inspection

This inspection is carried out in the same way as the first inspection. The premises must be meticulously inspected **preferably by an experienced officer not previously involved in an earlier inspection.** If there are any doubts, then work must be repeated. If there are no questionable areas, the workforce is removed from the premises. All equipment and personnel are finally disinfected at the decontamination site before removal. If the final inspection is satisfactory, reconstruction work can be carried out and the premises made re-habitable for stock. The premises are left empty for a prescribed time before restocking with sentinel animals, depending on the specific disease strategy.

4.2.9 Restocking sentinel animals

Depending on the local disease situation, sentinel animals may be allowed back into the premises at a time determined in accordance with the relevant disease strategy. They must come from a disease-free area of the country. The sentinel animals must be inspected by a departmental veterinary officer before loading. The sentinel animals will be housed in those areas that had the highest degree of contamination.

The vehicle and driver will be disinfected when leaving the receiving property. **This is because the driver may have further contact with other animals and if there has been any breakdown in decontamination, the consequences would be serious.**

The animals will require regular clinical inspection. The officer doing the inspection must disinfect off the premises at each visit. If there is no sign of disease at the end of the sentinel

period, the premises are declared free of disease and quarantine lifted, depending upon any local disease control measures in force at the time.

4.3 Vehicle and machinery decontamination

Contaminated cars, livestock, animal feed or product haulage vehicles with their drivers carry a disease dissemination risk. The first priority is to ensure no vehicles leave the IP without thorough decontamination. A second priority in any disease outbreak is to trace urgently vehicles that have been in contact with the disease agents — taking them off the road and decontaminating them thoroughly. Inquiries should be made about the origin and occupation of the travellers and any contact they may have had with livestock.

Most vehicles should remain off IPs or DCPs. If the numbers of vehicles warrant it, a local area with a hard standing, drainage and a good water supply should be designated as a local vehicle disinfection station. A carwash facility is ideal for decontamination of surveillance vehicles if one is conveniently located. A carwash can do the job quickly and more effectively than a team of people and has the advantage of being able to wash under vehicles very easily. Although this cleaning may be unnecessary from an epidemiological point of view, it is very effective public relations to have clean vehicles visiting suspect private properties.

Vehicles can be divided into four broad categories:

- those that do not need cleaning and disinfection;
- those that need the wheels cleaned only;
- those that need the outside cleaned only; and
- those that need both outside and inside cleaned.

4.3.1 Cars

Any rubber floor mats on the driver's side should be removed for scrubbing with disinfectant. The dash board, steering wheel, handbrake, gearstick and driver's seat should be wiped liberally with appropriate disinfectant. If the boot *is considered contaminated*, the contents must be removed and the interior of the boot wiped with disinfectant. The contents of the boot must be treated similarly before being replaced. The wheels, wheel arches and undercarriage of the car should be sprayed with disinfectant — NOT plain water. The vehicle wheel arches, wheels and bodywork should be sprayed with a non-paint corrosive disinfectant.

Plain water is not to be used with power hoses because the process will release contaminated aerosols of the pathogen. A mixture of disinfectant and water should always be used with power hoses. Cleaning heavily contaminated vehicles would only be done on the infected rural IP as most cleaning processes, including power hoses, spread the infectious agent.

Cleaning using disinfectant/soap and water with *brushing* to dislodge encrusted dirt and organic matter is preferable to washing with strong water streams. Caustic soda should not be used on paintwork.

4.3.2 Livestock vehicles

All solid debris should be removed from trailers and the like. The vehicle is then soaked in disinfectant using a detergent, and scrubbed down to bare metal or wood.

When the crate structure of the trailer has been decontaminated, the crate should be lifted free from the body, the undersides of the stock crates and where the crate was sited on the trailer, decontaminated. The vehicle must be closely inspected to identify if there is a double layer. If this is so, the top layer of metal tread plate or wood must be removed to reach areas where contaminated material could be trapped. Any metal flooring which appears solid must be weight tested to ensure welding is not cracked and that there is no rubbish under the flooring. Some trailers may carry extra equipment under the body — this must be treated. The outside dual wheels and spare wheels must be removed to ensure:

- adequate decontamination of wheel hubs; and
- to inspect the spare wheel hangers which can be of hollow construction and therefore could hold contaminated material.

The driver's cabin and, where fitted, the sleeping compartment must be thoroughly cleaned and decontaminated. Enquiries should be made of the driver as to what clothing and boots s/he was wearing when in contact with suspect stock. These articles must be identified, decontaminated and arrangements made for dry cleaning where applicable (see Section 4.1.2).

All animal faecal matter and bedding must be removed. All water, feedstuff and litter carried in the vehicles must be disinfected and burnt or buried. All fixtures and fittings must be dismantled to ensure that infected material has been removed. All surfaces must be cleaned down to metal and then disinfected. Any wooden surfaces must be cleaned and disinfected where appropriate or valued before removal and destruction. The wheels, wheel arches, bodywork and undercarriage must be cleaned of detritus and disinfected. The drivers cabin and sleeping compartments also need to be cleaned and disinfected. It is common practice for specialised vehicles to be self-contained with water, food and litter supplies for the animals.

If the vehicle is known to have carried diseased or suspect stock, then every effort should be made to identify the area of disposal of these materials if they have been removed before departmental officers have identified the vehicle as being contaminated. Once identified, these materials must be disinfected and disposed of by burial or burning.

Other livestock-carrying vehicles can include horse boxes (single or multiple), vehicles carrying stud and show stock and racing pigeon carriers. For any vehicle known to have carried stock susceptible to the disease organism, the principles of vehicle and trailer decontamination are the same.

4.3.3 Milk tankers

These vehicles can become contaminated and disseminate the disease organism in the following ways:

- picking up infected milk from a dairy farm, while the disease is incubating;
- allowing a contaminated aerosol to be released from the milk store; and
- mechanical means (by vehicle and driver).

Disinfectants used within the tank must be those which do not leave a ‘taint’. Every dairy factory will have a disinfection point for tankers/drivers and an approved disinfectant against the disease organism. The vehicles must be cleaned and disinfected at the end of each day.

When picking up milk in a control area, tankers must be disinfected off any potentially contaminated area, paying particular attention to wheels and hose inlets. The tanker exhaust vent must be fitted with hydrophobic membrane-type filter elements rated at 0.2 µm. The filter elements should be selected to permit air displacement flow rates during tanker emptying and filling without exceeding tanker vessel design pressures. Filter housings should be selected to permit cleaning and decontamination in place. Filter housing outlets should be protected against the ingress of rain, hose down water and insects.

Any spillage of milk must be disinfected. The drivers must disinfect themselves off each property. If the disease does not affect cattle, the decision to allow a milk tanker into a mixed animal enterprise will depend on:

- amount of spare capacity in the bulk tank;
- the level of decontamination achieved on the property; and
- the opinion of the IP site supervisor.

The vehicle and driver must be decontaminated before leaving.
If it is determined that the tanker is carrying infected milk, the volume of milk is determined, the milk mixed with the correct strength of disinfectant using a disc plunger, left standing for one hour and then discharged to a drain or pit. The interior of the tanker must be decontaminated along with all hoses and fittings. Principles of vehicle decontamination discussed previously must be observed (see the **Dairy Industry Enterprise Manual** for further details).

4.3.4 Animal feed delivery vehicles

The visits of feed delivery vehicles to an IP or DCP will be identified from the epidemiology report. The path of the vehicle through the IP or DCP must be traced and the degree of contamination of vehicle and driver ascertained. When the vehicle has been determined to have visited another property, the path of the vehicle and driver and the area of possible contamination and contact with susceptible animals must be traced. When a suspect vehicle has been detained, decontamination will require removal of all encrusted material in wheel arches, wheels and the underside of the body, and depending on the degree of contamination of the driver, his or her clothing, boots and cabin.

An epidemiology report could identify bulk or bagged food material of animal origin, eg meat and bonemeal which has been carried by the vehicle, as being contaminated. Residual food material in the vehicle must be sprayed with disinfectant and removed for disposal. The inside of the bulk trailer must be decontaminated with approved disinfectant.

If it is necessary on animal welfare grounds or in a mixed animal enterprise to allow a food vehicle onto an IP or DCP the route within the IP or DCP should be specified to the driver so as to minimise contamination of the vehicle. The vehicle and driver must be thoroughly decontaminated before being allowed to move off.

Wherever practical, animal feed should be delivered to the outer limits of the property and then transferred to the animals without the vehicle or driver of the delivery vehicle becoming contaminated.

4.3.5 Vehicles at alternative disposal sites

Under extraordinary circumstances carcases, offal and other contaminated material may have to be moved off the IP or DCP for disposal elsewhere, if, for example the land area on the IP or DCP is limited or the topography is unsuitable or environmental factors preclude the use of normal disposal methods.

The transport vehicle body container will have to be drip proof, preferably with a rear opening, capable of tipping, and capable of being sealed at the top. If such conditions cannot be met, there must be a crane at the disposal site for lifting carcases out. The designated disposal site will be as close as possible to the IP or DCP and the access route determined as being of no danger to other susceptible stock. The disposal site will be designated as a quarantined area. The vehicle will be loaded using a suitable 'lift' crane/cargo net or front–end loader. Once the vehicle is loaded, the carcases or contaminated material will be sprayed with disinfectant. The driver and vehicle body, wheels and undercarriage must be decontaminated thoroughly before departure. The cover of the container must be strapped down tightly and decontaminated.

The journey speed must be limited to 40 km/hour. **This slow speed is recommended to minimise aerosol release.** A courier or police car must accompany the vehicle.

At the disposal site, there must be sufficient equipment, water supply, drainage and materials to decontaminate the expected number of vehicles. The facilities should be arranged at a specific decontamination site. Each driver and vehicle must be decontaminated before leaving the disposal site.

On completion of the exercise:

- all vehicles and equipment will be decontaminated off the site;
- the area of disposal will be soaked in disinfectant;
- the area will be securely fenced;
- after 21 days, the burial site will be revisited and the mound and surrounds disinfected again under supervision of a departmental officer; and
- quarantine will remain in force for a period to be determined by the LDCC controller.

4.3.6 Aircraft decontamination

Aircraft construction prohibits the use of a strong alkaline disinfectant such as caustic soda because of severe corrosion problems with metals such as aluminium.. A mild alkaline disinfectant suitable for use on aircraft is sodium carbonate with 0.1% sodium silicate. Care is required with specialised equipment within the aircraft.

NB Helicopters should not be used in close proximity to the IP where aerosol disease spread is suspected, for example, with foot-and-mouth disease virus.

4.3.7 Other machinery and vehicles used on IP or DCP

Heavy machinery used on an IP or DCP will be grossly contaminated. This includes:

- mechanised diggers for burial pits;
- bulldozers for pushing carcases;
- front-end loaders for carrying carcases, faecal and other material;
- tractors/trailers for carrying carcases, faecal and other material;
- cranes for carcase lifting; and
- chains hooks and cargo nets.

Such equipment must remain on the IP until needed elsewhere.

Once carcase disposal has been completed, machinery must be decontaminated. When the vehicle has been decontaminated, it is moved to the decontamination site and the tracks disinfected again. The cab must not be recontaminated when moved by the driver. All ancillary equipment will be treated similarly. The driver must be decontaminated. Where low loader vehicle transporters are required, they should NOT be allowed onto the IP. The vehicle leaving the IP should load outside the IP limits.

5 AREAS OF SPECIAL CONSIDERATION

5.1 Animal effluent

5.1.1 Slurry

The amount of spare space in the slurry tank will govern the course of action. Identify where the previous loads of slurry have been spread or disposed of, and the disease risk. If the slurry tank is almost full, an alternative pit can be dug (and if necessary lined with plastic sheeting) into which slurry can be pumped for treatment. Slurry pits may be underfloor tanks within buildings or tanks in the farmyard. Any covers should be removed.

Estimate the capacity of the tank. Use chemicals to modify the pH to <2.00 or >11.00 and test using universal indicators. Mix using a slurry tanker pump or agitator. Keep at the required pH for 7 days. Neutralise the mixture and spread on **non–grazed agricultural land**.

Safety

- Be aware that agitation of the material can release a mixture of carbon monoxide and dioxide, hydrogen sulphide, ammonia and methane.
- Explain safety aspects to workers. Only use as many people as necessary.
- **Never** have one person working in a tank on their own.
- Provide as much ventilation as possible if indoors.
- If necessary wear respirators, safety harness and lifeline. Slurry level should never be less than 30 cm from the top of the tank.
- Never trust the 'crust' on top of a tank to take weight.

Semi-solid slurry tanks

Often it is not feasible to liquefy this material. Most of the material will be non-infective. Add caustic soda 2% to the surface and allow to stand. Further additions of material to the tank must be treated before entry. Quarantine the tank for up to three months, depending on the disease agent involved.

5.1.2 Manure

If the volume is not great, spray with **an acid disinfectant, as manure tends to acid pH and this can be enhanced by acid treatments.** Note that hypochlorite has limited effectiveness in the presence of high organic loads.

Remove treated manure and bury in a pit.

5.2 Dairy equipment and milk storage tanks

There may be varying amounts of milk in bulk tanks on the IP or DCP. Depending on the disease the milk must be made safe with a disinfectant which is added to the milk and agitated. The milk is then held for 1 hour and then released into a pit — NOT into the slurry tank.

Milk from properties in a restricted or control area may be removed from the property provided the driver and vehicle are disinfected on leaving contaminated areas and the milk is subjected to appropriate treatment for the disease.

Milking machines

These machines need to be stripped to their components and then boiled or scrubbed with disinfectant. All instruments and gauges are removed from the milk lines and disinfected. The apertures are 'stopped' and all lines filled with non-taint disinfectant. This is left in contact for one hour. The joints of the pipeline are then loosened to allow seepage. The lines are then run through with plain water and then with chlorine dairy detergent.

5.3 Animal feed

There will be varying amounts of animal feed on the IP or DCP. Some may be unaffected, some safely decontaminated, and other feed may have to be destroyed. The destruction of large quantities of animal feed is expensive. Manual labour costs of treating the feed may outweigh the benefits of keeping it. Depending on the disease agent involved, keeping the feed or treating it may be judged as too great a risk to contemplate. However, most exotic viruses inactivate spontaneously with time and certain temperature and humidity conditions, thus in some cases feed can be quarantined for a period determined by epidemiology, then used again with confidence.

5.3.1 Hay and straw stacks

The length of time the disease has been present on the property will be determined from the epidemiology report. If it is a new stack, it may have been contaminated throughout by the footwear of workers while stacking it.

Designate a new stack area and start disinfecting it. As the new stack progresses — spray with 2% caustic soda . Leave for 30 days and then restack, retreat and again leave for 30 days. The material can then be spread on arable land. Wherever possible bury the material (see the **Disposal Procedures Manual, Sections 2.1 and 3.1**).

Given the amount of time and labour required to treat and restack, it may be more economical to destroy the whole stack and compensate the owner. The contaminated bales can be used by the disposal team, if appropriate. If the disease is affecting only one species of animal in a mixed enterprise, the stack may be used for bedding/feed until the time of the second disinfection.

5.3.2 Grain stores

There may be many tonnes of grain on a mixed farm enterprise. The owner/manager must be carefully questioned as to the likely degree of contamination on the floor before the grain went down. Also seek epidemiological advice as to the length of time the disease agent has been present. If no underlying contamination exists, remove approximately 7 cm of the surface of the grain and spray the new surface with disinfectant. The removed grain and scrapings are buried or burnt. Grain may sprout after this treatment or go mouldy, and this must be taken into account in the long term.

With bins of grain incorporated into home mixed rations, the floor of the bin can be easily contaminated by farm workers auguring out the last grain before refilling the bin. If this is found to be the case, remove the grain and destroy it.

5.3.3 Silos

Silos can hold many tonnes of grain or prepared feed. If it can be determined that there is or has been no disease contamination, remove approximately 25 kg of the contents through the chute. Wipe the inside and outside of the chute with disinfectant. Enclose the chute mouth with a plastic bag and secure it. When first disinfection is complete (see Section 4.2.4) spray the outside of the silo with disinfectant. Place two 25 kg sacks of a desiccating agent (calcium chloride "quicklime") in the top of the silo to preserve the contents. However, if epidemiological investigations suggest that a food supply is contaminated, the silo must be completely emptied, the contents buried and the inside and outside of the silo disinfected.

It may be feasible to use formaldehyde gas in this situation, depending on the construction of the silo outlet and whether it can be completely sealed (see Section 3.2.5 and Appendix 3)

5.3.4 Feed in sacks

Depending on the nature of the disease agent, opened sacks of feed or feed in hessian sacks may be deemed contaminated and destroyed after valuation. Porous sacks of feed should always be destroyed when the disease agent is easily transmissible or resistant. Porous sacks would in this case be considered high risk, as in the future the feed will be exposed directly to susceptible animals. Unopened paper bags can be wiped with disinfectant and restacked in an area which has been disinfected.

5.3.5 Silage clamps

Well made grass silage should have attained a pH of 3–4 but, usually, silage clamps above ground are close to the animals. Silage clamps should be left until first disinfection. Remove 30 cm of the face and top if it is not covered with plastic sheet and bury the scrapings. Spray the exposed surfaces with disinfectant ensuring that cross contamination does not occur with the workers doing the spraying. If the top is covered, estimate possible contamination at the edges of the sheet. If there are gaps, scrape the exposed area, remove the cover from the edges and spray with disinfectant.

When feedstuffs are being dealt with, it should not be policy to destroy everything. Considerable quantities of feed can be safely decontaminated. The decisions must be taken in consultation with the LDCC (see the **Control Centres Management Manual, Section 3**).

5.4 Specialist equipment on the IP and DCP

On some properties, there is equipment such as control panels, electronic gear, electric motors and computerised equipment, which could be damaged by some of the direct methods of decontamination previously discussed.

5.4.1 Electric motors and switchboards

If there is doubt, then consult an electrical contractor. Consider whether decontamination of such equipment is a priority activity. It is unlikely that covered electrical equipment will be heavily contaminated. Such items are best considered at the end of the decontamination process when specialists can be more readily consulted.

The most practical method of decontamination is to make an airtight ‘tent’ of plastic sheeting around the equipment or, if the equipment can be easily dismantled, all the separate items can

be placed in a small enclosed space for fumigation. Some items will be airtight in which case they can be safely decontaminated by wiping down with disinfectant.

The only other method is to use formaldehyde gas. However, serious consideration must be given to the practical and safety aspects of this procedure (see Section 3.2.5 and Appendix 3). Most exotic viruses will inactivate spontaneously with time. Exposure to sunlight may be a good option for complex equipment.

5.4.2 Radios, tape recorders and cameras on IPs/DCPs

Hand-held radios are useful on an IP. They enable efficient communication between officers in different areas of the IP who are performing integrated tasks. Tape recorders are used by some officers for recording epidemiology and property assessment data. They can also be used as a recording method for damage claims, after destruction of buildings. All the above can be used while secured inside plastic bags. Inexpensive waterproof cameras can be used to record lesions and symptoms.

When required to remove such equipment from the IP the following procedure must be carried out at the decontamination site:

- wipe over the plastic bag and then discard the bag;
- wipe over the body of the instrument with disinfectant; and
- replace in a watertight plastic bag for removal after the bag has again been disinfected.

There is a small residual risk of contamination. For the duration of the outbreak these items of equipment should only be used on specific IPs or DCPs.

5.4.3 Captive-bolt pistols and firearms

These items will be grossly contaminated. After completion of slaughter, the weapons should be scrubbed with disinfectant on the IP. When the weapon requires servicing, it is taken to a gunsmith in a disinfected plastic bag. The weapons should be stripped down for service. The gunsmith is made aware that the mechanism should be disinfected. When decontaminated they are serviced and re-oiled.

If the outbreak of disease includes a number of premises the weapons can be delivered to the next IP after disinfection enclosed in disinfected plastic bags.

5.5 Wool bales

There are three situations in a disease outbreak where wool and wool bales may cause problems:

- disease diagnosed at shearing;
- disease diagnosed after shearing; and
- disease diagnosed when wool bales have left the property and are in store.

5.5.1 Disease diagnosed at shearing

The property will be quarantined as an IP. The procedures detailed in this manual to deal with an IP will apply. Special considerations will be the decontamination of the shearing team, their equipment, vehicles and dogs, the disinfection of the team off the premises and their future employment and the disposal of wool.

5.5.2 Disease diagnosed after shearing

The epidemiology report will determine if, in some cases, the disease was present or not at the time of shearing. If wool bales are on the property, and it can be determined from the epidemiology report that the wool within the bales is not contaminated, then the requirement for decontamination would be a surface spray of the bales during FIRST and SECOND property disinfection.

When quarantine is lifted, the bales may be removed. If wool bales are on the property and it is determined that the disease existed at the time of shearing, the wool bales will be destroyed by burial. It is very difficult to burn wool or sheep carcases with wool.

5.5.3 Wool bales in store

When wool bales have left a property which is subsequently diagnosed as being infected, the LDCC veterinary investigations section will determine appropriate actions. If the wool within the bales is deemed to be contaminated, the destination of the bales will be traced and they will be removed from store, valued and destroyed.

If only the exterior of the wool bales is deemed contaminated, the bales will be identified in the store and sprayed with disinfectant along with neighbouring bales. Destruction may not be carried out because the risk associated with hemp and synthetic wool bales (even though perforated) is considered not to be as high as that of perforated sacks of grain that would be exposed directly to susceptible animals in the future.

APPENDIX 1 Equipment checklist

Personal equipment

Industrial hard hat

Knee length Wellington boots

Fisherman's waders

Plastic jacket and trousers

Cotton overalls

Neck cloth (hand towel)

Torch and batteries

Gloves – industrial
– disposable

Supply of citric acid (1kg in plastic container)

Short-handled scrubbing brush

Boot tray or bucket

Ear protectors

Heavy duty plastic garbage bags

Spare underclothes

Decontamination site — IP or DCP

2 plastic ground sheets (10 m x 10 m)

50 m hessian sacking

Star pickets

Caravan and portable shower units

50 m of 20 mm rope

6 x 200 L drums

Fibreglass water tanks to 2500 L

Water supply

Pumps eg Southern Cross or Davey Firefighting units

Hoses (spray attachments)

Disinfectant supplies (citric acid or sodium carbonate) as appropriate

Hand brushes – short and long handle

Boot trays

Buckets

Heavy duty plastic garbage bags

Spare cotton overalls

Property decontamination

Water supply

Portable pumps, eg Southern Cross, Firefighting pumps

Polypipe 50 mm

Fittings for pipe

Hoses

High pressure industrial pumps and lances

Fibreglass water tanks of sizes up to 2500 litres

200 L drums

Universal indicator strips

Supply of disinfectant
- citric acid
- sodium hydroxide
- sodium carbonate
- calcium hypochlorite
- soap and detergent

Flame guns and fuel

Fuel for pumps and engines

Generators

Arc lamps

Electric lead and connectors

Mechanical diggers

Bulldozers

Tractor and trailers

Front-end loaders

Vehicle-mounted boom spray

Shovels

Brooms

Forks

Crowbars

Hand tools

Plastic sheeting

20 L containers (metal)

Industrial gloves

Respirators

Perspex face shields

Ear protectors

Back pack sprays

Vehicle decontamination at LDCC

Road control points

Road and rail transport

Water supply and tanks for storage

Buckets

Detergent and brushes

Supply of citric acid
sodium carbonate
sodium hydroxide for rail transport

Sponges

Tools for dismantling floor – shovels, hand brushes, scrapers

Fire fighting pump

High pressure pump

Fuel for pump engines

Perspex face shields

Personal equipment

Lifting gear for crates

The equipment above will vary with specific circumstances.

Vertebrate pest control officers and vehicles

In addition to personal equipment listed in this appendix, officers should carry:-

Spade

Axe

Firearm and ammunition appropriate to target species

Water containers (90 L)

Fridge

Full face mask

Sponges

APPENDIX 2 Suppliers and distributors of disinfectants

This AUSVETPLAN document recommends disinfectants that are effective against viruses as most exotic disease agents of concern are viruses. It concentrates on well known chemical names rather than trade names.

The eight major disinfectants listed have been chosen for the following reasons.

1) They are effective against viruses in most of the conditions expected to be encountered on a property during an exotic disease outbreak.

2) Most are widely available from hardware stores as general-purpose chemicals (sodium hydroxide, sodium carbonate, hydrochloric acid), swimming pool disinfectants (sodium and calcium hypochlorite), or general laboratory chemicals.

3) Most are relatively inexpensive, the exceptions being glutaraldehyde and Virkon®.

4) Most are available in large quantities to facilitate use in large-scale outbreaks.

5) All are available as powders or as concentrated liquids to allow easy transportation to an infected property followed by appropriate dilution.

6) Most are effective as technical grade chemicals.

The table below gives suggested suppliers for the major recommended disinfectants. The list is rudimentary and operators responsible in regional areas will be in a better position to identify the best local suppliers.

DISINFECTANT/CHEMICAL	SUPPLIERS[1]
Citric acid	a, b,
Formalin (formaldehyde solution)	a, b,
Glutaraldehyde (aidal)	a, b, d
Hydrochloric acid (spirits of salts)	a, b, c[2]
Hypochlorites (calcium and sodium)	a, b,
Sodium carbonate[3] (washing soda)	a, b,
Sodium hydroxide (caustic soda)	a, b, c
Virkon®	e, f

1 Correct at January 2000; see names and addresses of suppliers below

2 This company provides a wide range of other chemicals

3 Soda ash (sodium carbonate) is the active ingredient in washing soda. Some forms of soda ash (eg. that labelled as 'washing soda') contain more water molecules than others, which makes them weigh more and be larger for a given number of sodium carbonate molecules — this means that you need to measure out a larger quantity of the hydrated form in order to get the same results (see Table 4).

Key for suppliers:

a. APS - Asia Pacific Specialities

Internet address http://www.apchem.com.au/locations_aus.html

Various distributors including the following branch offices:

NEW SOUTH WALES

15 Park Rd, Seven Hills NSW 2147	Tel (02) 9839 4000
	Fax (02 9839 4225
Fax Sales Desks	(02) 9838 0218
T Kiehne	0417 249 273
	Email timk@apschem.com.au
F Luca	0418 445 690

NSW Divisions

APS Watercare

390 Marion Street, Bankstown NSW 2200	Tel (02) 9795 5500
	Fax (02) 9796 7848

APS Culamix

46 Skarratt Street, Silverwater NSW 2128	Tel (02) 9748 3933
	Fax (02) 9748 3249

VICTORIA

7 Business Park Drive Notting Hill VIC 3168	Tel (03) 9558 8800
	Fax (03) 9558 8777

VIC Divisions

APS Valchem

Sales and Administration

16-20 Hamlet Street, Cheltenham VIC 3192	Tel (03) 8586 3600
	Fax (03) 8586 3660

APS Culamix

121 Keys Road, Moorabbin VIC 3189	Tel (03) 9532 3211
	Fax (03) 9532 3088

QUEENSLAND

775 Kingsford Smith Drive, Eagle Farm QLD 4007
Tel (07) 3268 5999
Fax (07) 3268 3665

APS Culamix
64 Basalt Street, Geebung QLD 4034 Tel (07) 3265 1277
Fax (07) 3265 3029

SOUTH AUSTRALIA

1 East Terrace, Mile End SA 5031 Tel (08) 8234 5944
Fax (08) 8234 2540

WESTERN AUSTRALIA

Lot 15 Sudlow Rd, Bibra Lake WA 6163 Tel (08) 9434 4233
Fax (08) 9434 4837

b. Tasman Chemicals Pty. Ltd. (except Calcium hypochlorite)

FREECALL 1800 675 529
Email address taschem@taschem.com.au

VICTORIA

2–6 Roberna Street Tel (03) 9555 8033
Moorabbin VIC 3189 Fax (03) 9553 2902

SOUTH AUSTRALIA (Mr Alan Davidson) Mob 0418 896 604
4/159 William St Tel (08) 8243 0644
Beverley SA 5009 Fax (08) 8243 0622

QUEENSLAND (Mr Mike Hackett) Mob 0415 875 231
109 Boundary Road Tel (07) 3206 3427
Thornlands QLD 4164 Fax (07) 3206 3644

NSW (Mr Philip Parkin) Mob 0419 275 369
PO Box 472 Tel (02) 9980 5999
Pennant Hills NSW 1715 Fax (02) 9484 8647
Suite 15 80 Pennant Hills Rd
Pennant Hills NSW 2120 Email pparkin@tasmanchemicals.com.au

TASMANIA (Mr Rod Speglic)	Mob 0418 140 590
1 Durham Road	Tel (03) 6432 1988
Cooee TAS 7320	Fax (03) 6432 1989

c. Nowra Chemical Manufacturers (John Lamont Snr)

Internet address http://www.globalpresence.com.au/profit/pw_nc.htm
http://www.nowchem.com.au/

5 Flinders Road	Tel (02) 4421 4099
Nowra NSW 2541	Fax (02) 4421 4932
	Mob 0413 809 255
	Email sales@nowchem.com.au

d. Whiteley Industries Pty. Ltd (Greg Whiteley)

Internet address http://www.whiteley.com.au/INDUSTRI/indust.html

FREECALL	1800 257 352
Fax	1800 249 696
Email	whiteley@whiteley.com.au
Level 1/23 Berry st	Tel (02) 9929 9155
Nth Sydney NSW 2060	Fax (02) 9929 9077
PO Box 1076	
Nth Sydney NSW 2059	
C/- Blue Circle Transport	Tel (03) 9548 5955
2-6 Mcwilliam St	
Springvale VIC 3190	

e. Ausmed (Mr G McNicol)

51 Flanders St	Tel (07) 3274 1766
Salisbury QLD 4107	Fax (07) 3274 1296
Email	ausmed@powerup.com.au

f. MSA - Branch Offices of MSA in each State:

Internet address	www.msa-aust.com.au
Email address	msasyd@peg.apc.org

Sales enquiries	1300 728 672
SYDNEY (Mr Greg Single)	
137 Gilba Road	Tel (02) 9688 0333
Girraween NSW 2145	Fax (02) 9896 1835
MELBOURNE (Mr Jon Fleming)	
Unit 1/600 North Road	Tel (03) 9576 7644
Ormond VIC 3204	Fax (03) 9764 7688
ADELAIDE (Mr Carl Alvino)	
16 Reese Avenue	Tel (08) 8234 2322
Richmond SA 5033	Fax (08) 8234 2737
BRISBANE (Mr Terry Parker)	
Unit 3, 32-36 Hampton Street	Tel (07) 3891 1966
East Brisbane QLD 4169	Fax (07) 3891 6087
TOWNSVILLE (Mr Leigh Anderson)	
PO Box 856	Tel (07) 4788 8100
Aitkenvale Qld 4814	Fax (09) 4788 8572
	0417 661 178
MACKAY (Mr Bill Savage)	
PO Box 55	Tel (07) 4954 9219
Bucasia Qld 4750	Fax (07) 4954 9955
	Mobile 0418 425 924
	Email savdav@mackay.net.au

APPENDIX 3 Practicalities of decontamination with formaldehyde gas

There are limited ways that decontamination of large spaces or electronic equipment can be done on rural premises. Formaldehyde gas can be used with limited safety only in certain environments and in the hands of experienced operators.

Effective decontamination with gaseous formaldehyde requires a favourable combination of gas concentration, temperature, relative humidity and contact time. Most usual procedures suggest formaldehyde concentrations of 2–10 g/m^3, relative humidity values of 70%–90% at temperatures of 20^{o}C for periods of 15 to 24 hours.

Considerations before attempting formaldehyde decontamination:

1) Ensure all surfaces are clean first.
2) An even dispersal of the gas within the enclosed space is essential for uniform decontamination. Electric fans are recommended to assist circulation.
3) Because formaldehyde is a very toxic gas, it must be totally retained within the space to be treated and then effectively neutralised prior to opening. Breathing masks and special equipment for monitoring residual formaldehyde are strongly recommended.
4) Although an elevated relative humidity is necessary for optimal activity, water cannot be present in liquid form as it will dissolve the gas and reduce its effective concentration in the gaseous phase. It is therefore difficult to establish the required relative humidity conditions outside a controlled laboratory situation.
5) An evenly controlled temperature is also essential for effective decontamination. If the temperature of the walls of the vessel/building falls during the decontamination, the formaldehyde will polymerise on them to form a powdery precipitate of paraformaldehyde which reduces the effectiveness of the operation and creates problems of residual toxicity. Such conditions are likely to occur in farm buildings or vehicles during overnight decontaminations.
6) Formaldehyde will react with free chlorine or chlorides (eg hypochlorites or hydrochloric acid) to produce carcinogenic compounds, which are a potential danger.
7) Environmental release of formaldehyde is prohibited by most regulatory health agencies.
8) Mixtures of formaldehyde with air are explosive, so risks associated with fire and explosions are substantial.

Notwithstanding the problems associated with formaldehyde decontaminations, there are two possible ways of generating the gas in non-laboratory situations. Formalin solution (20 mL/m^3 space) can be mixed with potassium Permanganate (16 g/m^3), a violent reaction that produces heat and boiling and is potentially dangerous. Large vessels (ten times the volume of the formalin) must be used to contain the boiling reaction. A number of smaller vessels is preferable, each of which must be in a metal tray and well clear of combustible material. The enclosure must be prepared in advance so the operator, wearing protective clothing and a full face respirator, can mix the ingredients and leave the enclosure quickly. A second person equipped similarly, must wait at the open door to ensure no mishaps occur. The last action in the enclosure must be to add the pre-measured formalin to the potassium permanganate in each reaction vessel commencing with the vessel furthest from the exit door.

Alternatively, paraformaldehyde powder may be sublimed by heating at 200°C in an electrically heated device such as a frypan to produce an active concentration of 5 g/m^3. This method is safer than the former, but requires a remote controlled method of supplying the heat.

Formaldehyde gas can be neutralised by reaction with ammonia gas produced by heating ammonium carbonate (7.5 g/m^3 space) at 120°C after the decontamination is complete. Again, a satisfactory remotely-controlled heating device is required. Ventilation of the space must be done thoroughly upon completion of the decontamination and neutralisation process.

In summary, gaseous formaldehyde decontaminations should only be done by experienced personnel with appropriate safety equipment. It is recommended only if no suitable alternative options are available to achieve the desired result.

GLOSSARY

Agent	*see* Disease agent
ANEMIS	*An*imal Health *Em*ergency *I*nformation *S*ystem. A system for the collection, assimilation, actioning and dissemination of essential disease control information using paper documentation and a computer data base..
Amplification (of virus)	Increase in the amount of virus. Some infected animal species produce much larger amounts of virus than others, these are known as amplifying hosts.
Animal by-products	Meat products and products of animal origin (eg eggs, milk) for human consumption or for use in animal feeding.
Animal products	Meat products and products of animal origin (eg eggs, milk) for human consumption or for use in animal feeding.
AUSVETPLAN	A series of documents that describes the Australian response to exotic animal diseases linking policy, strategies, operations, coordination and counter-disaster plans.
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 exotic animal disease incursion
Chief veterinary officer	The senior veterinarian of each State or Territory animal health authority who has responsibility for exotic animal disease control in that State or Territory.
Control area	A bigger area 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 exotic 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).
Declared area	A defined tract of land for the time being subject to disease control restrictions under exotic disease legislation. Types of declared areas include restricted area; control area; infected premises; and dangerous contact premises
Disease agent	The organism that causes the disease.
Disposal	Sanitary removal of animal carcases and things by burial, burning or some other process so as to prevent the spread of disease.
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.

Enterprise	*see* Risk enterprise
Infected premises	A defined area (which may be all or part of a property) in which an exotic disease or agent exists, 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.
Lipid envelope	*see* Viral envelope
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.
OIE Code	International Animal Health Code 1992 (*see* References)
Quarantine	Legal restrictions imposed on a place, animal, vehicle or other things limiting movement.
Restricted area	A relatively small declared area (compared to a control 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.
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.
Sentinel animals	Animals of known health status monitored for the purpose to detect the presence of a specific exotic disease agent.
'Setting' (meat)	The hardening of carcase tissue during the process of chilling, immediately following slaughter.
Silage clamps	Structure in which silage is stored.
Slurry tank	A tank that contains a suspension of solids in liquid, usually animal manure.
Stamping out	Eradication procedures based on quarantine and slaughter of all infected animals and animals exposed to infection.
Surveillance	A systematic examination and testing of animals or things to determine the presence or absence of an exotic disease.
Suspect animal	An animal which may have been exposed to an exotic disease such that 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 materials or things	Materials or things suspected of being contaminated by an exotic disease agent.
Suspect premises	Premises containing suspect animals which 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 which 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 *biological* vector is one in which the infectious agent must develop or multiply before becoming infective to a recipient host. A *mechanical* vector is one that transmits an infectious agent from one host to another but is not essential to the life cycle of the agent.
Vector control area	An area in which the containment, control or reduction of specified vector populations is conducted.
Viral envelope	The lipoprotein outer covering of virions of some viruses, derived from cellular membranes but containing virus-specific proteins, usually glycoprotein peplomers.
Zoning	The process of defining disease free and infected area in accord with OIE guidelines, in order to facilitate trade.
Zoonosis	A disease that can be spread between animals and people.

Abbreviations

AAHL	CSIRO Australian Animal Health Laboratory
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AHC	Animal Health Committee
ANEMIS	Animal health emergency information system
AUSVETPLAN	Australian Veterinary Emergency Plan
CA	Control area
CCEAD	Consultative Committee on Exotic Animal Diseases
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CVO	Chief veterinary officer
DCP	Dangerous contact premises
EDSC	Exotic Diseases Sub-Committee of AHC
IP	Infected premises
LDCC	Local disease control centre
NDCHQ	National disease control headquarters
OIE	World Organisation for Animal Health [Office International des Epizooties]
PDS	Personal decontamination site
RA	Restricted area
SCARM	Standing Committee on Agriculture and Resource Management
SDCHQ	State disease control headquarters
SIT	Sterile insect technique

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Video/training resources

Cleaning it up - decontamination of properties and equipment (video),

AAHL 1993 (available from the Animal Diseases/Incidents Section, Department of Primary Industries and Energy, Canberra; or AAHL).

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

OIE publications

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

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