BIOSECURITY AND PATHOGEN CONTROL FOR PIG FARMS

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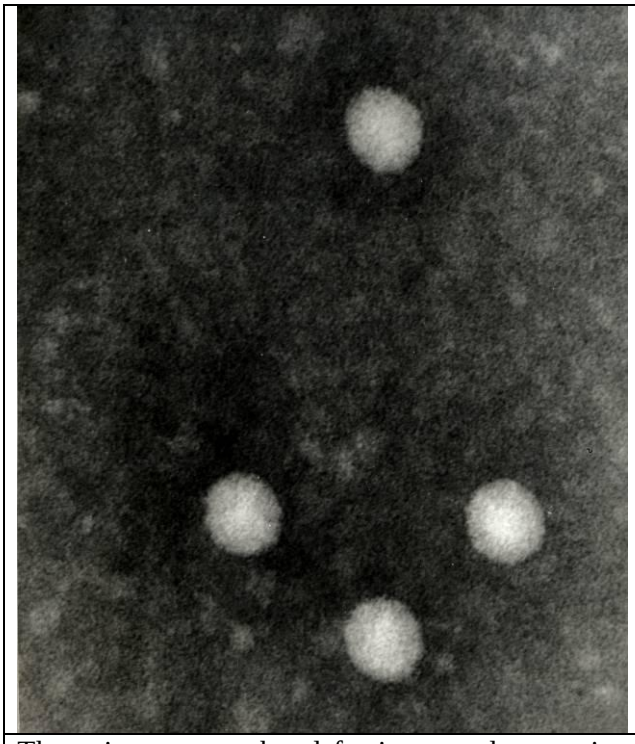
Introduction

This guide is presented as a series of advice sheets, some of which can be used around the farm. The aim of the advice sheets is to provide rapid in formation in a format easily understood by all members of the farm team. There are sheets to aid the checking and auditing of Biosecurity standards. The notes are also presented on a CD format allowing the user to customise the advice sheets to suit their own personal situation and to take note of new advances as science provides.

Biosecurity is the foundation stone to health on a pig farm. It can be difficult enough to control the effect of pathogens that are already on the farm, without the need to develop new strategies for invading pathogens.

A pathogenôs effect on the pig can range from nothing to devastating. Many pathogens are under global watch through organisations like the World Organisation for Animal Health (www.oie.int). Consult with your local governmental veterinarian for a list of pathogens absent from your area.

Biosecurity can be summarised by the photographs below. A 2000 sow nucleus farm infected with Foot and Mouth Virus, resulting in the necessary destruction of 20000 animals on the farm. While this was a disaster for the farm, the destruction saved many thousands of other pigs from suffering.



The picture on the left is an electronmicrograph of the Foot and Mouth Virus.
The upper right picture demonstrates the ulcerated area on the feet of an infected pig.
The bottom right picture graphically demonstrates the disaster of Foot and Mouth affecting a pig farm.

The major pathogens of pigs

Pigs are typically affected by three major groups of pathogens ï parasites, bacteria and viruses.

Pigs can act as a host for a variety of other life forms, which range from the relatively large, *Taenia solium* worms can reach up to 7m long, to the extremely small Circovirus, which is only 17nm in diameter. Under normal circumstances, most pathogens do not want to harm the pig (host). Majority of the pathogens live in harmony with the pig. Pathogenic organisms are only a minor component of the normal flora living on and in the pig and its environment.

Parasites of the pig

External Parasites

The Mange Mite

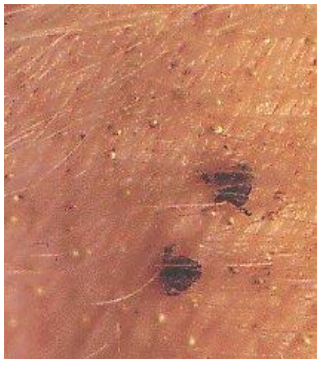
Mange

Mange is caused by infestation with the microscopic burrowing mite *Sarcoptes scabiei* var *suis*. All parts of the its life cycle, the egg, larvae, nymph and adult develop below the surface of the skin and only require 15 days to complete. Experimentally the mite can live for up to 3 weeks off the pig, however, at ambient temperatures higher than 25°C the mite does not survive more than 3 days. The consistent clinical sign is rubbing and scratching. All ages can be affected from weaner to adult and the worse cases can be in the growing pig with PRRSv infections. Classical signs are excess wax in the ear from which the mites can be identified. The clinical signs may be exacerbated by the presence of other pathogens.

Dirty ears in an adult boar

Lice

The pig biting louse is *Haematopinus suis*. This is the biggest louse known to man and are readily observed crawling on the skin. The life cycle occurs on the body and takes 30 days to complete from egg to adult; however, the louse cannot live for more than 3 days away from the pig. It is possible that Swine Pox virus may be carried by lice.



Internal Parasites

Ascaris –milk spot

Ascaris suum is a large round worm which lives in the intestinal tract of pigs, with a prevalence of between 50 and 75% of pig herds. The female worm produces around 2 million eggs per day; however, production is very variable. The eggs are very sticky and are resistant to most disinfectants, but heat (steam) and direct sunlight are effective in destroying the eggôs viability. The eggs are able to survive for more than 7 years in pasture or housing.

Egg

Worm from anus

White spots on the liver surface

Once ingested the egg hatch and the larvae pass through the intestinal wall and migrate, via the blood stream, to the liver. The worm is only in the liver for 5 days. However, this is where the parasite causes most economic damage. The liver damage heals by scarring, producing the white marks on the liver surface or ómilk spot liverô. These lesions heal within 25 days. The larvae leave the liver and migrate to the lungs where they contribute to respiratory diseases such as Enzootic pneumonia or Swine Influenza. The larvae are then coughed up and swallowed and once back in the intestinal tract they mature to adults. The time interval from ingestion to producing eggs can be as short as 40 days. Ascaris is important to the pig industry as the disease reduces growth rates and feed conversion and may aggravate other diseases. It also has a direct economic loss to the slaughtering industry though liver condemnations.

Strongyle worms

There are two important strongyle worms in the pig. *Hyostrongylus rubidus*, the red stomach worm and *Oesophagostomum dentatum* which lives in the large intestine. Neither of these worms migrates around the body, but lives in the wall and lumen of the intestines causing local damage which results in poor food conversion and growth. The level of infestation is calculated through the worm egg count.

Whip worms

Trichuris suis is the pig whip worm and lives in the large bowel and causes local damage to the intestinal wall. These worms do not migrate around the body. They are readily recognized through a worm egg examination through their biopolar egg shape.

Trichinella spiralis

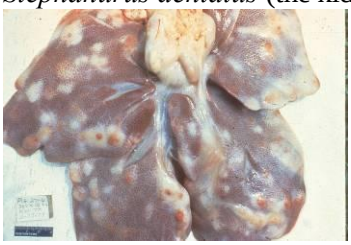
This is an important parasite of the pig. The parasite is zoonotic (can infect man). In man *Trichinella spiralis* may result in severe muscular pains and swelling of the face. The adult worm lives in the intestine of pigs, but no eggs are laid. The larvae develop within the female worm. The larvae are released from the female and migrate through the pigôs intestinal wall moving through the body eventually localizing in muscle tissues. Here they wait (for up to 24 years) until the muscle in eaten by another pig, a rat or man, when the live cycle starts again. Diagnosis of trichinella is through examination of muscle tissues, especially the diaphragm. The parasite appears as a spiral in infested tissues.

Lung Worm

The pig lung worm in the pig is called *Metastrongylus apri*. This adult worm lives in the bronchi and bronchioles of the pig where it can cause local damage and coughing. The eggs containing fully formed larvae are laid by the female, coughed up, swallowed and passed out of the pig via the faeces. The larvae are then eaten by an earthworm where it remains in the blood vessels. The earthworm is eaten by the pig and the larvae migrate through the intestinal wall to the lungs where the cycle starts again. Earthworms are able to live up to 7 years and so once pasture is infected it will take a long time to eliminate the parasite.

Stephanurus dentatus

There are a number of other parasites especially in the warmer climates, two worthy of note are *Stephanurus dentatus* (the kidney worm), where the migrating larvae can cause severe liver damage.



Liver damage associated with *Stephanurus dentatus*

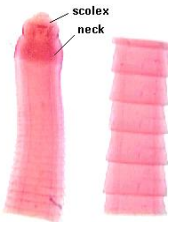
Kidney worms ï *Stephanurus dentatus*

Strongyloides ransomi

Strongyloides ransomi which is a worm which can kill piglets due to diarrhoea resulting from damage to their intestinal tract.

Tape Worms

With increased vigilance in the slaughterhouse, tape worms of pigs are now rare. Of particular important is *Taenia solium*, where the pig is the intermediate host. The larvae develop into a cyst and when infected pork is eaten by man the tape worm develops in the intestinal tract.

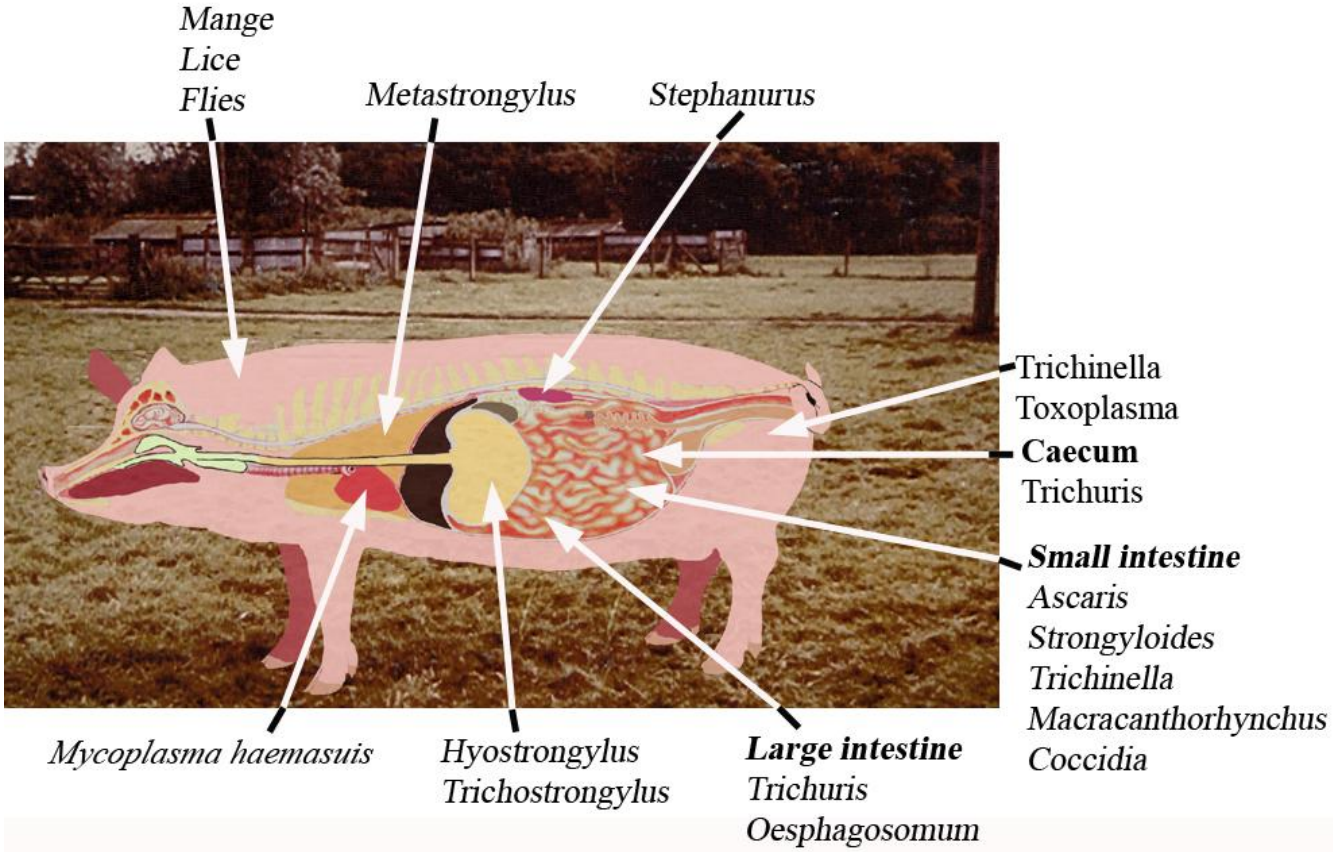


Coccidia

Isospora suis is associated with diarrhoea in the young pig older than 10 days of age. This is a chronic condition and can reduce weaning weights by 0.5 kg. These parasites have a complex life cycle. The older pig becomes resistant to *Isospora suis*. However, other species of coccidian (Eimeria) live in older pigs without producing any clinical signs.

Pig Parasites General

The major sites where the parasites of the pig can be found



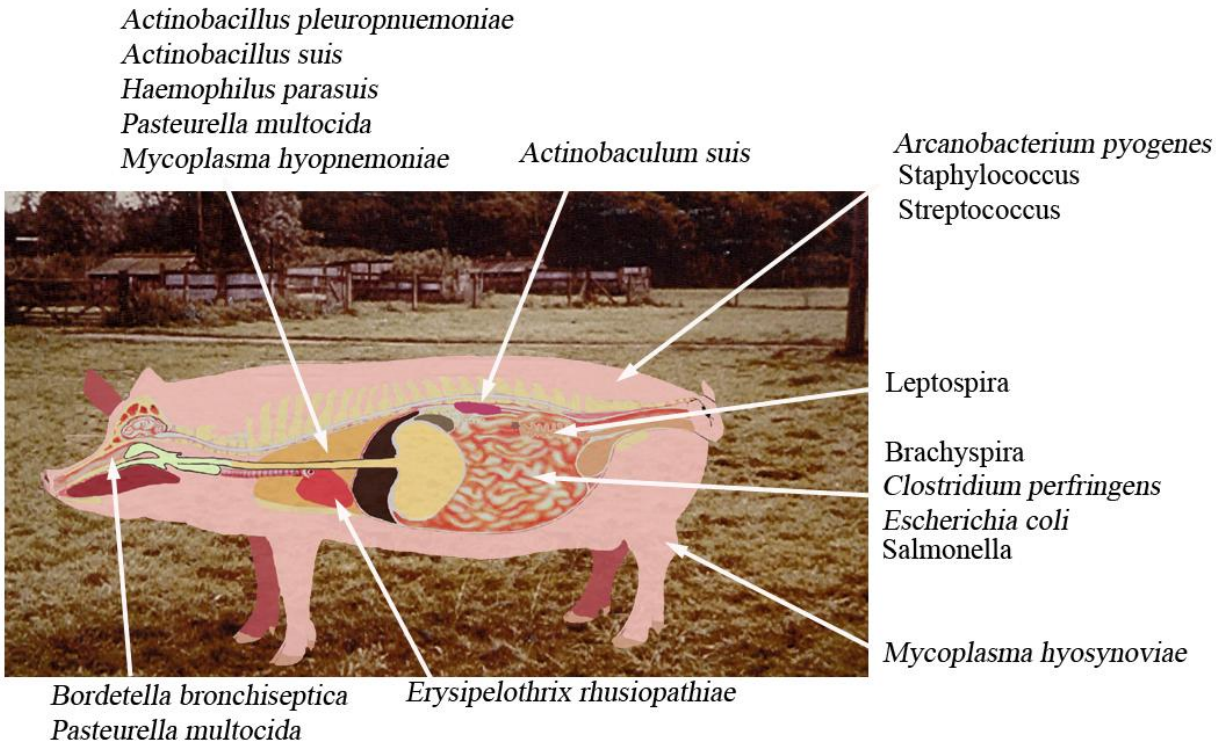
Bacteria in the pig

Bacteria are the major form of life on planet earth and the average healthy 60 kg pig will produce some 150 million bacteria every day. Bacteria live in all niches where life is possible, this includes inside and outside the pig. Pigs would be unable to survive without the presence of bacteria as many are vital for digestion of feed and are needed to protect the pigôs skin and intestinal surfaces from damage by other bacteria and parasites. While the vast majority of bacteria are either beneficial or result in no harm to the pig a small minority can cause disease. These diseases often occur at specific times in the pigôs life ï when it is young for example or when the pig is stressed by its living conditions ï for example if the pig is overcrowded.

Bacteria are generally classified as having a cell wall ï similar to plant cells. In this book Mycoplasma is also classified as bacteria, however, they are unusual as they do not posses a cell wall.

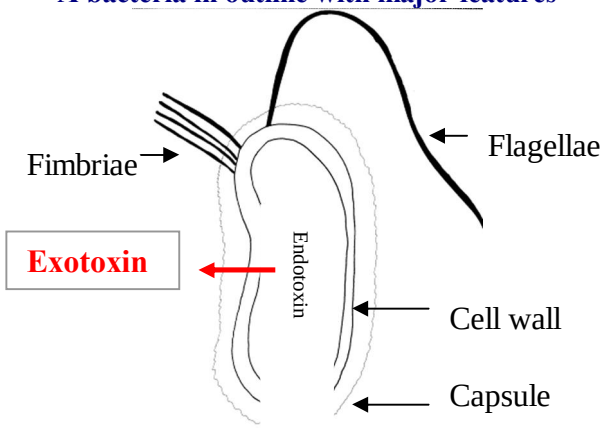
Pig Bacteria General

The major sites where bacteria of the pig can be found



How can Bacteria make your pig sick?

There are a variety of features to bacteria which can make them pathogenic (likely to make a pig sick) these are examined simply below:

A bacteria in outline with major features	Electron-microscopic view of a bacteria, *E. coli*
	

1	**Toxins** There are a variety of toxins the bacteria can produce The bacteria can produce and excrete toxins - these are exotoxins. For example *E. coli* may produce T and SH toxins which damage and kill intestinal cells. *Actinobacillus pleuropneumoniae* produce haemolysin to destroy red blood cells and cyotoxins to destroy and damage lung cells. The toxin is released as the bacteria dies, these are called endotoxins. The cell wall of *E. coli* is an endotoxin and is called Lipid A. Endotoxins can be found in significant amounts in the air of pig houses.
2	**Attachment mechanisms** To produce clinical problems bacteria must attach to their target cells. This is achieved by attachment sites on the fimbriae. A common attachment in *E. coli* is called F4 (K88). These fimbriae components are important in vaccine manufacture.
3	**Flagella** Shown in the drawing, but not present in the photograph. Many bacteria have flagellae which allow the bacteria to move and swim to a more ideal site.
4	**Enormous potential growth rates** In the lab an *E. coli* can divide every 40 minutes (double their population) and so rapidly can overwhelm the stressed host organism. However, in the healthy body bacteria cannot multiply at this rate. One major control mechanism for bacteria multiplication is the normal microbiota (normal background bacteria and other microorganisms living in the pig) who compete for space and nutrients.
5	**Hide from the bodies defence mechanisms** Many bacteria can make it more difficult for the bodyôs defence mechanisms to kill or disable them by entering the bodyôs cells. This means the bacteria cannot be seen by the immune system. This also may be significant because it may limit the use of certain medicines which are able to enter the host cells. Examples of pig bacteria that hide are *Lawsonia intracellularis* (PIA) or *Pasteurella multocida*.

Most bacteria live in perfect harmony with the pig and only become problematic when the pig is stressed

Basic Swine Bacteriology – Summary Table

Bacteria are classified using two major systems ï staining ability with a special stain (Gramôs stain) where taking the stain (going blue) is positive (+) whereas not taking the stain (staying red) is negative (-). In addition the bacteria are classified by their shape ï rods or bacilli (B) or circles or cocci (C). Some are an elongated ellipse (CB). The other major shape the bacteria look like an S shape ï the Spirochaetes.

Organism	Gram stain	Examples of the shapes of bacteria
Actinobaculum suis	+B	**Gram +ve Cocci – Example Streptococci** 
Actinobacillus pleuropneumoniae	-CB	
Actinobacillus suis	-B	**Gram +ve Bacilli (Rod) – Example Clostridia** 
Arcanobacterium pyogenes	+B	
Bordetella bronchiseptica	-CB	
Brachyspira	+S	
Clostridium perfringens	+B	**Gram –ve Bacilli (Rod) – Example *Escherichia coli*** 
Erysipelothrix rhusiopathiae	+B	
Escherichia coli	-B	
Haemophilus parasuis	-CB	
Pasteurella multocida	-CB	**Gram +ve Spirochaetes** 
Salmonella	-B	
Staphylococcus	+C	
Streptococci	+C	

Viruses of the pig

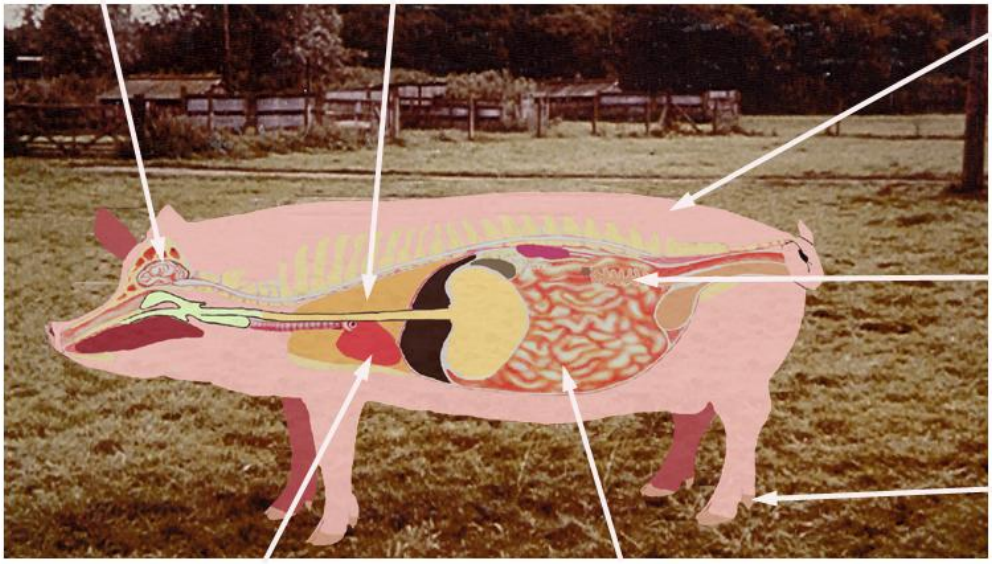
Viruses are extremely small ï the word means filterable as the organism can pass through an extremely fine filter, whereas bacteria cannot. In the pig we recognise only a small number of viruses. However, there has to be many more waiting for identification. Similarly to bacteria majority of viruses cause no harm to the pig. A small number can cause extreme distress and even death within an extremely short period of time.

The major viruses of pigs				
Virus name	**Family**	**Genetic**	**Envelope**	**Comments**
Adenovirus	Adenoviridae	DNA D	+ ve	
African Swine Fever	Un-named	DNA D		Insect borne
Aujeszkyôs Disease	Herpes Virus	DNA	+ ve	Pseudorabies
Blue Eye Virus	Paramyoxoviridae	RNA	+ ve	
Circovirus	Circoviridae	DNA S	- ve	Two types I and II
Classical Swine Fever	Flaviviridae	RNA	+ ve	CSF Hog Cholera Note BVD and Borderôs can infect. Pestivirus
Coronavirus	Coronaviridae	RNA	+ve	Several types, TGE, PRC, ED, HEV
Cytomegalovirus	Herpesviridae	DNA	+ ve	
Eastern Equine Encephalomyelitis	Togaviridae	RNA S	- ve	Also similar West Nile Virus
Encephalomyocarditis virus	Picornaviridae	RNA	- ve	
Enterovirus	Picornaviridae	RNA	- ve	Numerous types ï Talfan, Teshen, SMEDI
Foot and mouth	Picornaviridae	RNA S	- ve	FMD
Hepatitis E virus	Caliciviridae?	RNA S	- ve	
Japanese Encephalomyelitis virus	Flaviviridae	RNA	+ ve	
Nipah virus	Handra virus	RNA S	+ ve	Paramyoxoviridae
Menangle Virus infection	Paramyxovirus	RNA	+ ve	
Parvovirus	Parvovirus	DNA S	- ve	
Porcine Mycocarditis virus	Bungowannah	RNA	+ve	Related to Pestivirus
Porcine Reproductive and Respiratory Syndrome Virus	Arterividae	RNA	+ ve	PRRSv
Rabies	Rhabdoviridae	RNA	± ve	
Reovirus	Reoviridae	RNA	- ve	
Rinderpest	Paramyxovirus	RNA	+ve	
Rotovirus	Reoviridae	RNA	- ve	Mainly type A
Swine Influenza	Orthomyxoviridae	RNA Segmented	+ ve	SIV Several types based on H and N antigens.
Swine Vesicular Disease	Picornaviridae	RNA S	- ve	An enterovirus
Swine Pox	Poxviridae	DNA D	+ ve	
Torovirus	Torovirus	RNA	+ve	Related to Coronavirus
Torque Teno Virus	Anellovirus	DNA	- ve	Related to Circovirus
Vesicular exanthema	Caliciviridae	RNA S	- ve	
Vesicular stomatitis	Rhadboviridae	RNA S	± ve	Affects horses as well
West Nile Virus	Flaviviridae	RNA	+ ve	

Genetic ï D= Double stranded. S= Single stranded

Pig Viruses General

The major sites where viruses of the pig cause clinical disease



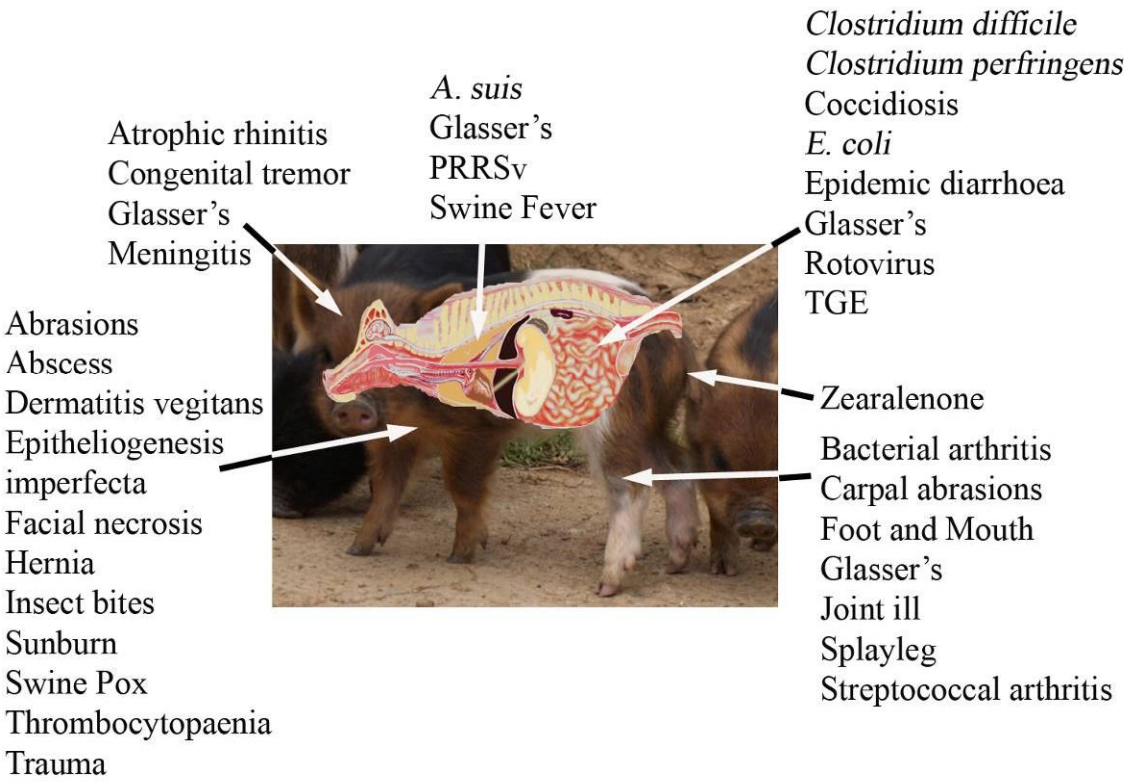
Viruses – How do they cause disease?

Background	Viruses are very small and the word means ófilterableô. Once bacteria were recognised down the microscope by Pasteur many diseases became associated with particular bacteria such as Pasteurella or Salmonella (discovered by Dr Salmon). It soon became apparent that some diseases were not associated with the ónewô bacteria and the disease could still be transmitted after all bacteria were removed by filtration. These diseases were then called viral. Foot and Mouth was the first virus recognised.
	Viruses cannot replicate on their own, they require other living organisms (some even parasitize bacteria) to replicate.
	Viruses are classified into two main types depending on the type of genetic material: DNA viruses have their genetic material similar to our chromosomes (the genetic material needs to be transformed into RNA to make proteins) and RNA viruses which have their genetic material in the form from which proteins are made.
	After genetic material classification viruses may have an envelope of lipid (fat) materials. Those viruses with an envelope are more susceptible to disinfectants as the disinfectant removes the envelope rending the virus incapable of survival.
	The other characteristics of viruses are determined by their size or shape: Viruses that infect bacteria are called bacteriophages Parvovirus are very small and round (Parvo means small in Greek) Influenza viruses are very long Coronaviruses have protein projections that make them look like a crown or corona
	It is important to note, that the vast majority of viruses live quite harmlessly in our bodiesô cells and do not cause any significant or recognised problem.
Treatment	Because viruses do not replicate on their own there is no specific treatment thorough antibiotics. Antibiotics work against bacteria because they will either kill the bacteria or affect their replication ability. There are a few antiviral medicines but they are very expensive and are not really available to pigs.
How to treat viral diseases – the basics	Keep the disease agent out through good biosecurity
	Use the bodies own difference mechanisms through vaccines and antibodies
	Reduce the stress on the animal by good management ï pig flow and management of the water, food, floor and air systems.
	Treat any sick pig promptly and appropriately ï classically through a hospital pen
Are there things smaller than viruses?	
	The prion diseases (CJD of man and BSE in cattle for example) are diseases where the infectious agent is without any nuclear material and appear composed for lipid and proteins only. These diseases have not been recognised anywhere in the world in farmed pigs.

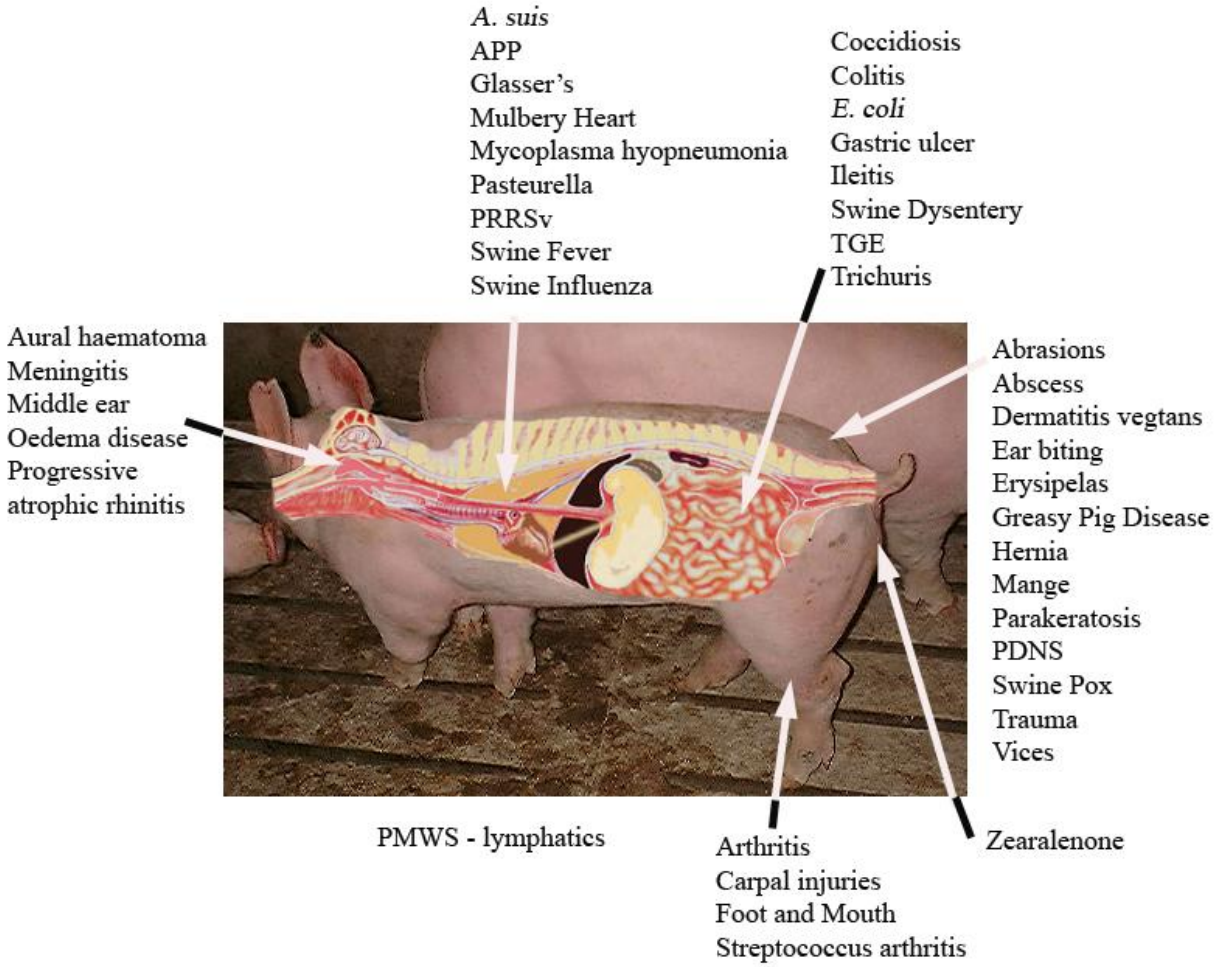
Major Disorders of the Pig by Age/Group

Clinical diseases often affect pigs at specific times in the pigôs life. This greatly aids the veterinarian in reaching a diagnosis regarding the probable cause of the clinical signs. The following pages illustrate the major diseases and the organ location of the main clinical signs for pigs at the four major age ranges, the piglet (birth to 8 kg); the weaners (8 to 30 kg) the grow/finish pig from 30 to 110 kg and finally the adult gilt, sow or boar.

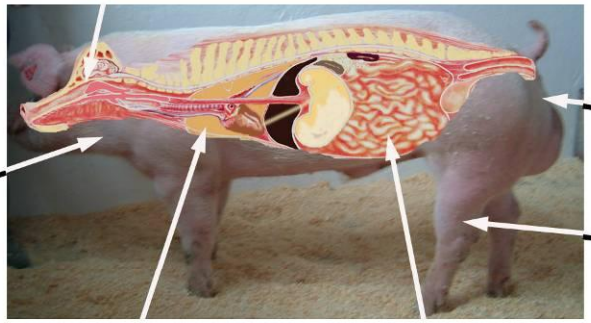
Piglet disorders (Birth to 8 kg)



Nursery disorders– weaning to 30 kg



Grow/finish disorders– 30 to 110 kg



Atrophic rhinitis
Conjunctivitis
Glassers
Meningitis

Abscess
Eperythrozoonosis
Erysipelas
Flank biting
Hernia
Insect bites
Lice
Mange
Parakeratosis
PDNS
Ringworm
Swine Pox
Sunburn
Tail biting

Zearalenone
(Females)

Arthritis
Bursitis
Bushfoot
Foot and Mouth
Fractures
Glasser's
Kinky back
Mycoplasma arthritis
OCD
PSS
Sores
Spinal abscess

APP
Aujeszky's
Endocarditis
Glasser's
Mycoplasma pnuemonia
PRRSv
PMWS
Salmonellosis
Swine Fevers
Swine influenza

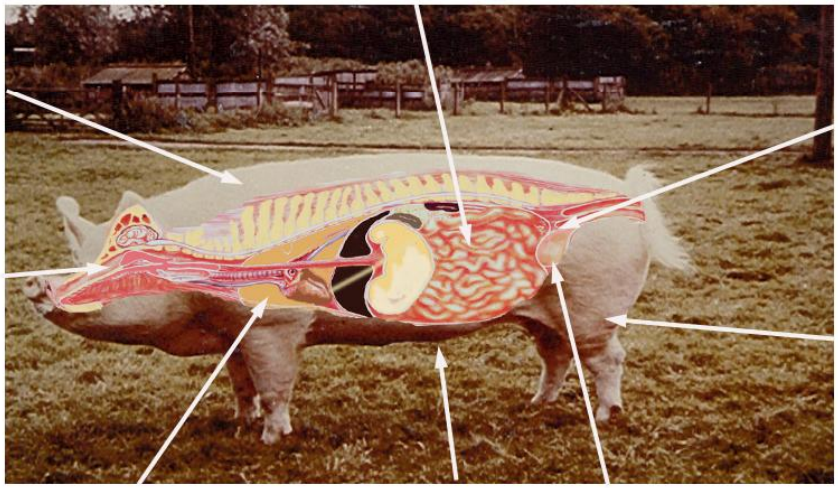
Ascaris
Clostridium
Colitis
Epidemic Diarrhoea
Gastric ulcer
Glasser's
PIA (ileitis)
Rectal stricture
Salmonella
Swine dysentery
TGE
Torsions

Gilt, Sow or boar disorders

Abrasions
Abscess
Erysipelas
Fat sow
Flaky skin
Insect bites
Lice
Prolapse
Ringworm
Sarcoptic mange
Shoulder sores
Sunburn
Trauma
Vulva biting

Atrophic rhinitis
Glasser's Disease

Ascaris
Clostridium novyi
Constipation
Epidemic diarrhoea
Gastric ulceration
Haemorrhagic bowel
Ileitis
Intestinal parasites
Spirochaetal colitis
Swine Dysentery
TGE
Torsion



Aujeszky's Disease
Enterovirus
Eryipelas
Leptospirosis
Parvovirus
PRRSv
Swine Influenza

Arthritis
Borrelia granuloma
Bursa
Epiphysiolysis
Erysipelas arthritis
Foot and Mouth
Mycoplasma arthritis
Overgrown feet
PSS

Mycoplasma hyopneumoniae
Pleurisy
Swine Fevers

Agalactia
Mastitis
Udder oedema

Crystalluria
Cystitis
Pyelonephritis

How do pathogens get into your farm?

The major function of biosecurity is to stop pathogens from entering the farm. It is vital therefore, for all members of the farm health team to appreciate how easy it is for a pathogen to enter the unit. All members of the health team must agree and adhere to any biosecurity arrangements and ensure that visitors who may not appreciate all the rules, adhere.

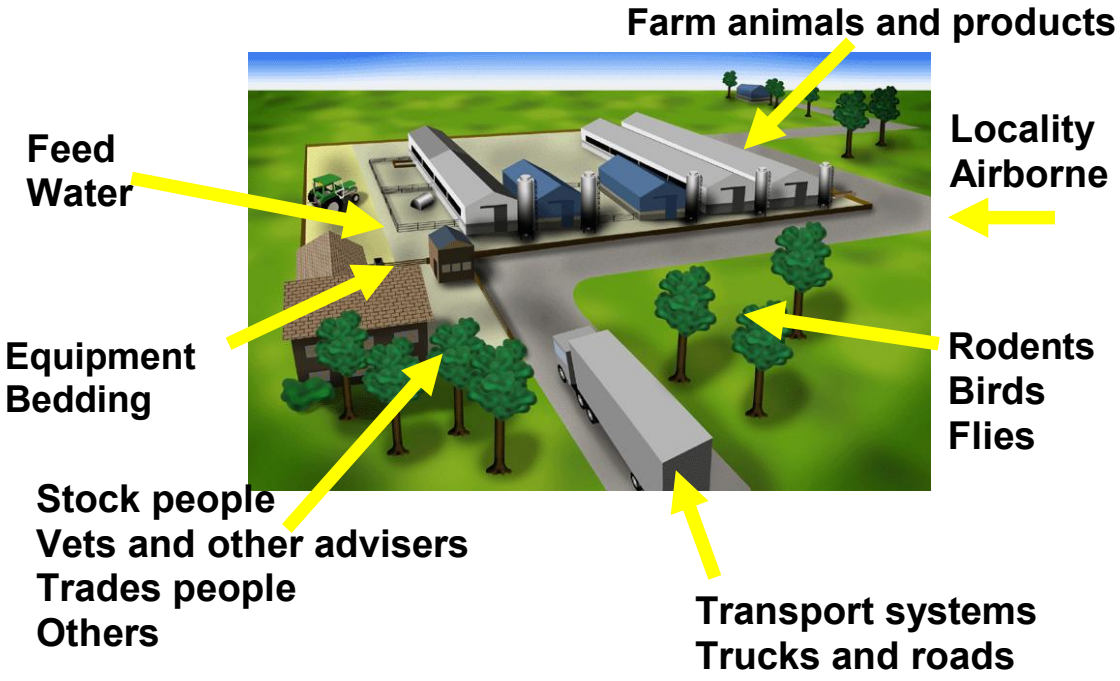
Threats to a Pig Unit

They are in order of importance, but the order can change depending on many circumstances

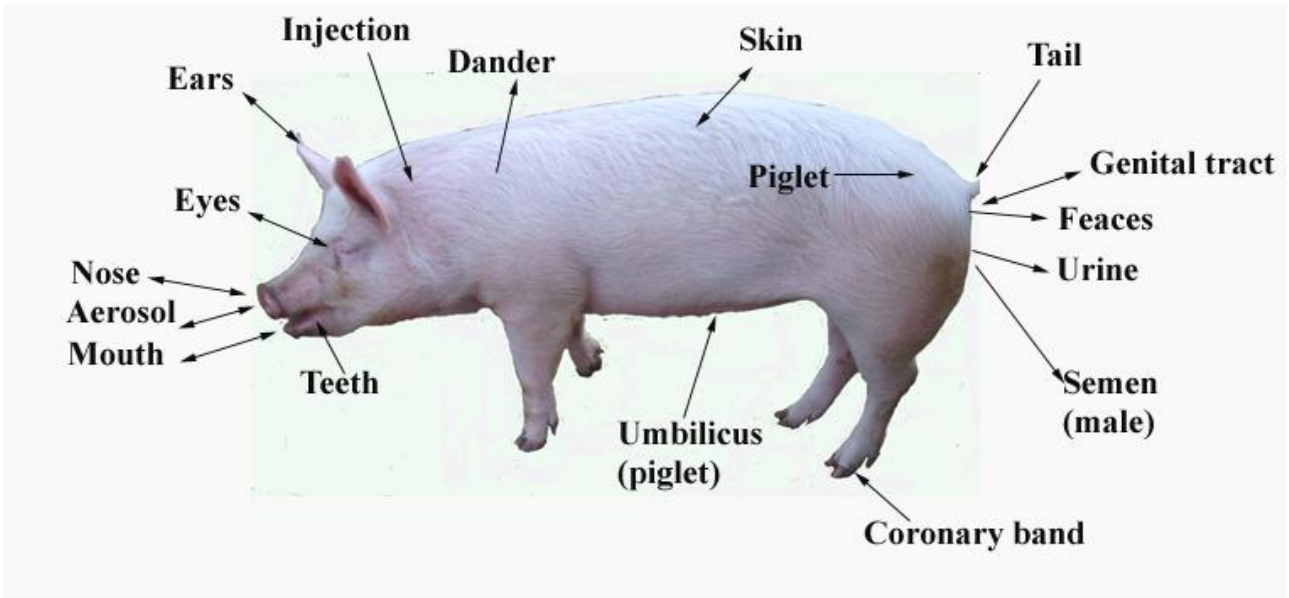
Other pigs
Pork products (ham, salami, sausage, pizza)
Knackerman (placement of dead pig disposal area)
Transportation systems
Locality of neighbouring pig units
Presence of a major road
Purchased second-hand equipment
Clothing from another unit
Birds, Rodents, Cats, Dogs, Flies
AI and Embryo transfer
Feed and water
Bedding and straw (note source of manure for straw)
Staff owning their own pigs
Staff visiting pig markets, shows, other pig units and slaughterhouses
Visitors (note electricity and gas service people)
New utensils
Medicines – live vaccines

Note the most significant risk to the unit today is any sick or compromised pig on the farm

Pathogens major entry points onto a farm



Movement of pathogens into and out of the pig

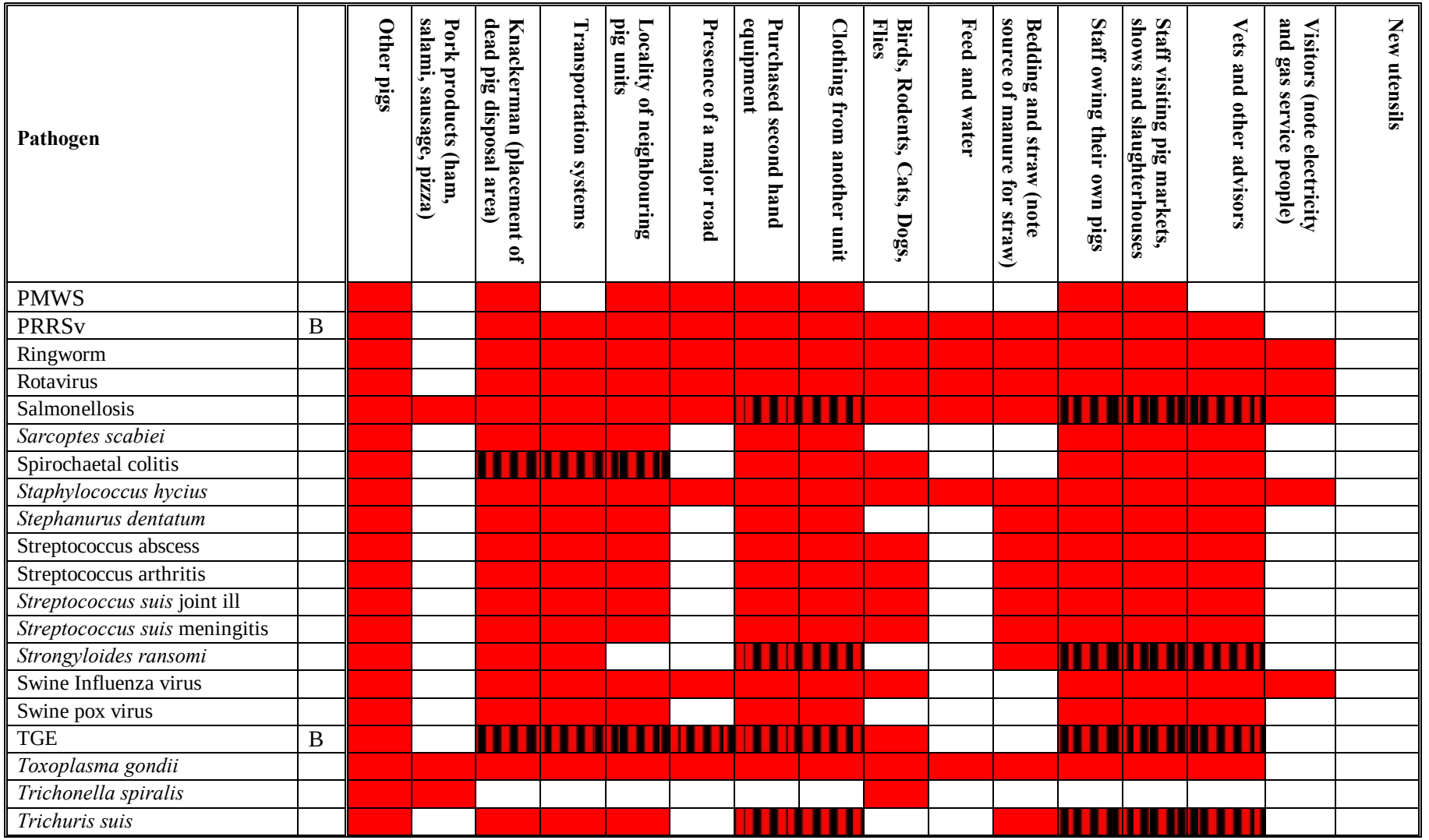


The arrows indicate the direction in which organisms can enter and leave a pig

POSSIBLE TRANSFER ROUTES OF THE MAJOR PATHOGENS OF THE PIG
Where the pathogen movement is primarily through pig faecal movement this is shown by being hatched

Pathogen	OIE status	Other pigs	Pork products (ham, salami, sausage, pizza)	Knackerman (placement of dead pig disposal area)	Transportation systems	Locality of neighbouring pig units	Presence of a major road	Purchased second hand equipment	Clothing from another unit	Birds, Rodents, Cats, Dogs, Flies	Feed and water	Bedding and straw (note source of manure for	Staff owing their own pigs	Staff visiting pig markets, shows and	Vets and other advisors	Visitors (note electricity and gas service people)	New utensils
Actinobaculum suis																	
Actinobacillus suis																	
Actinobacillus pleuropneumoniae																	
African Swine Fever	A																
Arcanobacterium pyogenes																	
Ascaris suum																	
Aujeszkyôs Disease Pseudorabies	B																
Bordetella bronchiseptica																	
Borrelia spiralis																	
Brachyspira hyodysenteriae																	
Brachyspira pilosicoli																	
Brucella suis	B																
Classical Swine Fever	A																
Circovirus I and II																	
Clostridium difficile																	
Clostridium perfringens																	
Congenital tremor virus?																	
Cytomegalovirus																	

Pathogen		Other pigs	Pork products (ham, salami, sausage, pizza)	Knackerman (placement of dead pig disposal area)	Transportation systems	Locality of neighbouring pig units	Presence of a major road	Purchased second hand equipment	Clothing from another unit	Birds, Rodents, Cats, Dogs, Flies	Feed and water	Bedding and straw (note source of manure for	Staff owing their own pigs	Staff visiting pig markets, shows and slaughterhouses	Vets and other advisors	Visitors (note electricity and gas service people)	New utensils
E. coli cystitis																	
E. coli diarrhoea																	
E. coli bowel oedema F18 Ste2x																	
Enterovirus																	
Epidemic diarrhoea virus																	
Erysipelothrix rhusiopathiae																	
Foot and Mouth virus And other vesicular viruses	A																
Haemophilus parasuis																	
Haematopinus suis																	
Hyostrongylus rubidis																	
Isospora suis																	
Lawsonia intracellularis																	
Leptospirosis	B?																
Metastrongylus apri																	
Mycoplasma haemasuis																	
Mycoplasma hyopneumoniae																	
Mycoplasma hyosynoviae																	
Oesophagostonum dentatum																	
Parvovirus																	
Pasteurella multocida (Toxigenic)	B																
Pasteurellosis																	


Pathogen
Other pigs
Pork products (ham, salami, sausage, pizza)
Knackerman (placement of dead pig disposal area)
Transportation systems
Locality of neighbouring pig units
Presence of a major road
Purchased second hand equipment
Clothing from another unit
Birds, Rodents, Cats, Dogs, Flies
Feed and water
Bedding and straw (note source of manure for straw)
Staff owing their own pigs
Staff visiting pig markets, shows and slaughterhouses
Vets and other advisors
Visitors (note electricity and gas service people)
New utensils
PMWS
PRRSv B
Ringworm
Rotavirus
Salmonellosis
Sarcoptes scabiei
Spirochaetal colitis
Staphylococcus hycius
Stephanurus dentatum
Streptococcus abscess
Streptococcus arthritis
Streptococcus suis joint ill
Streptococcus suis meningitis
Strongyloides ransomi
Swine Influenza virus
Swine pox virus
TGE B
Toxoplasma gondii
Trichonella spiralis
Trichuris suis

Considerations in the design of the outer security perimeter

Specific pathogen Free Farm Security

Basic Design – ideal situation that farms should aim to achieve over time	
1	The unit must be surrounded by a complete fence
2	The fence should be 2.5 metres high and 0.5 metres underground to stop pigs and other mammals entering and leaving the unit
3	A car park should be sited away from the unit and appropriately marked
4	All entrances through the fence must be locked
6	All personal items including personal clothing, watches, cigarette lighters etc must remain outside the entrance to the unit itself
7	Spectacles, cameras and other visitor equipment must be inspected by a member of staff before being allowed onto the unit
8	Outside unit fence, all meters (electrical, gas and water) must be situated off-farm and placed in a locked area
9	The farm manager's office should be situated near the entrance
10	A horn switch should be placed by the car park to attract staff attention to visitors.
11	None of the staff should own or come into contact with other pigs
12	No staff should visit animal markets, pig shows or slaughterhouses
13	No unauthorised pigs, pig products or pig faecal material must be allowed onto the farm
14	Unit rules regarding last pig contact must be strictly adhered to and visitors book signed
15	All entry and exit points should be well lit, ideally with proximity sensors
The following entrances/exits are permitted	
1	Entrance via a locked door into staff shower facility
2	Entrance via a locked door into a visitor shower facility
3	Connector to the feed bins which pass through the fence
4	Exit via a raised ramp for livestock
5	Exit for dead animal disposal through a locked gate
6	The straw barn has an entrance from off-farm and an entrance on-farm. Both should be kept locked. Staff are not allowed to leave the farm through the straw barn
7	Ensure you know the location of all the keys for the farm doors. Do not permit keys to be copied without written permission
8	Slurry disposal through underground pipe to slurry store off-farm

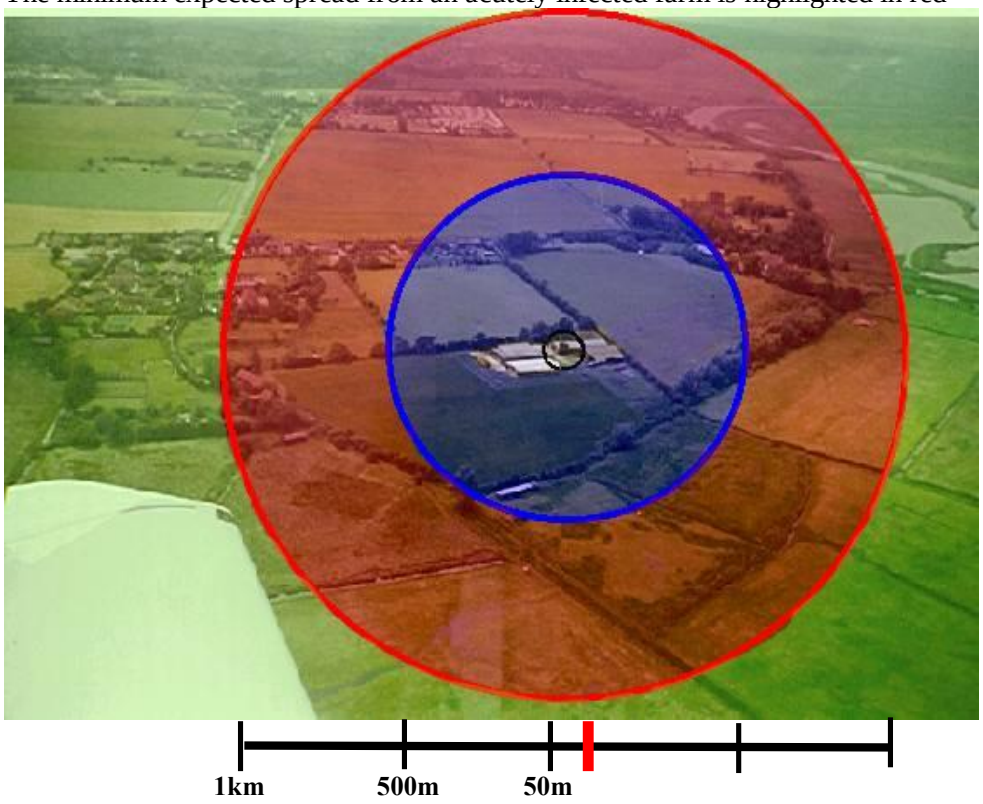
Photographs to illustrate unit security

Security fence should be buried into the ground	 Perimeter into the ground	 Perimeter fence above ground
Car park outside perimeter		
Feed through fence	 Feeder inside fence	 No fence around feeder. Note overgrown weeds
Avoid visitors		Avoid visitors by providing postal points and ensure electric and gas meters can be read outside the farm. Have a fax machine and email to reduce callers
Loading area	 A stop for the stockperson leaving the farm	 Ensure loading area always clean
No pig products should enter the unit	 Raw pig products on a unit posses a high risk	 No pork products should be eaten on the unit

Location: Pathogen Movement from a Farm

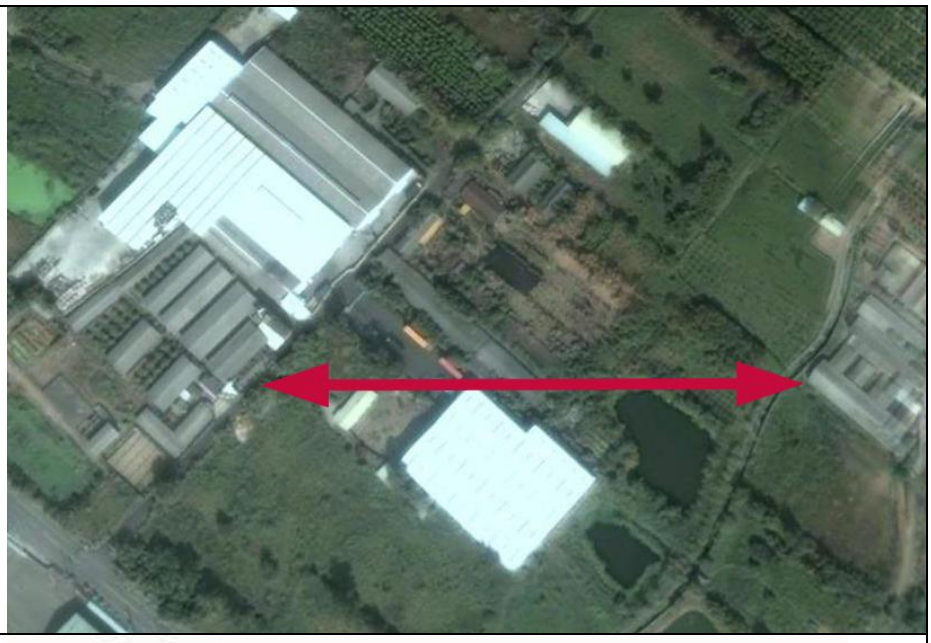
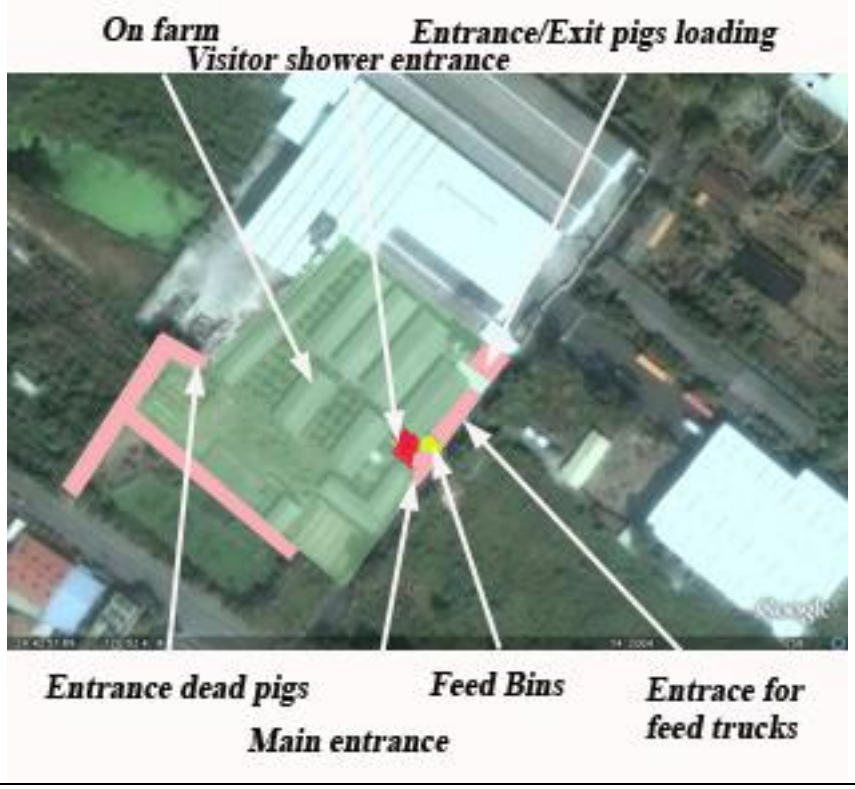
Possible distance spread from acutely infected unit	*Actinobacillus*	Aujeszkyôs Disease	*Brachyspira hyodysenteriae*	Brucellosis	Classical and African	*Escherichia coli (E. coli)*	Foot and Mouth Disease	*Lawsonia intracellularis*	Lentospirosis	*Mycoplasma*	*Pasteurella multocida*	PMWS (cause unknown)	Parvovirus	PRRSv	Salmonellosis	*Sarcoptes scabiei* - Mange	Swine Influenza virus	TGE/PED
Less than 10 metres	■	■	■	■	■		■	■	■	■	■	■	■	■		■	■	■
10 to 50 metres		■	■	■	■		■	■	■	■	■	■	■	■		■	■	■
50 metres to 1 km		■		■			■	■	■	■		■	■	■			■	■
1 to 10 km		■		■			■	■	■	■			■					■
More than 10 km							■	■					■					■

The minimum expected spread from an acutely infected farm is highlighted in red



The movement of smoke from a farm fire.

Estimating distance a pathogen may spread is always difficult. Some pathogens like *Escherichia coli* and Salmonella are ubiquitous (everywhere). Other pathogens live in soil ï for example *Erysipelothrix rhusiopathiae.* Other pathogens may be moved because they exist in wild animals and movement of the pathogen is dependent on these animals, *Lawsonia intracellularis* and Brucella are examples. Note all the pathogens can be spread by pigs, and therefore, the movement of feral pigs will transmit the pathogen over their range. In addition, pathogens that are faecal borne and environmentally resistant (which may be seasonal) can be transmitted over vast distances ï PRRSv for example when winter gets below 0•C, the pathogen will survive in frozen faeces carried on boots or vehicles, potentially over 100ôs km. It is interesting, that pathogens like APP do not move far from the pig, and yet is present on almost all pig farms.

Internet programmes such as Google Earth can provide an extremely useful resource as the farm and the surrounds can be visualised. The two farms illustrated are only separated by 300 metres, significantly limiting the long term biosecurity of each farm.	
In addition biosecurity maps can be created illustrating entrances and exits, weak points in the perimeter and rodent bait box positions.	

Ensuring the incoming stock is of the correct health status

Incoming pigs are the major threat to any pig unit. It is essential that all incoming stock are not going to introduce a new pathogen. Many breeding companies will monitor the health and pathogens present (or absent) on their farms. An example health declaration form is illustrated below:

HEALTH STATUS FORM

Jan/Mar		July/Sept	
Apr/June		Oct/Dec	

UNIT:

DATE:	**QUARTER:**

CONDITION	CLINICAL AND OTHER TESTS PERFORMED	RESULT
Actinobacillus pleuropneumoniae		
Enzootic pneumonia ï *Mycoplasma hyopneumoniae*		
Enteric viruses (TGE, PED)		
Leptospira pomona		
Lice		
Mange		
Porcine reproductive & respiratory syndrome (PRRSv)		
Progressive Atrophic Rhinitis ï toxigenic *Pasteurella multocida*		
Salmonella cholerae-suis		
Streptococcus suis II meningitis		
Swine dysentery ï *Brachyspira hyodysenteriae*		
Swine influenza		
Pig disease notifiable within the country (e.g.) FMD, SVD, VS, CSF, ASF, Brucellosis, TB, Rabies, Aujeszky's (Pseudorabies) and any other exotic disease		
RESULTS TO BE REPORTED AS **Negative** = Disease believed absent from herd **No Evidence** = Disease previously diagnosed within last 2 years **Present** = Disease evident at visit or evident on farm		

Current prophylactic medication vaccines, in-feed and water medications

Age group	Vaccines, Medication and dose	Reason
7-12 kg		
18-30 kg		
30 + kg		
Adult		

Veterinary Surgeon's Signature .....

This report does not guarantee freedom from the pathogen. The report is limited to the accuracy of the tests preformed

Example of Routine Health Monitoring as carried out by a pig breeding company

A variety of specific disease states are monitored quarterly on each of the units. The reporting form to be used by the unit veterinary surgeon is illustrated on the previous page. Monitoring will follow the specified scheme. Note the farms are inspected twice daily by training stockpeople. Weekly reports by the manager are submitted to the company veterinarian. The unit is examined quarterly by the company veterinarian. Other testing may be required depending in the pathogen. For example if the farm is *Actinobacillus pleuropneumoniae* free.

Units Health Status A PRRSv –ve *Mycoplasma hyopneumoniae* –ve (Herd less than 500 sows)
PRRSv 20 finishing pigôs minimum age 12 weeks at least once a quarter
Mycoplasma hyopneumoniae
20 finishing pigôs minimum age 12 weeks at least once a quarter
Progressive Atrophic Rhinitis ï Toxigenic *Pasteurella multocida*
Every 6 months nasal swabs 4 swabs from pigs at 4, 8 and 12 weeks of age pigs
Internal parasites
Every 6 months worm examination of faeces from boars, lactating and dry/gestating sows and finishing pigs
Slaughterhouse Examination
Every 6 months examination of 60 pig skins, 30 lungs and 20 snouts
Note: This will only provide an assurance of 99% that less than 20% of the animals are positive to the organism. Any sample that is not 100% of the animals cannot rule out the possibility that positive animals exist within the population. Over time confidence increases in the accuracy of the statements.

Unit Health Status B PRRSv –ve *Mycoplasma hyopneumoniae* +ve (Herd less than 500 sows)
PRRSv 10 finishing pigôs minimum age 12 weeks bled at each quarter
Progressive Atrophic Rhinitis ï Toxigenic *Pasteurella multocida*
Every 6 months nasal swabs 4 swabs from pigs at 4, 8 and 12 weeks of age pigs
Internal parasites
Every 6 months worm examination of faeces from boars, lactating and dry/gestating sows and finishing pigs
Slaughterhouse Examination
Every 6 months examination of 60 pig skins, 30 lungs and 20 snouts

Unit Health Status C PRRSv +ve *Mycoplasma hyopneumoniae* +ve (Herd less than 500 sows)
Progressive Atrophic Rhinitis ï Toxigenic *Pasteurella multocida*
Every 6 months nasal swabs 4 swabs from pigs at 4, 8 and 12 weeks of age pigs
Internal parasites
Every 6 months worm examination of faeces from boars, lactating and dry/gestating sows and finishing pigs
Slaughterhouse Examination
Every 6 months examination of 60 pig skins, 30 lungs and 20 snouts

AI Stud PRRSv-ve *Mycoplasma hyopneumoniae* Vaccinated (AI stud less than 150 boars)
10 animals will be examined by serology for PRRSv. Where required, serum may be tested by various PCR techniques for PRRSv. Additional entry and exit tests may be required by governmental bodies.

How many animals do we need to test?

In any investigation of health, it is important to realise that it is unlikely that all the animals will be tested. Health is monitored on a statistical basis using probability tables. In the previous health checks undertaken by the breeding company the numbers to be tested are agreed by the health team to provide a responsible degree of pathogen detection.

Sampling herds to detect evidence of infection

95% confidence limit

Herd size	Sample Size to detect > 1 +ve Sensitivity (=% =+ve) = Prevalence							
	0.1	**0.2**	**0.5**	**1**	**2**	**5**	**10**	**20**
50	50	50	50	50	48	35	22	12
100	100	100	100	95	78	45	25	13
150	150	150	148	130	95	49	26	13
200	200	200	190	155	105	51	27	14
300	300	300	260	189	117	54	28	14
500	500	475	349	225	129	56	28	14
750	750	648	412	246	135	57	28	14
1000	950	777	450	258	138	57	29	14
1500	1279	947	493	271	142	58	29	14
2000	1553	1054	417	277	143	58	29	14
5000	2253	1294	564	290	147	59	29	14

99% confidence limit

Herd size	Sample Size to detect > 1 +ve Sensitivity (=% =+ve) = Prevalence							
	0.1	**0.2**	**0.5**	**1**	**2**	**5**	**10**	**20**
50	50	50	50	50	50	42	29	17
100	100	100	100	99	90	59	36	19
150	150	150	150	143	117	68	38	20
200	200	200	198	180	136	73	40	20
300	300	300	286	235	160	78	41	20
500	500	495	420	300	183	83	42	21
750	750	715	530	343	197	85	43	21
1000	950	890	601	368	204	86	43	21
1500	1430	1177	687	395	212	88	44	21
2000	180	1367	737	410	216	88	44	21
5000	3008	1844	840	438	223	89	44	21

In addition, note that no test is fool proof. Tests use a system of sensitivity and specificity

The number of false positives is defined by the testôs sensitivity.

The number of false negatives is defined by the testôs specificity.

To use these tables: To have a 95% confidence that you will detect one positive animal in your test group when the disease affects at least one in 10 animals and the sample group is 500 animals: it will be necessary to test at least 28 animals.

Determination of the sensitivity and specificity of a test

This simple table will allow the results of a test to be predicted
Construct a table with four rows and two columns.

	Animals which are going to test positive	**Animals which are going to test negative**
Actual results from the prevalence of the pathogen in the herd – ie 10% of animals have the pathogen	Thus ï from a 100 animals the result will be 10 animals	Thus ï from a 100 animals the result will be 90 animals
From the claimed sensitivity (accurate positives) of the test the number which will actually be positive. Ie test is 90% accurate in detecting positive animals	Thus ï from the 10 true positive animals, the test will detect 90% of them ï 9 animals will be found truly positive	Thus ï from the true positive animals, the test will fail to detect 10% of them ï 1 animal will be found to be falsely negative
From the claimed specificity (accurate negatives) of the test the number will accurately identified as negative. Ie test is 80% accurate in detecting negative animals	Thus ï from the true negative animals, the test will identify 20% as false positive ï thus 18 animals will be found positive.	Thus from the true negative animals, the test will fail to indicate they are negative 80% of the time ï 72 animals will be found truly negative
Apparent result of the test	This test will identify 9 animals truly negative and an additional 18 as false positive ï thus 27 animals in total will be found positive	This test will identify 1 animal as a false negative and an additional 72 animals as truly negative, thus 73 animals in total will be found negative.

A simple spreadsheet can thus be constructed ï this is an embedded excel on the CD.

Prevalence in the herd	10	%
Sensitivity (positive)	90	%
Specificity (negative)	80	%

Calculation from	100	animals

	Positive	**Negative**	
Actual	10	90	animals
Sensitivity - true positive	9	1	
Specificity - true negative	18	72	
Apparent results	**27**	**73**	
		Total	100 animals

What may happen if there is a positive sample?

The table below illustrates the type of response to be expected from a breeding company in the light of a positive test result. The pathogen *Mycoplasma hyopneumoniae* is used as the example.

Number of animals 1st test	**Result**		**Action**
All in group	Negative		No action ï sales continue
One in group	Inconclusive or **positive**		Inform company veterinarian
			Retests submitted sample
	2nd test	Negative	No action ï sales continue
		Inconclusive	**Inform company veterinarian**
			Sales only to *M. hyo* +ve customers (informed)
			Submit sample for PCR test
			Wait 10 days and retest animal and 5 others ï test serum antibody and PCR
		Positive	**Inform company veterinarian**
			Stop sales or only sales to *M. hyo* +ve customers
			Review whole health status of the herd, may involve a major investigation
	3rd test	Negative	Re-start sales
		Inconclusive or positive	**Inform company veterinarian**
			Stop sales or only sales to *M. hyo* +ve customers
			Review whole health status of the herd, may involve a major investigation
More than one in group	Inconclusive or **positive**		Inform company veterinarian
			Close farm until farm health secured or only allows sales to *M. hyo* +ve customers (informed)
			Re-test submitted sample Re-test animals and resubmit samples to different laboratory. Consider PCR.
			Slaughterhouse or Post-mortem examination to include IHC of suspects. Note animal slap marks
	2nd test	All negative	Re-open farm and re-start sales. Increase number tested in next quarter by 50%.
		Inconclusive or positive	**Inform company veterinarian**
			Herd closure remains
			Review whole health status of the herd, may involve a major investigation

Note all tests produce false results both positive and negative.

Selection of Specimens

Animals selected for laboratory analysis, ideally should be free from antimicrobial therapy and in an early or acute disease stage. Selected tissues should be collected as aseptically as possible. In addition, a meaningful history of the disease outbreak and a tentative diagnosis, based upon clinical evaluation, should be included. Laboratory tests results are directly affected by the selection, preparation, handling, and shipment of selected specimens.

Identify tissue and samples:
- Building or site
- Animal identification number
- Fluids, Exudate/Aspirates, Tracheal Washes, Urine

Preparation & Collection of Samples

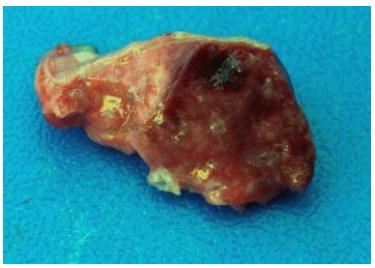
Tissues - Fresh
Collect aseptically approximately 6 to 12 cm samples and place each in a plastic bag (e.g. whirl-paks). Sample visible lesions with adjacent normal tissue. Double bag in whirl-pak bags. Do not mix tissues in one single bag. Transport with cold packs.

Eighteen to 24 cm of intestine should be carefully removed from the mesentery and tied to prevent leakage of intestinal contents. Collect sections of small and large intestine. The selected, clearly identified samples are double bagged and sealed in whirl-pak bags to prevent spillage. The sample should be refrigerated and cooled thoroughly prior to shipping.

Swabs
Aerobic culture: Commercial swabs with Stuart or Amies transport media is recommended to prevent desiccation.
Anaerobic culture: Note exposure to air for 20 minutes may destroy the sample. Transport in anaerobic transport media: for example a Clare Blair tube.
Virus culture: Collect blood in citrate tubes as EDTA may be detrimental to viral isolation. Dacron swabs are preferable over standard cotton swabs which may contain bleach which can reduce the viability of the viruses. The swabs must be prevented from dying out.

Histopathology
Preparation of Tissue for Fixation

Multiple sites or types of lesions should be taken. The sections should **only be 2 cm thick.** The small size of the tissue results in rapid and complete penetration of the fixative. Present normal looking tissue with the pathological specimen.



Normal lung left portion with pathological area on the right

Selected tissues should be cut with a sharp scalpel since the squeezing action of a scissors crushes and tears tissue. The tissue should be rinsed briefly with 0.85% NaCI to remove adhering blood, since blood will retard fixation. Autolysis or freezing will make samples unsuitable for proper evaluation. Place tissues in double whirl-paks. Identify bags if multiple animals are submitted. Do not use narrow mouth bottles to submit fixed tissue. Note: All hollow organs (intestine or uterus) are gently flushed with 10% formalin without disturbing the mucosal lining before placing them in formalin.

Volume of fixation

The selected tissues are fixed in 10% Neutral Buffered formalin. Use 10 times the volume of the tissues being fixed.

Wrong bottle for tissue

Insufficient formalin

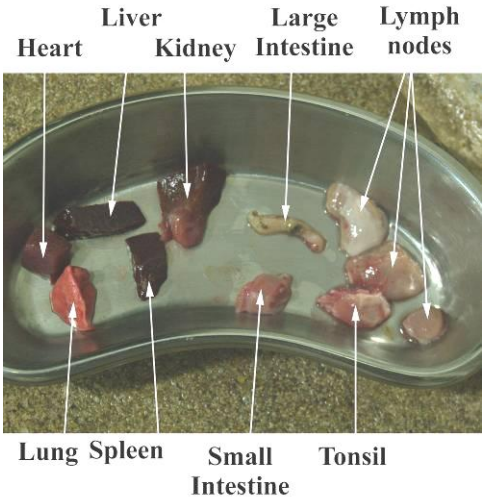
Correct formalin to tissue ratio

Tissue which floats formalin penetration assisted by placing a small piece of card over tissue (picture right)

Collection of samples

Ideally collect samples from all abnormalities visually recognised and from the draining lymph node. In addition, collect from the following organs: lung, heart, liver, spleen, kidney, small intestine, large intestine, tonsils and two lymph nodes.

In pigs less than 30 kg a piece of brain and meninges can be extremely helpful in reaching a final diagnosis.



Blood Samples

Blood smear: Prepare the blood smear on the slide at the farm. Allow to air dry and stain back at the laboratory.

Unclotted blood sample: Collect in either EDTA, Heparin or Citrate tubes. Pig blood clots extremely quickly.

Clotted blood samples: serum or plasma ï useful for biochemistry or antibody examination.

When sending paired serum, identify the acute samples from the convalescent samples on the tube and on the request form.

Packing Specimens

To avoid leaking in transit, double bag the samples. Whirl-pak bags work well for this purpose. Wrap sample bags and 2-4 ice packs on absorbent paper (e.g. newspaper) to absorb in the event of leaking. Place the package into a Styrofoam container. Completed submission forms should be inserted into the envelope on the inside cover of the cardboard box.

Mailing

Samples should be submitted by the fastest means possible to avoid deterioration of specimens. Next day or overnight delivery is preferred over others. Discuss with the mailing system selected any specific requirements. Ideally take the samples to the diagnostic laboratory personally or by carrier. Note try to avoid Friday or Holiday samples.

Ensure that all samples are adequately identified and a suitable history is provided with the samples.

Diagnostic Specimens and Tests For The Major Porcine Diseases

Disease Suspected	Specimen	Sample Preparation	Laboratory Procedure
Abortion	Foetus: liver, kidney, stomach content, thoracic fluid. Placenta. Swabs Sow: paired sera	Refrigerate	Culture-Sensitivity Leptospira-FAT Parvovirus EM Serology
Actinobacillus pleuropneumoniae	Lung Swabs Serum	Refrigerate	Culture-Sensitivity Stereotyping Serology **CF 1:4 suspect** **CF 1:8 positive**
Anthrax	Impression smear from retropharyneal fluid in swollen neck		Stain for Bacillus ï capsule does not form readily in pigs
Arthritis	Exudate, joint fluid, synovia swab and tissue Joint fluid Whole joint ï piglet and weaner	Refrigerate Formalin Refrigerate	Culture-Sensitivity Histopathology Serology
Atrophic Rhinitis	Snout, turbinates, nasal swab and tissue Nasal Section Nasal swab	Refrigerate Formalin	Culture-Sensitivity Pm toxin test Histopathology View and Score ELISA toxin presence
Circovirus 2	Swollen lymph nodes, selected tissues. Note always present	Formalin	Histopathology IFA and IHC
Coccidiosis	Faeces Small intestine smear (wash away faeces first)	Refrigerate Air dried smear Formalin	Smear, flotation Histopathology
Colibacillosis	Several acutely affected pigs Duodenum, mesenteric lymph nodes, liver smears and tissue. Note alkaline pH of contents.	Live Refrigerate Formalin	Culture-Sensitivity Serotyping Histopathology Toxin gene typing PCR
Colostrum	Heart Blood	Refrigerate	IgG **> 10 mg/ml normal**
Cryptosporidium	Small intestine smear and tissue	Refrigerate Formalin	Smear Histopathology
Cystitis/ pyelonephritis	Renal pelvis	Refrigerate	Culture-sensitivity anaerobic
Cytomegalovirus	Turbinates, lung, kidney	Formalin	Histopathology
Enteritis (non-specific)	Acutely affected pigs pH of contents Small & large intestine, liver, mesenteric lymph node swab, smear, tissue Intestine content	Live Refrigerate Formalin Contents	View villi Acid viral Alkaline *E. coli* Culture-Sensitivity Smear Clostridium Rotavirus Histopathology Clostridial toxin
Enzootic/ Mycoplasma pneumonia	Lung, respiratory lymph nodes, swab and tissue Serum	Refrigerate Formalin	View and score Culture-sensitivity IHC PCR Serology **S/P <0.3 negative** **0.3-0.4 suspect** **> 0.4 positive**
Erysipelas	Heart, lymph node, liver, spleen, swollen joints swabs. Serum	Refrigerate Formalin	Culture-Sensitivity Serology Histopathology
Genetic examination	Blood sample unclotted Tissue Note use separate needle for each pig	Separate needle Refrigerate/ freeze	PCR
Haemophilus parasuis **(Glasser's disease polyserositis)**	Sick pig Cavity of joint fluids Serous membranes, meninges, lung Serum Note organism dies rapidly	Live Refrigerate Formalin	Culture-Sensitivity Serotyping Serology Histopathology
Greasy Pig	Affected animal swabs from skin	Live Refrigerate	Culture-Sensitivity
Ileitis (*Lawsonia intracellularis)*	Ileum Tissue	Formalin Fresh refrigerate	Histopathology PCR IHC
Influenza	Trachea, lung, nasal swabs (in transport media) Serum	Refrigerate Formalin	Virus Isolation Immunoperoxidase PRC Serology **HI > 1:40 positive**

Leptospira	Foetus: kidney, thoracic fluid swab and smear Oviduct smear Sow: sera (paired)	Refrigerate	FAT Serology **1:100 suspect** **1:200 diagnostic**
Mastitis	Difficult to get a diagnostic sample	Refrigerate	Culture and identification
Meningitis	CSF (Cerebral spinal fluid) before cutting the skin of the head Brain and meninges	Refrigerate Formalin	Culture and identification Histopathology
Mulberry Heart	Heart and Liver	Formalin	Histopathology
Mycoplasma arthritis	Joint serosa Joint fluid	Formalin Refrigerate	Histopathology Serology
Mycoplasma haemosuis	Blood smear	Air dry	
Mycotoxins	Tissues ï submit at least 100g Food materials ï submit at least 1 kg (avoid condensation and fugal growth during transport)	Freeze Place feed in paper bag	
Oedema Disease	Stomach, intestine, kidney, brain, liver Sick live pig	Refrigerate Formalin	Culture-Sensitivity Serotyping Histopathology
Parvovirus (PPV)	Foetus: liver, thoracic fluid Sow: paired sera	Refrigerate	EM Serology
PMWS	Lymph nodes ï 5 from around the bodies	Formalin	Histopathology
PRCV	Serum Lung tissue	Formalin	Serology (note differential test re-TGE) IHC
PRRSv	Lung tissue Thymus Tonsilar scrape and biopsy ï use Dacron swab Blood serum via Dacron swab Serum	Refrigerate Formalin	Virus Isolation Histopathology IHC PCR Sequencing Serology
Rotavirus	Middle and lower jejunum, upper ileum, faeces	Refrigerate Formalin	Latex agglutination. Histopathology IHC
Salmonellosis	Colon, liver, lung, spleen, faeces, mesenteric lymph node swabs Live sick pig	Refrigerate	Culture-Sensitivity Serotyping
Streptococcus	Brain, Cerebral spinal fluid, lung, joint Serum	Refrigerate	Culture-Sensitivity Serotyping IHC Serology
Swine Dysentery	Affected pigs faeces, colon	Live Refrigerate Formalin	Culture-Sensitivity Darkfield Histopathology IHC PCR
Transmissible Gastroenteritis (TGE)	Affected pigs faeces, small intestine contents and tissue Serum Jejunal contents acidic	Live Formalin	Histopathology IHC Serology **NA 1:4 positive**
Water depravation	Brain	Formalin	Histopathology

Abbreviations

CF = Compliment Fixation ELISA = Enzyme-linked Immunosorbant assay
EM = Electron Microscopy FAT = Fluorescent antibody test
IFA = Indirect Fluorescent Antibody IHC = Immunohistochemistry
PCR = Polymerase chain reaction

Health Alarm List

This advice sheet is designed for a 10 sow farrowing a week farm
The vet should be notified as soon as possible if any of the following signs are seen by a member of the unit staff and verified by the manager.

This aims to reduce any time delay between an outbreak and effective treatment

Any Age Group	
	The development of lameness in pens or groups of pigs
	Blisters on the snout or excessive salivation in pens or groups of pigs
Sows	
	Four or more sows off their feed with an elevated temperature
	Four or more sows breathing rapidly and with obvious respiratory distress
	Four or more sows aborting within seven days
Suckling herd	
	A noticeable rise in pre-weaning mortality over a two week period
Growing-finishing herd	
	A noticeable rise in post-weaning mortality over a two week period
	Scour spreading through any age of pigs, particularly if containing blood
	A marked rise in the number and severity of pigs coughing or with laboured breathing
	Three or more unexpected deaths in one day

Diseases of pigs which are notifiable to the OIE

List A

Transmissible diseases that have the potential for very serious and rapid spread, irrespective of national borders, that are of serious socio-economic or public health consequence and that are of major importance in the international trade of animals and animal products.

- African swine fever
- Classical swine fever
- Foot and mouth disease
- Rinderpest
- Swine vesicular disease
- Vesicular stomatitis

List B

Anthrax
Aujeszky's disease / Pseudorabies
Echinococcosis/hydatidosis
Heartwater
Leptospirosis
New world screwworm (*Cochliomyia hominivorax*)
Old world screwworm (*Chrysomya bezziana)*
Paratuberculosis
Q fever
Rabies
Trichinellosis
Atrophic rhinitis of swine
Enterovirus encephalomyelitis
Porcine brucellosis
Porcine cysticercosis
Porcine reproductive and respiratory syndrome
Transmissible gastroenteritis

Examination of Isolation Premises
Prior to the Delivery of the Animals

Incoming animals must be placed in a separate accommodation which runs as an all-in/all-out building. The isolation facility should be far enough away from the receiving farm to protect it from the specific pathogen. All these requirements can be extremely difficult to achieve.

UNIT: ….....

	Area for examination	**Tick off if correct**
1	Isolation area as remote as practical from other livestock. Consult with the vet to confirm required distance	
2	Air space separate from other air spaces	
3	Interior cleaned and disinfected	
4	Building suitable for the housing the pigs	
5	No drainage or effluent produced by/or derived from other livestock can pass through the accommodation	
6	Overalls are reserved exclusively for use in the isolation accommodation	
7	Boots are reserved exclusively for use in isolation accommodation	
8	Foot baths are in place and are used	
9	Place adequate signs to keep people out of isolation area	
10	The isolation area has separate medicines	
11	The isolation area will run as all-in/all-out	

Signed .....

Date .....

With a 8 week gilt introduction programme at least 3 isolation facilities will be required if gilts are delivered monthly

Gilt Introduction

The isolation quarters are run as strict all-in/all-out

On arrival	
First two weeks	
1	Ensure animals are separate from native pigs for two weeks
2	Ideally separate by 50 metres
3	Attempt to climatise the animals to the new environment. Initially attempt to simulate the original environment. Make changes gradually
4	Pay particular attention to: the cooling systems and water supply if possible have bagged feed from original farm or make attempts to match original feed. Ideally feed a lactation diet. if pigs come from a straw based system, utilise straw or solid flooring before introducing to slatted systems
5	Ensure particle size of feed >700 μm to help any gastric ulcer heal
6	The animals may require antimicrobial or additional vaccine therapy following introduction, please discuss with the practice. Vaccination with Erysipelas, Parvo, *Mycoplasma hyopneumoniae*, Ileitis, SIV and PRRSv should be considered where necessary
7	It is essential to have separate needles, syringes and medicines for each batch of gilts
2 th to 4 week post introduction	
1	Introduce cull adult or grow/finish stock to the new arrivals
2	It may be necessary to introduce adults first for two weeks, then remove these and replace with growers
3	Change over the environment to match local conditions
4	Commence feed back programme
5	It may be necessary to medicate the pigs depending on how they respond to the new diseases
4 to 8 weeks post introduction	
1	Remove grow/finish animals to allow the new pigs time to recover from any illness
2	Consider exposing gilts to a boar for 20 minutes a day to start stimulation
Introduce into the herd	
	Place onto Lactator feed for 2 weeks prior to first service to flush the gilt
Thoroughly clean and disinfect isolation quarters	
Record all signs of illness over the 8 week period	

Boar Introduction

The isolation quarters are run as strict all-in/all-out
Manage isolation at end of day to ensure a 12 hours break or have separate staff looking after the isolated pigs

On arrival	
First two weeks	
1	Ideally separate by 50 meters
2	Attempt to climatise the animals to the new environment. Initially attempt to simulate the original environment. Make changes gradually
3	Pay particular attention to: the cooling systems and water supply if possible have bagged feed from original farm or make attempts to match original feed. If pigs come from a straw based system, utilise straw or solid flooring before introducing to slatted systems
4	Ensure particle size of feed >700 µm to help any gastric ulcer heal
5	The animals may require antimicrobial or additional vaccine therapy following introduction, please discuss with your vet. *Mycoplasma hyopneumoniae*, Ileitis, SIV and PRRSv vaccination may be useful to consider
6	It is essential to use new needles, syringes and medicines for each boar and record all signs of disease. A boar with a temperature can be infertile for 6 weeks.
2 th to 4 week post introduction	
1	Introduce cull adult or grow/finish stock to the new arrivals (for on farm studs only). On AI studs introduce faeces from the main stud to the corner of each boar dunging area three times a week to 'break down' the new boars to the environment of the stud.
2	Change over the environment to match local conditions
3	It may be necessary to medicate the pigs depending on how they respond to the new diseases
4 to 8 weeks post introduction	
	Remove grow/finish animals to allow the new pigs time to recover from any illness (for on farm studs only). On AI studs cease introduction of faeces from the main stud
Discuss with source herd(s) regarding any problems that have occurred on the unit over the last 8 weeks, ideally obtain written confirmation of lack of problems by email	
Introduce into the herd	
Thoroughly clean and disinfect isolation quarters	
Record all signs of illness over the 8 week period	

Use of Feed Back

1	'Feed back' may only allowable in some countries after written authorization from the Government because of Swine Fever controls

2	The best 'feed back' material is weaner faeces and scour from the farrowing house
3	Twice weekly collect material
5	Gilts: Gilts should be given feed back twice weekly for two weeks starting 3 weeks prior to first service
5	Sows: Sows should receive feed back twice during pregnancy at 6 and again at 3 weeks pre farrowing
6	Feed back is not without it own risks. The idea of the material is to immunise the sow and gilt to on-farm pathogens, however, some pathogens do not require to be spread around the farm, i.e. salmonellosis or dysentery and if new diseases occur on the unit discuss your feed back regime with your vet
7	Always ensure that gilts are vaccinated against Parvo prior to their first service as feed back cannot be guaranteed to protect against Parvo

Feedback is an excellent method of ensuring that immunity to the background/endemic pathogens on the farm is maintained, particularly for incoming new stock ï this should include home bred gilts. On multisite farms, feedback can not be moved between farms or units and this needs to be discussed with your veterinary advisors.

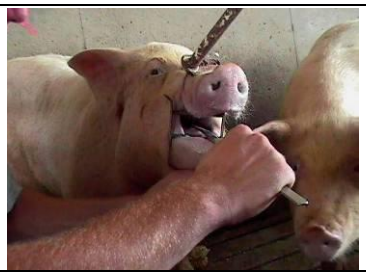
Feedback can be combined with tonsilar scrapes to provide good PRRSv and PCVII control.

Feedback materials

Weaner faeces and scour from the farrowing area

Stillborns, mummified and placenta. Diarrhoea from the farrowing house

Bedding from the farrowing area



Tonsilar scrapes

Isolation and Acclimatization
What does all-in/all-out mean?

Proper functioning of an isolation/acclimatization area:

				
	Isolation	Acclimatization		
	2 weeks	2-4 weeks	4-8 weeks	
Gilt arrive			**Wash and disinfect**	**Gilts arrive**
All tests carried out gilts enter breeding unit				

Typical problems

Basic commonsense issues		
		
No isolation facilities Gilts are placed at the end of the breeding barn only. This poses a serious PRRSv risk.	**No change of clothing** Between the main farm and the isolation facilities.	**No acclimatization** The only acclimatization offered these gilts was from the passing sows.
		
Isolation too close to the farm	**Movement of needles** between groups	**No or poor cleaning** between groups
Flow issues		
		
Truck dirty	**Dirty entry/exit facilities**	**Animals too old on entry**

PROPER FUNCTIONING OF AN ISOLATION/ACCLIMATISATION AREA

	Isolation	Acclimatization		
	2 weeks	2-4 weeks	4-8 weeks	
Gilt arrive			**Wash and disinfect**	**Gilts arrive**
		All tests carried out gilts enter breeding unit		

What is not adequate?

Risk: Test results are not available when gilts are needed to move

	Isolation	Acclimatization		
	2 weeks	2-4 weeks	4-8 weeks	
Gilt arrive			**Wash and disinfect**	**Gilts arrive**
		Test results not available when gilts enter breeding unit		

Solution: Do not move gilts until all results available. There is no compromise.

Risk: Next batch of gilts arrives before current batch leaves

	Isolation	Acclimatization		
	2 weeks	2-4 weeks	4-8 weeks	
Gilt arrive			**Wash and disinfect**	**Gilts arrive**
		All tests carried out gilts enter breeding unit		
				
	Gilts arrive in adjacent pens			

Solution: Need to have sufficient isolation/acclimatization areas. The length of the isolation is only from the introduction of the last group of gilts or boars.

Risk: Boar moved from other group of gilts in a different isolation

	Isolation	Acclimatization		
	2 weeks	2-4 weeks	4-8 weeks	
Gilt arrive			**Wash and disinfect**	**Gilts arrive**
		All tests carried out gilts enter breeding unit		
				
	Boar from another group of gilts in isolation			

Solution: Move boars from main farm down to isolation/acclimatization area and only move back with gilts when all tests on gilts adequate. Boars must not move between isolation/acclimatization areas before test results known.

Risk: No washing between batches ï new gilts subjected to a high disease load on entry

	Isolation	Acclimatization		
	2 weeks	2-4 weeks	4-8 weeks	
Gilt arrive		**No Washing and disinfection**		**Gilts arrive**
		All tests carried out gilts enter breeding unit		

Solution: All-in/all-out is not only animals, it includes, water, food, floor, air and medicines

Pathogens that might be transmitted though semen

Pathogens believed to be able to be transmitted in Boar Semen in medicated diluent (depending on antibiotic used)
Actinobaculum suis
Adenovirus
African Swine Fever virus
Aujeszky's Disease (Pseudorabies) virus
Brucella suis
Circovirus II
Classical Swine Fever virus (Hog Cholera)
Congenital tremor virus (not identified)
Cytomegalovirus
Enterovirus
Foot and Mouth Disease virus
Japanese encephalitis virus
Leptospires spp
Porcine Multisystemic Wasting Syndrome virus (not identified)
Porcine Parvovirus
Porcine Reproductive Respiratory Syndrome virus (PRRSv)
Reovirus
Swine vesicular disease virus
Transmissible genital papilloma virus
Raw semen contains large numbers of bacteria which include *E. coli*. streptococci, Klebsiella and Staphylococci spp, Citrobacter, Pseudomonas, Proteus, Micrococci, Corynebacterium, Serratia, Bacillus, Enterobacter, Acrobacter and Bordetella.

The use of artificial insemination is still much safer than bringing the whole boar to the farm. However, with farms which are PRRSv negative, it is safer to practice on-farm AI and boars which enter the farm stud will go through the same vigorous testing of incoming gilts.

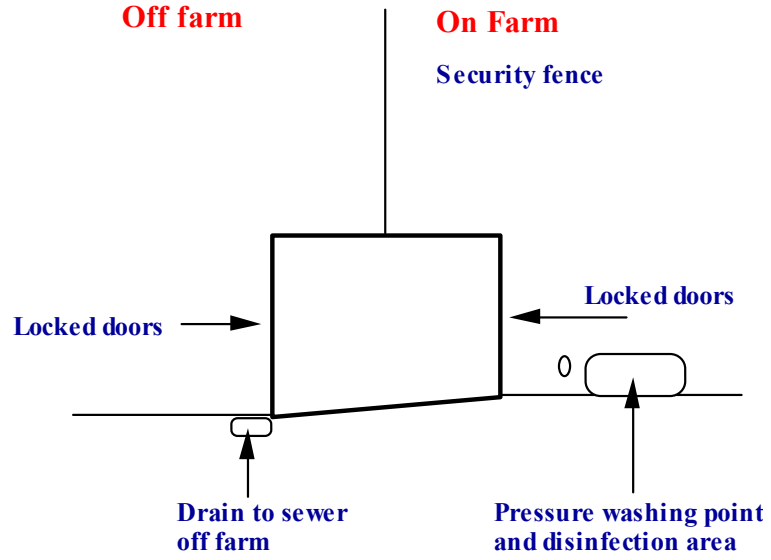
A thermocabinate running at 17°C for delivery of AI

Reject any broken AI delivery box

Disposal of Dead Pigs

1	When a dead animal is identified this should be recorded
2	The farm manager should decide if a post-mortem examination is required
3	The animal should be removed from the house as soon as possible
4	The animal should be moved to the perimeter fence dead area
5	The dead pig area should be designed as below

Photo example



6	Once the dead pigs are removed by the knacker man the dead box should be pressure washed and disinfected
7	The dead box should be emptied at least once a week, twice in the summer months
8	Cover cuts and abrasions when handling sick or dead pigs
9	Always wash your hands after handling sick or dead pigs
10	The knacker man's truck must not have any other dead pigs in the truck prior to arrival. Only reputable knacker men with properly constructed trucks should be utilised

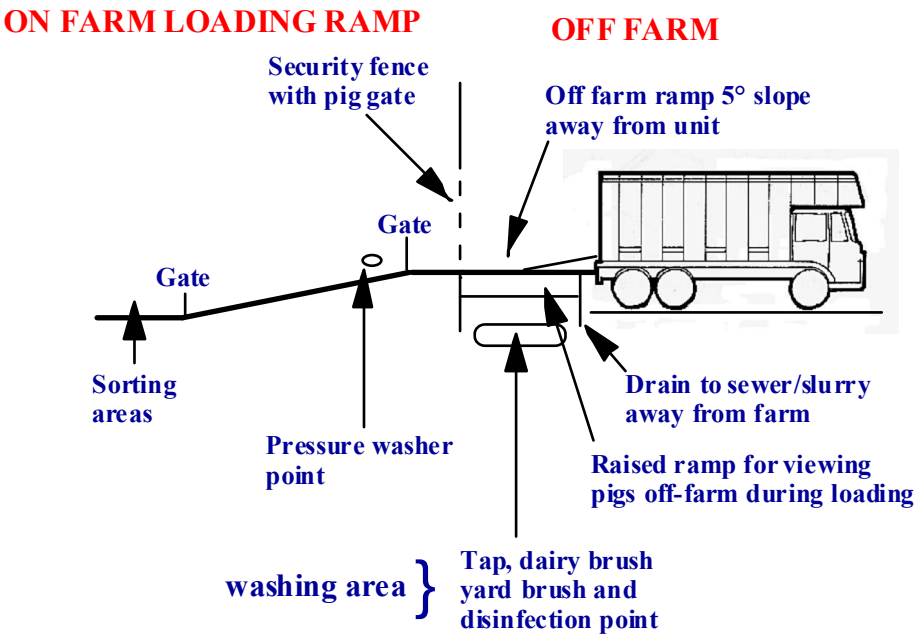
Composting

Ideally, a composing system should be designed to cater for any dead animal. Well constructed, sows will totally compost in 3 months.

A dead pit

Composting pile

Unit security
Entry and Exit Procedures for Livestock



Loading ramp rules	
1	Trucks must have no pigs on board, must be clean, washed and disinfected
2	The off-farm disinfectant/washing area (see above) must be prepared prior to each loading by the unit staff, (wearing off-unit clothing) and then they must re-enter the farm
3	The truck driver must inform a member of staff using the horn upon arrival
4	The truck drivers must wash their hands and wear the over-boots provided and dip the boots in the disinfectant provided
5	The truck driver's name and vehicle number should be logged in the animal movement book
6	Farm staff must not cross the security fence line or the loading ramp
7	The loading ramp area must be thoroughly cleaned after loading each batch of pigs In many countries there is a legal slope limit of 20°
8	The truck driver must not enter the unit, under the security fencing onto the on-farm ramp, to assist the loading
9	All entry and exit points should be well lit, ideally with proximity sensors
10	The sorting area and on-farm loading area must be thoroughly cleaned and disinfected once the pigs have arrived or left

Truck Routines

Trucks are the second major risk to a pig farm (after the pig themselves) because if they are not properly cleaned they will act as a vehicle to rapidly transport pig faeces, saliva, urine etc., from one farm (slaughterhouse for example) to another. It has been shown that pathogens can easily move in these pig materials.

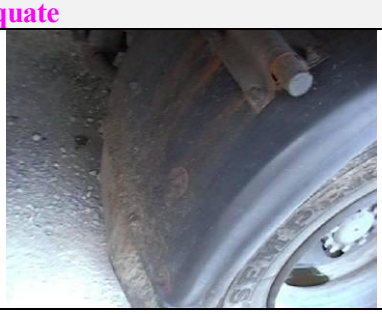
Truck Cleaning Protocols

1	The front of the truck should be raised on mounts
2	The inside of the truck should be completely empty of all straw and faecal material
3	Bag or move the straw and faecal material away from the truck cleaning area
4	Remove all removable equipment from the inside of the truck
5	Place a garden sprinkler inside the truck, connect to the water mains and turn on for at least 30 minutes
Removed equipment	
6	Soak all removable equipment for 5 minutes
7	Spray detergent using a low pressure washing (300 psi 30 bar) or via a foam gun applicator at the required concentration
8	Allow detergent contact time of 30 minutes
9	Using a pressure washer set at 500 psi (35 bar) with an 45° angle jet clean all removable equipment
10	Allow to dry and then disinfect all removed equipment at the required concentration
Truck	
11	Spray detergent inside the truck using a low pressure washing (300 psi 30 bar) or the foam gun application
12	Allow detergent contact time of 30 minutes
13	Using a pressure washer set at 500 psi (35 bar) with a 45° angle jet clean the inside of the truck. Start at the roof, work down the walls to the floor working towards the back of the truck
14	Allow the inside to partially dry and then disinfect at the required concentration using a knapsack sprayer
15	Wet the outside of the truck with water from a hose or pressure washer set at 300 psi (30 bar)
16	Spay detergent using a low pressure washing (300 psi 30 bar) or the foam gun application at the required concentration
17	Allow detergent contact time of 30 minutes
18	Pressure wash at 300 psi (30 bar) the outside of the truck with water, starting at the roof, sides and finally underneath. Pay particular attention to the wheels and wheel flaps
19	Disinfect the exterior of the truck with disinfectant at the required concentration
20	Ideally, dry the inside of the truck with a heater. This assists drying and may also assist killing viruses. Note PRRSv is destroyed within 30 minutes at 60°C.
21	Complete the vehicle cleaning log book

Truck Cleaning Problems

External surface cleaning inadequate

Tail gate with clear evidence of bedding



Poor cleaning of wheel housing

Cleaning equipment not clean or disinfected

Cab and personnel routines

Cab area cleaning poor

Protective clothing dirty

Boots dirty

Belly box hygiene

Belly box contents dirty. Note brush has faecal material on the brushes

Belly box with old bedding and feed

Deck areas

Not wearing protective clothing during cleaning

Faeces still present after disinfecting

Food and bedding remaining from last load

Transport Inspection Check List

Area	Requirements or comments	Yes	No
Vehicle Cleaning			
	All vehicles are required to be cleaned and disinfected with an approved disinfectant between loads.		
Loading/unloading			
1	Pigs must be loaded quietly from a suitable dock, using voice, flags, sacks of pig boards to guide them. A raised ramp is preferable		
2.	Ramps		
a.	Ramps must be fitted with foot battens and secure side guards with no projections		
b.	The angle between the tail ramps and the unloading ramp must be no steeper than 1 in 5 (20^{o})		
Livestock Transporter			
1	Is the livestock transport suitable for the purpose?		
2	Does the vehicle body have non-slip flooring?		
3	Is the vehicle body free from projections or other hazards which may cause injury to the pigs?		
4	Does the vehicle body have apertures? Is lighting available for easy inspecting of the pigs?		
5	Are the partitions of a minimum of 76 cm?		
6	Are the partitions set at the appropriate intervals (not exceeding 3.1 m)?		
7	Can the partitions be fitted at intervals of one metre?		
Stocking density			
1	Have the pigs been transported at the desired stocking density?		
2	235 kg/m^2 for transport for EU regulations		
Stock separation			
1	Are boars over six months of age individually penned during transit?		
2	Have significantly different sized animals been partitioned off except in the case of sow and offspring?		
3	Have pigs from different producers been penned separately on the vehicle?		
Feeding and Water			
	Have pigs been fed and watered on journeys over 12 hours?		
Ventilation			
	Has the air flow been adjusted to take account of prevailing weather conditions?		
Records			
	Are movements and cleansing records maintained?		
Dispatch notes			
	Are the pigs being accompanied by the appropriate movement orders?		

Transport Hygiene Check List

Vehicle number _____ **Date** _____ **Driver** _____.

Check area		1	2	3	Comments or recommendations
Outside of vehicle					
	Tail gate				
	Surface of sides				
	Vents				
Wheels					
	External wheel hub				
	Internal wheel hub				
	Wheels				
Drivers cab					
	Floor of cab				
	Clothing				
	Other items				
Boxes under body					
	Box condition				
	Contents				
Inside of body					
	Upper deck				
	Lower deck				
	Tail ramp				
	Pig Board				
Protective clothing					
	Clothing				
	Boots				
Disinfectants in use					
Cleaning protocols					
	Observed				
	Follows protocols				
	Cleaning area				

Interpretation of scores	1	Room for improvement	2	Attention of detail needed	3	Good

Vermin Control Measures

Rodent Control

1	Rodents do not like exposed situations. Remove all rubbish and overgrown vegetation from outside the buildings. Ideally all buildings should be surrounded by a 1-2 metre wide concrete walk-way. Keep weeds and grass short	
2	Ensure all bagged feed is stacked tidily on pallets off the floor and away from the walls	
3	Food must be stored in closed containers	
4	All spilt food under feed bins must be swept up and removed	
5	All rubbish must be placed in rodent proof containers	
6	Block all holes wherever possible. Wire mesh on windows must be 6 mm to keep out mice. Seal junctions between walls, floors and ceilings with metal sheeting	
7	Seal water cisterns and header tanks. Seal and remove obsolete plumbing. Rodents require large quantities of water	
8	Depending on the farms health status, Cats and dogs are not to be used as rodent control as they are a health risk to the pigs ie Aujeszky's Disease	
9	Prepare a map of the farm and examine for evidence of rats. Examine at least 100 meters around the farm	
10	On the map mark out the position of the permanent baits and where clearance baits are to be placed. Number all bait boxes	
11	**Clearance baits**	Check baits every week and continue baiting for one week after baits have stopped being taken
12	**Permanent baits**	Check baits every 2 weeks. If signs of feeding are found replenish the bait and re-survey the premises. Place baits in drain pipes placed at the base of straw stacks
13	Burn all dead rodents found and all unused clearance bait boxes	
14	Prevent access to the bait by children and other animals	
15	Wear impervious gloves when handling dead rodents and baits	
16	Wash your hands thoroughly after handling baits or rodents	
17	Operator must be familiar with the health and safety rules for the rodenticide/baits being used	
18	Empty rodenticide/bait containers must not be re-used for any purpose	
19	In buildings which can be sealed, fumigation may be effective to reduce a serious infestation to controllable levels	
20	In straw stacks build stack on sand and plastic. Insert drain pipes while building the stack so that the inside of the straw stack can be baited throughout the storage period	

Rodent control areas of concern:

Rubbish by building	 Rubbish along building provide areas for rodents to hide	 All buildings should have a 1-2 metre walk way to reduce rodent risks
Bags opened	 Feed bags with rodent damage and evidence of faecal contamination	 Stored bagged feed on pallets
Waste feed	 Spilt feed by feed bin	  Holes in feeders leading to waste feed
Water leaking		Water, in particular poorly cleaned drinkers provide rodents with waster and allow for the build up of disease
Insulation		Insulation can be seriously damaged and reduced through rodents

Bird Control

1	Repair all broken windows
2	Ensure no waste feed remains under food bins
3	Clean up all spilt food in storage areas
4	Cover all feeders
5	Install strip curtains over all openings
6	Close off roof spaces by netting
7	Install window screens
8	Cover all eaves and ridge gaps with bird proof netting
9	Repair and seal all holes
10	All doors should be on spring hinges
11	If starlings are the major problem shooting may become necessary
12	Whilst unpleasant, the hanging of dead birds can may be effective

Waste feed under feeder which can encourage birds to the pig unit

Uncovered feed barrow allowing easy access for the birds

Bird contamination clearly evident on covered feeders. Without covers all this faeces would have entered the feed

Buildings should be bird proofed

Some areas can be impossible to bird proof.

Fly and mosquito control

1	Maintain and repair all windows
2	Ensure no food enters the dung channel. Creep feed is an ideal medium for fly multiplication.
3	Place a 2 mm mesh over the windows and air intakes. This must be kept clean to prevent the mesh reducing ventilation rates. This can be difficult.
4	Consider use of biological fly control using Ophyra which eat the fly maggots
5	Site solid manure pile as far away from the buildings as possible
6	The solid manure pile should be covered as soon as possible after tipping faeces and then properly compacted to generate heat which will kill the larvae
7	Control birds
8	Remove faeces as often as possible
9	Remove afterbirths as soon as possible (immediately)
10	Have efficient pressure washing
11	Remove all fermenting food
12	Insecticides should never be used as a substitute for good hygiene. Care should be taken to ensure that no unnecessary spillage of food. Ensure that a build up of animal waste products in passageways or on ledges around pens is prevented
13	Flood slurry channels in summer with water to cool and break up slurry crust.
14	Turn lights off at dusk and leave them off over night
15	Reduce weeds around buildings by 2 metres
16	Do not cut weeds around the finishing house within 3 weeks of slaughtering the pigs to reduce fly bite lesions on the carcase
17	Manage curtains to eliminate any standing water acting as a breeding ground for mosquitoes.
18	Eliminate all areas of standing water around the farm ï old buckets or tires for example

Initially use a knock down agent and then a residual in areas where flies congregate

If flies are a serious problem causing disease or a nuisance, it may be necessary to identify the fly species before a specified control strategy can be designed

Insect bites can result in skin damage

Control flies and mosquitoes with baits and poisons

Eliminate all standing water around the farm to reduce breeding mosquitoes Note the lowered curtain is acting as a water trap

Reducing and controlling people risk

Visitor Entry Procedures

You must be at least
…….. hours pig free

Do not enter without	
1	Authorisation
2	Sign visitors sheet to declare é é hours pig freedom
3	Read and follow the showering procedure
4	Cameras and video are only allowed after obtaining the management's agreement and the outer case will need to be clean.
Showering Procedure	
1	Completely disrobe and leave clothes, watches and jewellery on the dirty side. If you have spectacles thoroughly wash them while showering.
2	Take a complete shower. Pay particular attention to wetting and washing hair (shampoo and soap provided).
3	Use the timer to ensure that your shower takes 4 minutes. Spend the time wisely.
4	Towels, underclothes, soaks, t-shirts, track suits, overalls, hats and boots are provided on the clean side.
5	Once you have showered do not step back onto the dirty side or take towels or unit clothes on to the dirty side.
During the visit	
	No spitting on the farm

Thank you for observing unit entry procedures

Visitors Book

THIS FARM CANNOT BE VISITED IF CONTACT WITH PIGS HAVE BEEN MADE WITHIN THE LAST .....HOURS.

EXCEPT FOR THE FOLLOWING FARMS

.....

.....

IF YOU HAVE VISITED A FOREIGN FARM IN THE LAST WEEK YOU MUST GET PERMISSION IN WRITING FROM THE MANAGER BEFORE ENTERING THE FARM

Date	Name	Company	Last Pig Contact	Signature

This is a true record of all visitors in the month of

..... to .....Unit

..... Unit Manager

Biosecurity – Visitor Dress Code

It is absolutely essential that a visitor does not transmit pathogens from one farm to another. The easiest method that a visitor may transmit pathogens is through poor hygiene.
Ideally a visitor should completely shower ï which ensures that the outer clothing and boots are removed and left off-farm. If this is not practical, all outer clothing must be covered and only wear the farmôs boots.

Foot wear

Clean boots are essential

All faecal material (arrow) must be removed - sole

And heel and sides

The foot wear must be easily cleaned and waterproof. Lace and suede shoes are totally unsuitable

Ideally wear footwear provided by the farmer

Animals can are very inquisitive and will lick any material from your boots ï and thus get sick

Protective clothing

Always wear protective clothing on farms ï street clothing is unsuitable

Protective clothing must cover all your daily clothes. Disposable protective clothing are a ideal

Exposed clothing cap (arrow 1) and street clothes (2) which cannot go to the next farm.

Ideally wear protective clothing provided by the farmer

Showering may be required by some high health farms combined with a period of animal absence

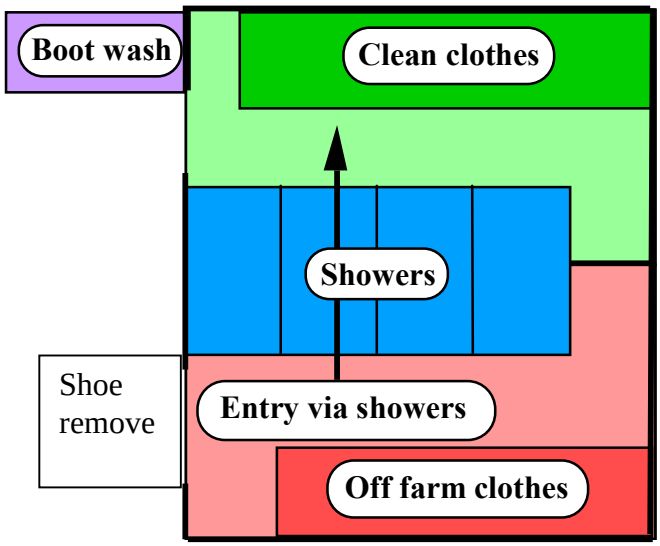
Ensure all exposed flesh ï hands, arms, face are clean and not splattered with faeces or blood

Shower Room Protocols

Ideally visitors should not shower off the farm

Entrance	
1	All staff are to enter the staff side (male and female respectively)
2	Prior to entering the showering facility all shoes must be removed and remain outside the showering facility
3	All items of clothing including watches must be removed and must remain off-farm. Other items such as glasses must be washed.
4	All body surfaces including hair should be washed, using the supplied soap
5	All visitors must sign the visitor's book detailing their organisation, last pig contact and dates
6	A selection of clean clothing must be provided on-farm, together with clean towelling
7	Disposable socks and underwear is to be provided
8	A dirty clothing 'bin' is to be provided for wet towelling/used clothing
9	A selection of clean boots is to be provided
10	Staff boots should be named
Exit	
1	All boots must be cleaned thoroughly with the boot cleaner. This must include the soles and heels.
2	All on-farm clothing to be deposited in provided laundry bin
3	All damaged clothing to be repaired before re-use
If visitors shower off the farm	
1	Specific coloured towels should be provided. These must not be moved back onto the farm and are washed separately. A different colour to on farm should be used (blue for example)
2	All shoes must be put on outside the shower block

Basic design of entrance/shower block



SHOWER ROOM HYGIENE

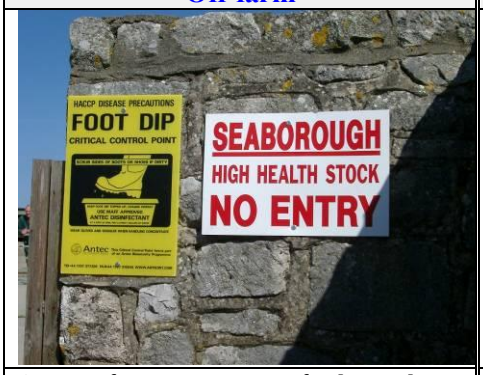
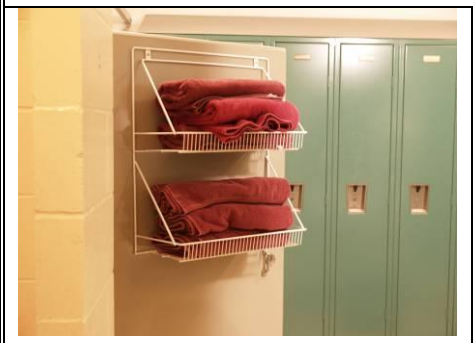
Daily checks		
1	**Shower block**	The floor of the shower should be wiped with disinfectant
		Quantity of body and hair shampoo's to be checked
2	**Toilet area**	Off-farm and on-farm toilets
		The toilet seats should be wiped clean
		The toilet bowl disinfected
		All toilets are to have sterilising tablets
		Small bins in toilet to be wiped clean with disinfectant and emptied each day
		Check quantity of toilet paper
3	**Wash basins in toilet**	Check quantity of hand disinfectant
		Check quantity of hand towels
4	**Floor of the toilet block**	Cleaned with disinfectant
Weekly checks		
1	Clothing supplies - quantity suitable	
2	All damaged clothing disposed off-farm	
3	Hygiene of boots	
4	Shower curtains clean	
5	Shower works well with appropriate body soaps	
6	Horn hooter works and gets a reply	
7	Locks on doors adequate	

MANAGEMENT BOARD

SHOWER ROOM HYGIENE

	Week	1	2	3	4	5
1	Shower curtain clean					
2	Floor of shower clean					
3	Plenty of body and hair shampoo					
4	Suitable clean clothing					
5	Boot hygiene good					
6	Floor of shower room clean					
7	Wash basin clean					
8	Plenty of soap					
9	Plenty of paper hand towels					
10	Toilet bowl clean					
11	Plenty of toilet paper					
12	Bins empty					
13	Visitors book completed					
14	Sign on door clean					
15	Klaxon hooter works					
16	Klaxon hooter gets a reply					
17	Locks on doors adequate					
Initials						

A well designed showering facility

Off-farm	Shower block	On-farm
		
Signs informing visitors of rules and entry	Entrance to the showering area showing **on-farm** side	
		
Areas for shoes outside shower block	Walk through shower with no return	Clean **on-farm** clothing
		
Remove all clothing, watches and glasses	Shower from the on-farm side	Clean **on-farm** overalls and boots
		
Off farm towelling when necessary		Signing the visitors book

Straw and Bedding

1	All bedding materials must come from named sources or agree point 2 with agent
2	All straw must be obtained from fields where no pig manure has been spread, except from the recipient unit only
3	Straw should be delivered to the unit in trucks not used to transport pigs. Use wood shavings when transporting pigs. Note wood shavings can carry avian tuberculosis
4	All straw should be stored on 10 cm of sand covered with a polythene sheet to reduce rodent infestation. Place rodenticide at the base of the straw in drain pipes and replenish as necessary
5	All mouldy or damp bedding must be carefully judged whether it is suitable for use, if necessary it may be better to dispose of the straw, consult your veterinarian for advice
6	Note mouldy straw can be a hazard to human health and if the straw is dusty face masks should be worn

Straw stacks need rodent control programmes

Pigs with wood shavings

Machine and Equipment Purchases

All equipment which is going to come into contact with the animals must be purchased new and without any previous contact with other animals.

All equipment must look new on arrival and be clean otherwise entry to the farm must be refused.

ON NO ACCOUNT MUST EQUIPMENT BE LOANED TO OTHER FARMS

Biosecurity Checking

A photomontage which may be used as a visual guide while walking the farm

Location of farm

General area

Too close to another farm

Is there a major road near farm?

Perimeter of farm

Fencing needs to be adequate right round the farm

Signs and adequate gating

Communication off farm to limit visitors ï email and fax

Visitor security

Visitor book

Shower and toilet facilities

Unit clothing

Boots

Electricity and gas meters

Internal biosecurity

Feed delivery from off-farm ï do not allow feed wagons on farm

Feed storage ï bagged food should not be stored on the floor

Straw storage

Water storage

Manure storage/disposal

Rodent control, too much rubbish

Bird and fly control

Hospital pen location

Cleaning protocols -batching

Dead animal disposal

Knackerman

Isolation facilities and location

Loading facilities

Animal Truck

Animal Contact

Other pigs

Other livestock

Other animals

Medicine use

Disposal

Hygiene

Food products

Staff

Their own pigs

Visit other farms/markets/shows

Visiting Slaughterhouses

Biosecurity Examination

Date: …….

Proposed Farm: é é é é é é é é é
Location: é é é é é é é é .. Tel/Fax é é é é @é é é é é é .Email

AREA	INFORMATION	A biosecurity risk YES	NO
Nearest Pig Farm			
Surrounding Roads			
Current Stock			
Proposed Health Status			
Veterinarian	Tel, Fax, Email		
Date Since Pigs Arrived			
Preventative Medication			
Secure Perimeter			
Fencing			
Signs			
Gating			
Facsimile Machine			
Email/Internet access			
Visitor Security			
Visitor Book			
Showering Facilities			
Unit Clothing Available			
Boots Available			
Electricity/water meters			
Feed Delivery and Storage, Vermin control, Dead animal protocols			
Feed			
Storage			
Straw source, delivery and storage			
Water Source and Storage			
Manure/Slurry Disposal			
Rodent Control			
Bird Control			
Fly Control			
Equipment shared between farms			
Dead Animal Disposal			
Rendering facilities			
Isolation Facilities Available (and time)			
Loading Facilities			

Animal Contact			
Proximity to other pigs			
Proximity to other livestock			
Other animals, pets etc.,			
Medicines, Needles & Syringes			
Medicine Storage			
Needles & Syringes			
Medicine Book			
Movement Book			
Food in ófridge			
Medicine in use on farm			
Staff			
Live on pig farms			
Routinely visit pig farms			
Contact with slaughterhouses			
Contact with markets			
Any other pig contact			
Transport of Animals			
AI Use			
Audit Scheme + N^{o}.s			

Reducing pathogens on the farm

Controlling today's number one risk – the compromised pig

Hospital Pen Records

Any compromised pig should be immediately isolated in a hospital room and medicated as required.
If they do not response to treatment within a week they should be slaughtered.
If there is a rise in the number of sudden deaths or any coughing then the herd veterinarian should be notified immediately

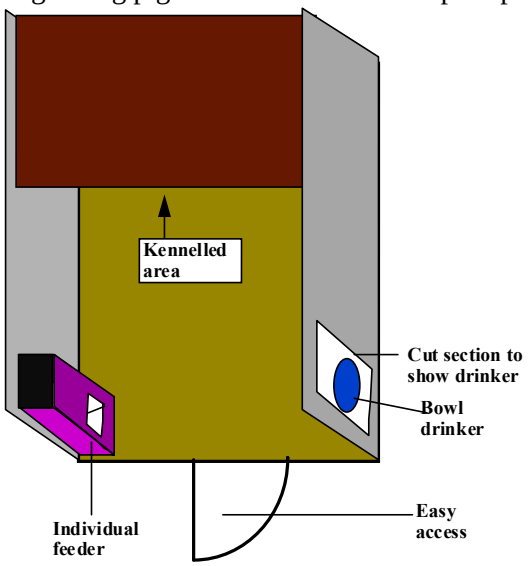
Date Started	Animal Number	Disease condition	Treatment	Response days after start X = still sick √ = recovered													
				1	2	3	4	5	6	7	8	9	10	11	12	13	14

Hospital Pen Design

1	Deep dry straw bedding covering a non-slip, insulated concrete floor
2	Good draught free ventilation. The provision of a kennelled area should be available
3	Provide an individual feeder, which is hand filled twice daily. There should never be a lot of food in the feeders so that in-feed medication is possible
4	Provide a bowl drinker which is set at 30 cm above the ground for 20 kg pigs or more. This drinker should be fed from a separate header tank to enable easy medication if necessary
5	Easy entry and exit points which do not necessitate lifting of the animal over steps
6	Pigs in this pen should be examined a minimum of twice daily and the hospital pen records should be completed
7	All hospital pen pigs should be tagged and treated as individuals on entry
8	Pigs in the sick pen may need a companion
9	Each hospital pen should be of adequate size to hold up to ten pigs

Hospital pen for nursery and growing pigs

Hospital pen for adults



Compromised pig pen from straw bales

There are times when it is required to provide emergency hospital care.
In many places it is possible to provide hospital accommodation outside. The following gives an illustration of one such accommodation built between two finishing sheds.
Straw based hospital pens will provide adequate protection from 0-40°C.

		
General view of hospital area ï walls constructed from straw bales with a simple gate at one end. Floor space 1.4 m^2 per pig. One bowl drinker per 20 pigs. Use high quality feed.	**Hiding area** Shade cloth is used to provide a lying area and protection from the sun. Sick and compromised pigs like to hide.	**Good water supply** Ideally in a trough or bowls as shown. Avoid nipples as these are more difficult for weak pigs. Dehydration is a common cause of death in compromised pigs.
		
Wallow If the climate is very hot, even newly weaned pigs will appreciate a shallow wallow.	**Bedding comfort** Sick and compromised pigs like to hide and burrow into straw. In the hot parts of the day, under the straw can be cooling.	**Feeders** Feed little and often. This way the feed is as fresh as possible and rapid changes to the feed can be made
		
Pig identity Do not lose the pig in the system ï record the original pen number and date of entry into the hospital area.	**Good records** Record all pig entry and exit. Pigs should be marketed at the first possible weight. If the pig does not recover adopt a 7 and 14 day review programme. Euthanasia may be the best option for sick pigs which fail to rapidly recover	**Proper care and attention** Ensure that all the animals are checked at least 3 times a day and receive medication where appropriate. The water and feeding system should be capable of being an easy medication route when required.

What to do with Compromised Pigs

To send to slaughter all growing/finishing pigs must be over 60 kg in weight and have a body condition score of 3 or greater, if less than condition score 3 treat or destroy
All pigs hospitalised must be identified with a numbered ear tag.
All medication withdrawal periods must be complied with.

Condition	Extent	Immediate action	Action after x days
Lameness	Unable to use back legs	**Destroy**	
	Infected joints with soft pus filled abscess	Treat or **destroy**	**7 days no improvement destroy**
	Multiple joints infected	**Destroy**	
	Single infected joint with non-discharging abscess less than golf ball size and able to walk unassisted	Treat as necessary	Send to slaughter as soon as possible
	Cannot walk with all four feet on ground	Treat or destroy in hospital pen	**7 days no improvement destroy**
	Fractured bone	**Destroy**	
	 Broken leg	 Swollen joint	 Broken back
Hock sores	Less than 3 cm and walking without lameness	Keep on deep straw in hospital pen	If healed <14 days send to slaughter as soon as possible **No improvement destroy**
Bush foot but not lame	One joint only. No discharge and no swelling up leg	Treat as necessary	When the pig goes to slaughter send in separate pen
	 Hock sores	 Bush foot	
Tail bitten	Abscessed	**Destroy**	
	Base of spine exposed	**Destroy**	
	Tail bitten and lame	**Destroy**	
	Infected with no abscesses	Treat in hospital pen	If healed within 14 days retain separate until slaughter
	Fresh with no infection	Treat in hospital pen	Send to slaughter as soon as possible
	 Tail bitten severe	 Tail bitten and lame	 Fresh no infection

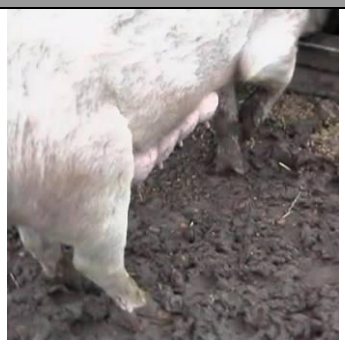
Condition	Extent	Immediate action	Action after x days
Open wounds	Cuts of any type	Treat in hospital pen	When healed send to slaughter as soon as possible
	Grazes less than 6 cm	Treat if necessary	Send to slaughter as soon as possible
Cut = damage through whole skin. Graze = surface skin damage only			
Flank bites	Greater than 6 cm or infected	Treat in hospital pen	Once healed send to slaughter as soon as possible
	Fresh. No infection less than 6 cm and superficial.	Treat if necessary	Send to slaughter as soon as possible
	 Open wounds	 Flank biting	 Beaten up pig
Beaten up pigs	Numerous fight marks	Treat in hospital pen individually	**Sick for more than 3 days destroy**
Ear haematoma	Large and any infection and swelling	Treat in hospital pen	Leave a week, then if necessary lance and when healed send to slaughter as soon as possible
Crumpled ear	Healed and no infection	No treatment necessary	Send on normal load
Middle ear infection	Can walk unaided	Treat as necessary	Send to slaughter as soon as possible
	Cannot walk unaided	**Destroy**	
	 Ear haematoma	 Ear crumpled	 Middle ear
Ruptures Hernias	Belly, scrotal or groin rupture and 9 cm clear of ground with no damage or infection	No effective treatment possible	Send to slaughter as soon as possible
	Pedunculated rupture with no damage or infection	No effective treatment possible	Send to slaughter as soon as possible, separate on the truck
	Rupture in contact with ground, with skin damage or infected	**Destroy**	
	**Any pig with a hernia that is bigger than 30 cm should be destroyed.** Send pigs with large hernias to the cutter market at 70 kg rather than trying to get them to bacon weights		

Condition	Extent	Immediate action	Action after x days
Rectal prolapse	Fresh, no smell, no bigger than 15 cm	Send to slaughter as soon as possible	Or stitch in and send to slaughter as soon as possible
	Larger than 15 cm	**Destroy**	
Rectal stricture	Any type	**Destroy**	
Pneumonia	Walking but off food	Treat in pen	24 hours no improvement move to hospital pen. **No response to treatment for 7 days destroy**
	 Rectal prolapse	 Rectal stricture	 Pneumonic
Thin pig	With or without scour	Treat in hospital pen	If no response clinically within 7 days and **no visible improvement within 14 days destroy**
PMWS		Treat in hospital pen	If no response clinically within 7 days and **no visible improvement within 14 days destroy**
PDNS		Treat in hospital pen	**If no response within 7 days destroy**
Kinky back or other abnormality	Visibly deformed and affects ability to slaughter pig	Mark in the pen	Discuss with veterinarian
	 Thin pig	 PDNS	 Kinky back
All pigs, which present with a condition that makes them unlikely to be slaughtered for human consumption should be destroyed as soon as this decision is reached.			
It is essential that the appropriate therapy is used for each condition and that all pigs are slaughtered after the relevant withdrawal period has elapsed.			

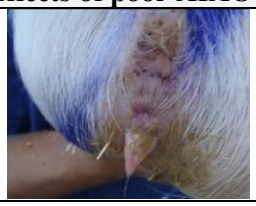
What to do with Compromised Adults

To send to slaughter all adults must have a body condition score of 2 or greater, if less than condition score 2 treat or destroy.
All adults hospitalised must be identified with a numbered ear tag

Condition	Extent	Immediate action	Action after x days
Prolapses	Uterine	Immediate treatment or **Destroy**	
	Vagina	Immediate casualty slaughter	
		Treat if found fresh	Sell as soon as possible. **If re-prolapses destroy**
	Rectum	Immediate casualty slaughter if not excessive	
		Treat if found fresh and undamaged	Sell as soon as possible. If re-prolapses immediate culling
	 Uterine prolapse	 Rectal prolapse	
Open wounds	Traumatic injuries, cuts and wounds	**Severe - destroy**	
		Not severe- treat	Sell when healed. If in doubt ask the vet
	Shoulder sores and ulcerated hocks	Treat and move to bedded area.	Sell when healed
	 Traumatic injuries	 Ulcerated granuloma	 Shoulder sore

<table>
<tr><td rowspan="8">Lameness</td><td>Off back legs</td><td>Destroy</td><td></td></tr>
<tr><td rowspan="2">Acutely lame</td><td>Severe - destroy</td><td></td></tr>
<tr><td>Not severe - Treat</td><td>If still lame after 7 days destroy</td></tr>
<tr><td rowspan="3">Lame with no obvious cause</td><td>Severe - Destroy or treat</td><td>If still lame after 7 days Destroy</td></tr>
<tr><td>Not severe - treat in bedded area</td><td>If still lame after 7 days Destroy</td></tr>
<tr><td>Casualty slaughter as long as pig can bear weight on all 4 legs and is willing to walk unaided and without being forced</td><td></td></tr>
<tr><td> 
Off back legs</td><td> 
Acutely lame</td><td> 
Lame sow</td></tr>
<tr><td rowspan="3">Emaciated</td><td rowspan="2">Score 1, ribs visible</td><td>Destroy</td><td></td></tr>
<tr><td>Treat</td><td>Review after 7 and 14 days</td></tr>
<tr><td colspan="2"> 
Very thin sow</td></tr>
<tr><td rowspan="3">Dystocia</td><td rowspan="3">  </td><td>Treat</td><td>Review when farrowing finished</td></tr>
<tr><td>If live pigs are present</td><td>Use a Doppler pregnancy tester consider destruction and immediate hysterectomy</td></tr>
<tr><td>Destroy</td><td>Note do not send a sow with retained piglets for slaughter as it will be condemned</td></tr>
<tr><td colspan="4">All pigs, which present with a condition that makes them unlikely to be slaughtered for human consumption should be destroyed as soon as this decision is reached.</td></tr>
<tr><td colspan="4">It is essential that the appropriate therapy is used for each condition and that all pigs are slaughtered after the relevant withdrawal period has elapsed.</td></tr>
</table>

All-in/All-out

All-in/All-out (AIAO)	
Why? 	It does depend on where you start ï but this gives you a guide:
	7-12% improvement in ADG and FCR. 50% reduction in post-weaning mortality. 50% reduction in the medicine bill
	100% improvement in stockperson morale
	Pathogen control. PRRSv control is not possible without AIAO
	Farrowing house variability must be eliminated. Farrowing output must be batched
	Correct (legal) stocking density ï 30kg pig 0.3m^2 or finishing pigs 0.65-1m^2
What is it?	The room is cleaned and disinfected before the batch of pigs enter the building
	No additional pigs are added to the room/batch until all the pigs are removed
	The building is cleaned, disinfected and rested
	Filling even the next day is not acceptable ï , the new pigs enters a building that is not clean: this is **continuous flow**
AIAO is about the whole area – pigs, building, equipment and medicines	
 AIAO by water	 AIAO by feed
 AIAO by floor	 AIAO by air
Effects of poor AIAO	
 Diarrhoea weaner 3 days	
 Mixed ages	 Empty pens
Where does AIAO start?	AIAO starts in the farrowing house. If you donôt do AIAO in the farrowing area you donôt do AIAO
	The farm plan runs like a river from a lake itôs important to remove the rapids
	Gestation (continuous flow) → Farrowing (AIAO) → Wean to finish (AIAO)
Risk of pathogen spread? **What is the risk in the farrowing area?** Moving adult sows through the farrowing area is a small risk, whereas moving a healthy pig is an enormous risk	**Big Pig** **Small risk**  **Small pig** **Big risk**
I can't do AIAO	Mark/tag pigs which enter after the first batch and note production effects. In one farm, the mortality post-weaning was: 2% first group, 5% second group and **10% third group**. 

Pig Flow

Batching

The key to pig flow is that all outputs are in batches ï the basis of AIAO

What is a batch?

One batch is the number of weaners that are required to completely fill the wean to finish room (batch)

What are the common batch sizes

There are five major batch time intervals used in modern pig farms:
Weaning twice a week; once a week, every 10 days, every 2, 3 or 5 weeks

How many sows/batch will produce sufficient weaners to fill the wean to finishing area?

What number of weaners are needed to fill the nursery room in one go?

Sows per batch and approximate herd size to produce a set number of weaners per batch

Batch time	**0.5w**	**1w**	**2w**	**3w**	**5w**	**Sows/batch**
Weaners per batch	**Herd size** (approximate)					
50	260	130	65	45	30	**5**
100	520	260	130	90	55	**10**
200	1030	520	260	180	110	**20**
400	2060	1030	520	350	210	**40**
500	2570	1290	650	430	260	**50**
1000	5150	2570	1290	860	520	**100**

Farrowing room layout

Number of rooms required to allow for all-in/all-out

Batch time	**0.5w**	**1w**	**10d**	**2w**	**3w**	**4w**
Weaning age						
3 weeks	8	4		2		1
4 weeks	10	5	3		2	
5 weeks		6		3		

Note several models will not work over the 52 calendar weeks or groups do not align.
For example mated sows will farrow 115 days later but a farrowing crate is not available.

How can I divide my existing farrowing area?

Examine the current room layout and number of farrowing crates that are available. Based the layout on the number of weaners that are needed and the batching opportunities of the room and farrowing crates

Example Farm three rooms 40 40 21 crates no AIAO
Converted into five rooms of 20 20 20 20 20+1 with AIAO 200 weaners per batch

Physical division of the farrowing room to achieve AIAO

Previous room

Plan of division required

Use of plastic sheets for the door between groups within previous room

The ventilation system in the farrowing area is the biggest problem on most farms. Having to walk sows pre-farrowing through an running farrowing room produces little risk to either the current room or the next group of piglets

AIAO around the farm

Once the farrowing area runs as an AIAO programme the rest of the farm can be adjusted to ensure that the numbers weaned is achieved batch after batch.

What runs AIAO?

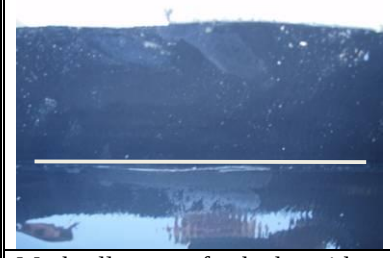
Gilt pool management is the key to managing pig flow

Disinfectant Management – Foot Baths

Foot baths can be a positive internal biosecurity tool but need to be properly managed

Foot baths must be filled with disinfectant at the right concentration

Prepare all foot baths



Mark all empty footbaths with a clear mark indicating a known depth ï 1.5 litre mark shown for example

Prepare disinfectant in a pre-measured scoop to provide the required concentration - for a 1.5 litre foot bath (for example)

Place the footbath in a position where rain water is not going to dilute the disinfectant

Filling and maintaining foot baths

Clean footbath completely
Place water into footbath to the mark ï in this case 1.5 litres

Use a measure scoop to add disinfectant volume to provide the required concentration. Mix well

Cover the footbath to prevent rain water diluting the disinfectant or evaporation during the summer

Correct use of foot baths

Place footbath in a logical position which is not going to get in the way of feed barrows

Only place clean boots and utensils into the disinfectant

Disinfectant do not clean dirty equipment and cannot kill pathogens protected by faeces

Footbaths are not good ways of disinfecting boots as it takes several minutes to total immersion to kill pathogens ï changing boots between departments is a better method

Footbaths and disinfectant is a good way of killing pathogens on clean utensils ï however, always have different utensils for each batch of pigs.

Disinfectants are extremely expensive and must be used appropriately

Cleaning a Room between Batches

Preparation	
1	Remove all the animals from the building
2	Remove all feed either by placing in bags and remove from the room, ideally all feed should have been eaten by the previous occupants
3	Dismantle as many movable objects and remove from the room
4	Isolate all electrics. Ideally all electrics should be encased in a wooden box within the room. Comply with current Health and Safety Recommendations
Pre-cleaning	
1	Turn the water supply off that goes into the header tank or room
2	Remove end drinker and drain water supply
3	Remove accumulations of dirt from the header tank, if in use
4	Re-fit the end drinker. Re-fill the header tank with water and add disinfectant
5	The dung channels should be drained and emptied. This should include all large faecal accumulations, tanks and gullies
6	All old or blistered paint work on animal housing, ie a crate or stall, should be smoothed down with a wire brush
7	Remove all cobwebs by brushing and all other material either into the slats or pick them up using a shovel
8	Repair any broken pieces of equipment/housing
9	Place a garden sprinkler in the centre of the room attached to an external water supply, close doors and soak room for 1 hour. Note any problem with the electrics etc that may arise. If soaking is not possible move to the next section
Cleaning of all removable objects	
1	All removed drinkers and feed troughs should be cleaned out thoroughly so that all food and faecal material are removed
2	All removed items should be soaked with water for 5 minutes
3	Spray detergent using low pressure washing (300 psi) or via a foam gun applicator at the recommended concentration
4	Allow detergent contact time of 30 minutes, do not allow surfaces to dry
5	Thoroughly wash down with a pressure washer at 500 psi,
6	All creep light fittings should be thoroughly cleaned. Beware that bulbs may blow if they are hot and water is splashed on them
7	Disinfect all utensils by soaking in disinfectant for 1 hour if possible, otherwise apply disinfectant using a knapsack sprayer or pressure washer at 300 psi
8	Allow all utensils time to thoroughly dry

Cleaning the room	
1	When the room is ready, spray with detergent using a low pressure washer (300 psi) or the foam gun application
2	Allow detergent contact time of 30 minutes, do not allow surfaces to dry
3	Pressure wash the house using a pressure washer set at 500 psi with a 45^{o} angle jet. Pressure washing is a very labour intensive job and particular effort must be made on all surfaces below pig height. However, surfaces above pig height must also be washed. Using steam washing can reduce the time of the operation.
4	Prior to entering the room with a pressure washer, ensure that the operator is properly trained and clothed. Wearing waterproofs, goggles and gloves and any additional equipment as required by health and safety. Electrically operated pressure washers should not be connected in the room to be washed.
5	Start at the apex of the room and work down the walls to the floor paying particular attention to corners and other areas where dirt accumulates. Caked soiling should be brushed if necessary to aid removal
6	If the slats can be easily raised, wash the under-surface of the slats to ensure that faecal material does not remain underneath slats within reach of pigs' tongues.
7	Store pressure washer and equipment clean. Ensure that the washer is stored so that it is protected from frost during the winter months
Re-building the room	
1	Remove end drinker and drain water supply
2	Re-fit the end drinker. Refill the header tank with water and check that all the drinkers work
3	Allow the house to dry for 2 hours, then disinfect using disinfectant using a knapsack sprayer or a pressure washer at 300 psi with a 45^{o} spray head
4	Spray into the apex of the roof and work down the walls to the floors
5	Open up all the ventilation system and maximise air flow through the building for at least two hours to completely change the air in the building
6	Allow the room to dry completely, using additional heaters if necessary before pigs are placed in the room
7	Make sure that there are no residues of disinfectant around before re-housing pigs
8	Ensure room environment is satisfactory for the pigs before the pigs enter the room
9	Place a disinfectant footbath outside the house filled with disinfectant

All-in/all-out needs good pig flow and must have even pig numbers between each batch. All-in/all-out is not only about pigs and floors, but also includes air, feed, water and medicine supplies

Fumigation

This is a highly dangerous operation.
Read and understand the instructions before starting to fumigate

1	Always work accompanied
2	The ambient air temperature inside the building has to be above 18°C preferably above 27°C
4	Wear water-proofs, gloves and chemical goggles and suitable respirator
5	Damp down the building including the roof and fan shafts
6	Per 100 m^3 use: 200 ml formaldehyde (40%) and 90 gm Potassium permanganate
7	Close off all air inlets and outlets
8	Place the required Potassium permanganate into metal containers
9	In large buildings several metal containers must be evenly distributed throughout the house
10	Be prepared to get out of the room immediately the formaldehyde is added to the Potassium permanganate as it is highly dangerous to inhale the fumes
11	Pour the required amount of 40% Formaldehyde into a wide necked container
12	Pour the 40% Formaldehyde on to the Potassium permanganate powder
13	Get out of the room and close the doors
14	Place sign over doors warning all others to stay out of the house
15	Do not re-enter the house for 24 hours
16	After 12 hours ventilate the house for an additional 12 hours before entering in the building. Wear a suitable respirator when first entering the house to remove the containers

Chlorine Dioxide may be a substitute for Formalin

WARNING

FUMIGATION IN PROCESS

THIS IS HAZARDOUS TO HEALTH

KEEP OUT

Application of Lime Wash

1	Wear goggles and gloves
2	Obtain a large plastic bucket
3	Mix Burnt or Builders Lime ($CaCO_3$) with 6 litres of water into a pasty liquid. Mix one third lime with $^2/_3$ water
4	Add a suitable disinfectant to the mixture. Note not hydrogen peroxide based
5	Brush onto the surface using a soft household brush
6	It is possible to dedicate a pressure washer to assist the painting of lime, use the washer as a spray gun
7	Leave to dry for 24 hours. If this time span is not available, do not lime wash any surface the pig is going to lie on as this will result in burns/scald

Minimum lime washing in a farrowing crate

A room fully lime washed

Piglets burned from wet lime wash
It is essential to give the lime wash time to dry

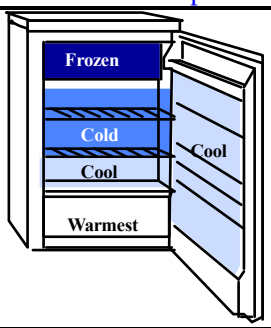
Medicine Control and Storage

Medicines can be extremely useful to treat clinically sick pigs, thus reducing pathogen spread. Vaccination enhanced the pigôs natural immunity. However, inappropriate medicine storage and use will negate these benefits. In addition, poor needles and medicine management can actually contribute to the spread of a pathogen. PRRSv and Classical Swine Fever can be easily spread between pigs with needles.

Control	
1	The farm veterinarian should be asked to prescribe all treatment medicines even if medicines are not purchased from your veterinarian. This should include all vaccines and growth enhancers
2	All medicine usage must be recorded in the medicine usage book. Records of medicine use must be completed within 72 hours of administration; otherwise the medicines use will not be recorded. Observe all withdrawal times before slaughter
3	All medicine data sheets should be easily available for consultation and emergency use, e.g. self injection.
4	The veterinary surgeon is required to check and advise on medicine usage, documentation and storage regularly
5	Record storage temperature weekly using a Max/Min thermometer
6	Check your medicine store regularly for amounts and expiry dates
7	Do not hold more than one months supply on the farm at any time
8	Make sure all medicines are locked away, out of the reach of children and secure at all times
Store in a Refrigerator (2-8°C)	
1	All vaccines
2	Hormones e.g. oxytocin
3	Iron
4	Part-used bottle tops should be cleaned before returning to fridge
5	Practice good hygiene and cleanliness in the fridge
6	No food is to be stored in the fridge
Store in a Dark Cupboard (8-25°C)	
1	Antibiotics
2	Sedatives
3	Stimulants
4	Vitamins and minerals
5	Disinfectants
6	Part-used bottle tops should be cleaned with alcohol before returned to the cupboard
7	Cupboards to be clean and either locked or the room locked
8	Do not leave medicines in your farrowing or other houses

Medicine Refrigerator set up

The fridge stores a vast amount of the unit's medicines and if the fridge is not properly maintained vaccine programmes may be ineffective.

Daily checking	The fridge should have a max/min thermometer inside	
Proper running temperature?	The fridge should run at 2 - 8ÅC. If it fails to maintain this temperature then change the settings, check the insulation and door closure policy. If the fridge persistently fails to maintain the temperature then it will need replacing	
Where is the fridge between 2 and 8°C ?	 Ice box fridges, commonly used on farms, have several zones of different temperatures. Note at the back of the fridge, cold air from the freezer compartment falls and vaccines placed right against the back can freeze and become inactivated. To prevent this, place a small flat piece of polystyrene against the back of the inside of the fridge	
Which medicines go into the fridge?	Any medicine which states store between 2 and 8ÅC or keep cool	
	For example: All vaccines Hormones i.e. oxytocin PG600 Iron Part used bottles	
What does not go into the fridge?	**1**	Food products. These can contaminate medicines and could spread serious diseases, for instance Swine Fever
	2	Dirty bottles. Ensure all bottles are clean before being returned to the fridge
	3	Needles and syringes do not need to be stored in the fridge
An on farm example	 In this example the ice-box freezer compartment door has broken off and the fridge could do with a good clean. This fridge operated between -3 to +5ÅC. All the time the fridge was below freezing the vaccines were being destroyed. Despite vaccination the unit had just experienced an episode of erysipelas! The fridge contains new bottles of antibiotics and other medicines which should be stored in a medicine cupboard in the dark below +25ÅC. The fridge is also overstocked for a 200 sow unit	
Maintenance	**1**	Do not overstock your fridge. Overstocking results in poor air circulation and leads to pockets of warmer air
	2	Defrost the fridge every 3 months or if ice begins to build up. Ice build up stops the fridge working well and uses more energy, so the fridge costs more to run
	3	Keep the fridge door closed as much as possible. Opening the fridge door warms up the air inside the fridge
You place a lot of faith in vaccines so store them well		

The use of Vaccines in Pigs

The following vaccines are commercially available in pigs

Control of:	Comments about use
Aujeszky's Disease	Whole herd twice yearly
Atrophic rhinitis vaccine	To gilts and sows pre-farrowing for piglets via colostrum
Classical Swine Fever	To pigs over 5 weeks of age
Clostridial vaccine ***Clostridium perfringens C*** ***Clostridium novyi***	 To gilts and sows pre-farrowing for piglets via colostrum Twice a year to adults
***E. coli* vaccine** **F4 and F5** **F18**	 To gilts and sows pre-farrowing or at weaning for piglets via colostrum To weaners via water supply
Epidemic Diarrhoea	To sows pre-farrowing for piglets via colostrum
Erysipelas vaccine **Gilt** **Sows** **Boars** **Growing pigs**	Available via injection or water At selection two injections 2-4 weeks apart Sows at weaning and for piglets via colostrum Twice a year After 30 kg
***Haemophilus parasuis* vaccine**	To piglets or weaned pigs. To gilts and sows pre-breeding for piglets via colostrum
Ileitis	To weaner to growing pigs via water
Leptospirosis	To gilts during acclimatization To gilts and sows pre-farrowing
***Mycoplasma hyopneumoniae* vaccine**	To piglets or weaned pigs
Parvovirus vaccine	To gilts during acclimatization
Pleuropneumonia vaccine	To growing pigs
PCVII	To sows pre farrowing for weaners via colostrum To piglets at weaning
PRRSV vaccine	To weaned pigs To gilts during acclimatization To gilts and sows pre-farrowing for piglets via colostrum
Rotovirus	To gilts and sows pre-farrowing
Salmonella	Via water supply to growing pigs
Swine Influenza	To sows twice a year
TGE	To gilts during acclimatization To gilts and sows pre-farrowing for piglets via colostrum

Note not all of these vaccines are available in all countries.
Timing and requirements may change between different countries.
It is essential to make yourself acquainted with the local legal situation.
In addition there may be a number of Autogenous vaccines available

Feed Hygiene To Reduce Contamination

Feed Bulk Bins

Bulk-bin Management is essential to keep feed as fresh as possible

Hygiene		
	Try to run the bin empty between each feed delivery	
Monthly		
	Inspect each bin	
	Check for leaking seams on the bin	
	Check for porous, rusty areas	
	Examine inlet and exit mouths of augers	
Spring and Autumn		
	Run bin empty once a month	
	Dust the bin with a mould inhibitor	
Every 6 months		
	Pressure wash interior	
	Allow to dry thoroughly before refilling	
	Fumigate to ensure eradication of all insects and mites	
	Watch staff health and safety when fumigating and entering feed bins	
Aims		
• **To prevent mould development**		
	Mould causes	Palatability problems
		Loss of nutrients
		Feed wastage
		Performance and health problems
		Loss of profit
• **Reduce mite contamination**		
	Mites cause	Reduced nutrients
		Food wastage
		Loss of profits

• **Reduce medicine residues**	
	Augers often leave residual feed in their housing because the screws must have clearance as shown in figure 1, the residual feed is represented in brown

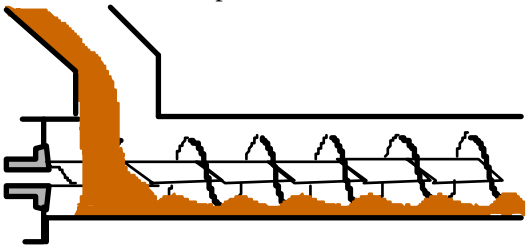


Figure 1

Movement of feed out of a bin occurs directly above the discharge point. The remaining feed then cascades down the slope of the crater that is subsequently formed. Failure to completely empty bins before refilling will result in residual feed retained in the bin

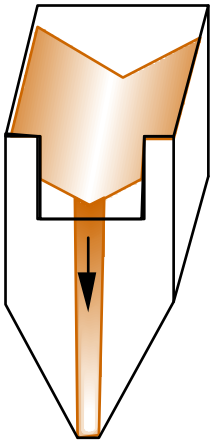
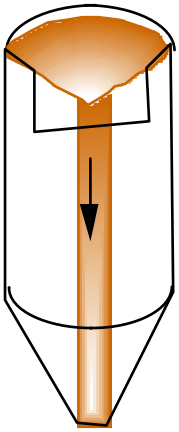


Figure 2



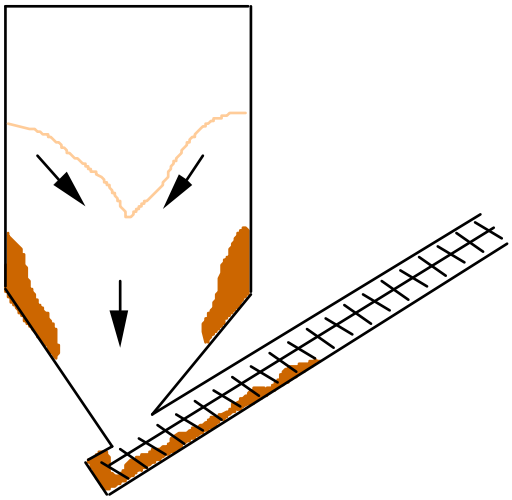


Figure 3

Figure 3 demonstrates the typical feed flow in a feed bin with brown areas illustrating where the feed is most likely to remain and contaminate the next batch

Detection of mites	
	Mites are not visible to the naked eye
	They may be detected as pink/brown "dust" at the base of bins.
	If you suspect mites, pinch the "dust" into a peak. If live mites are present the peak will soon collapse
	Some mites have a distinctive smell which is often more evident if the "dust" is rubbed between the fingers

Bagged Feed

Storage	
	Cool and dry, below 18ÅC
	On pallets, not on the floor
	Away from strong smelling products such as oil or disinfectants
Bags should be stock controlled, always use the oldest deliveries first	
Store should be vermin proof. Ensure all feed barrows are covered at all times	
Note expiry dates on the products generally 3 months or 9 months with milk products i.e. creep	

To reduce the presence of clinical disease on a farm, it is advisable to ómanageô the farm well to ensure pigs are provided with the most ideal environment possible. A simple reporting form can help with this endeavour.

Manager's Weekly Report

Date: .....

AREA	1	2	3	AREA	1	2	3
Needle security				**2nd Stage Nursery**			
Medicine storage				**• Hygiene**			
Foot bath hygiene				**• Water**			
Boot hygiene				**• Feed**			
Farrowing Area				**• Floor**			
• Hygiene				**• Ventilation**			
• Water				**• Stock**			
• Feed				**Grower House**			
• Floor				**• Hygiene**			
• Ventilation				**• Water**			
• Stock - sows				**• Feed**			
- piglets				**• Floor**			
Sow & Gilt House				**• Ventilation**			
• Hygiene				**• Stock**			
• Water				**Finisher House**			
• Feed				**• Hygiene**			
• Floor				**• Water**			
• Ventilation				**• Feed**			
• Stock - sows				**• Floor**			
- gilts				**• Ventilation**			
- boars				**• Stock**			
1st Stage Nursery							
• Hygiene				**Gilt Isolation**			
• Water				**AI Laboratory**			
• Feed				**Staff Canteen**			
• Floor							
• Ventilation				**External Appearance**			
• Stock							

Interpretation of scores	**1**	**Room for improvement**	**2**	**Attention to detail needed**	**3**	**Good**

# gilts		# breed females		# farrowed		# weaned		# sold	

Signed: .....

Partial Depopulation - the Basics

The effect of disease can become crippling. In some cases a partial depopulation, clean and refurbishment of the post-weaning accommodation can help restore the farm health greatly improving the pigôs welfare. By reducing food conversion and enhance growth rates this may also restore farmôs profitability again.

Day	Event
Pre-	Sort out yard accommodation for the finishers
	Purchase or make nursery kennels
	Calculate pig flow requirements
0	Weaning day. Wean all pigs older than 21 days into off-site weaner accommodation
	Stockpeople working with adults and farrowing house are not to enter finishing accommodation
	All stockpeople working with adult and farrowing houses are to wear clean overalls and boots
0 - 4	Empty out grow/finish accommodation
1	Clean out refrigerator and all tops of bottles. Throw out all out of date medicines. Dispose of all used needles and syringes
4 - 24	Clean out buildings starting with weaner accommodation
7	Wean piglets into off-site weaner accommodation
	Move next weeks farrowing sows into cleaned farrowing room
7 - 28	Repair buildings starting with weaner accommodation
10	Veterinary Check of cleaning programme
24	Wash all overalls and boots used by all personnel
	Start re-populating weaner accommodation
	Stockpeople cleaning finishing accommodation are not allowed into farrowing, adult sow or weaner accommodation
28	All buildings should be functional and ready to accept the pigs

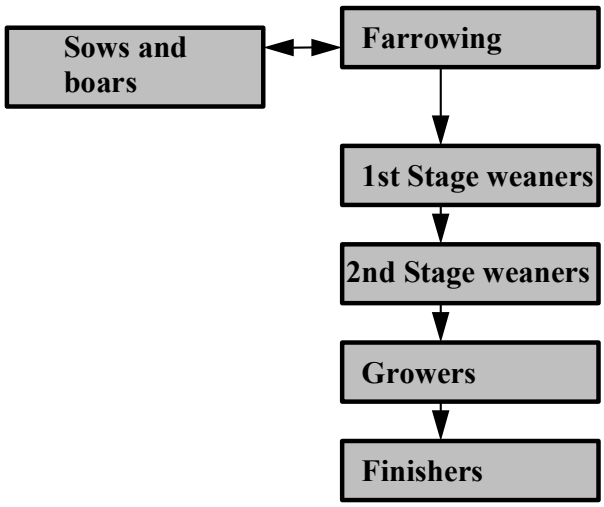
Stockpeople who tend to the grow/finish pigs on the off-site farms are not allowed back onto the farm wearing the same clothes. A complete change of clothing is required to re-enter the farm, ideally after a shower.

ANIMAL MOVEMENTS

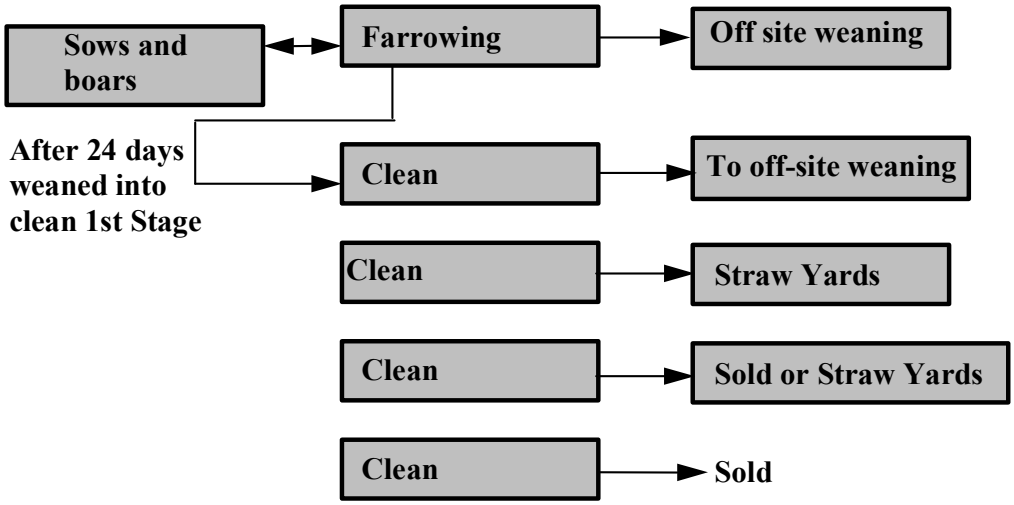
Sell all possible finishing pigs
Sell all cutter/pork pigs 65 kg to 80 kg or finish on straw as required
20 - 65 kg pigs move to an off-site straw yard
5.5 to 20 kg pigs place in outside kennel or a double straw nursery

Schematic of pig movements

Normal Pig Flow



Programme



Elimination of pathogens from farms

Pathogens can become so destructive to the farm that the welfare of the pigs and the farmôs profitability become unviable. It will then be necessary to completely remove the pathogen. For some pathogens this is almost impossible ï *Bordetella bronchiseptica* or *Lawsonia intracellularis* would be examples. These pathogens exist in other common animals and therefore, when eliminated the farm rapidly becomes re-infected.

However, some of the most serious pathogens to pigs can be eliminated from farms, Classical Swine Fever (Hog Cholera), Foot and Mouth Disease and Aujeszkyôs (Pseudorabies) would be examples. This section discusses some techniques which may be used to eliminate various pathogens. The key to pathogen elimination is a thorough understanding of the epidemiology, physical characteristics and diagnostic capabilities of the specific pathogen. In addition, a pathogen is not necessarily eliminated from a farm just because you cannot detect it in the laboratory test.

Also note, you cannot eliminate ódiseaseô ï only specific pathogens. Which is why a term like óhigh healthô is meaningless.

Elimination requires a detailed knowledge of the pathogenôs life cycle, method of spread and susceptibly to treatments.

Biosecurity and trust are the key components to any elimination programme.

Note there may even be pathogens you do not want to eliminate; *Haemophilus parasuis* and the virus of Congenital tremor II are examples which may be eliminated during the elimination of other pathogens and result in serious problems trying to integrate normal replacement stock after the clean up.

Possible Elimination methods of the major Pathogens of the Pig
A hatched block indicates it is only sometimes possible

Pathogen	OIE status	Depopulation and repopulation	Hysterectomy and move piglets to a new farm	Direct pathogen exposure	Vaccination	Segregated early weaning	Partial depopulation	Test and remove	Herd closure	Medication programmes
Actinobaculum suis										
Actinobacillus suis										
Actinobacillus pleuropneumoniae		■				■				
African Swine Fever	A	■								
Arcanobacterium pyogenes										
Ascaris suum			■							
Aujeszkyôs Disease Pseudorabies	B	■	▨		■			■		
Bordetella bronchiseptica										
Borrelia spiralis										
Brachyspira hyodysenteriae		■	■							▨
Brachyspira pilosicoli		■	■							
Brucella suis	B	■								
Classical Swine Fever	A	■								
Circovirus I and II										
Clostridium difficile										
Clostridium perfringens										
Congenital tremor virus?									■	
Cytomegalovirus										
E. coli cystitis										
E. coli diarrhoea										
E. coli bowel oedema F18 Ste2x										

Pathogen	OIE status	Depopulation and repopulation	Hysterectomy and move piglets to a new farm	Direct pathogen exposure	Vaccination	Segregated early weaning	Partial depopulation	Test and remove	Herd closure	Medication programmes
Enterovirus										
Epidemic diarrhoea virus										
Erysipelothrix rhusiopathiae										
Foot and Mouth virus And other vesicular viruses	A									
Haemophilus parasuis										
Haematopinus suis										
Hyostrongylus rubidis										
Isospora suis										
Lawsonia intracellularis										
Leptospirosis	B?									
Leptospira pomona										
Metastrongylus apri										
Mycoplasma haemasuis										
Mycoplasma hyopneumoniae										
Mycoplasma hyosynoviae										
Oesophagostonum dentatum										
Parvovirus										
Pasteurella multocida (Toxigenic)	B									
Pasteurellosis										
PMWS										
PRRSv	B									
Ringworm										

Pathogen	OIE status	Depopulation and repopulation	Hysterectomy and move piglets to a new farm	Direct pathogen exposure	Vaccination	Segregated early weaning	Partial depopulation	Test and remove	Herd closure	Medication programmes
Rotavirus										
Salmonellosis										
Sarcoptes scabiei										
Spirochaetal colitis										
Staphylococcus hycius										
Stephanurus dentatum										
Streptococcus abscess										
Streptococcus arthritis										
Streptococcus suis joint ill										
Streptococcus suis meningitis										
Strongyloides ransomi										
Swine Influenza virus										
Swine pox virus										
TGE	B									
Toxoplasma gondii										
Trichonella spiralis										
Trichuris suis										

All elimination programmes hinge on the availability of negative pigs to purchase or that internal replacements will be negative

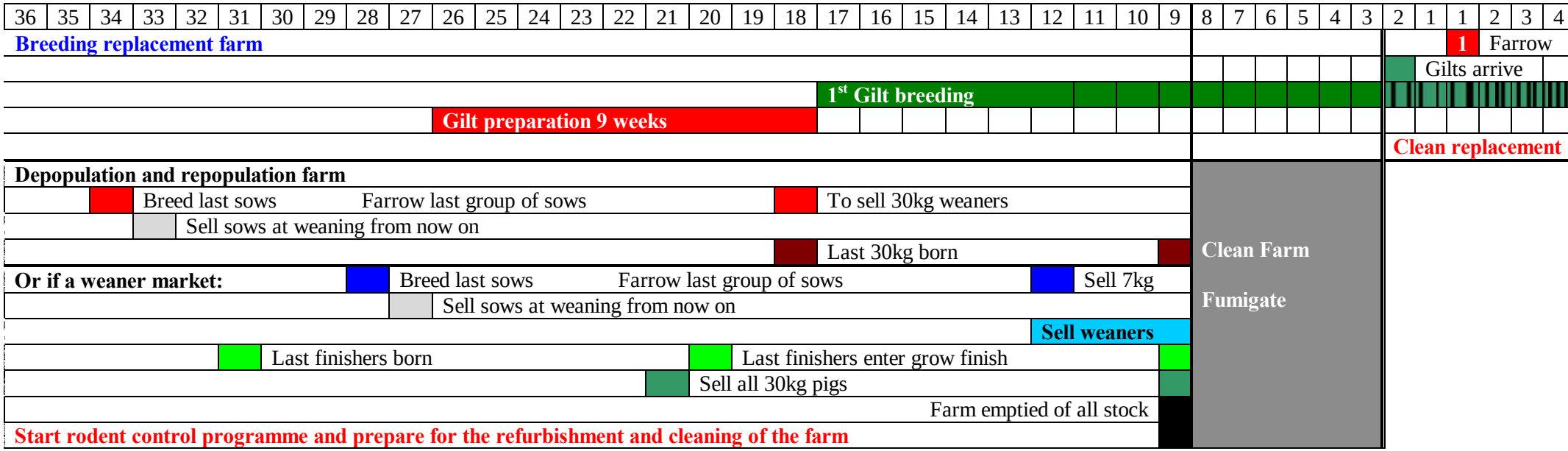
1	**Depopulation and Repopulation**
	All pigs, pig products and faecal contaminates must be removed from the farm, followed by fumigation and resting of the farm. The farm is then repopulated with animals negative to the pathogen.
2	**Hysterectomy and move piglets to a new farm**
	A sow at the point of farrowing is euthanased and her uterus removed and placed in disinfectant and carried 50 metres from the euthanasia point. Here the piglets are removed from the uterus and immediately placed in a warm box and taken from the area. None reproductive or systemic diseases can be eliminated – *Actinobacillus pleuropneumoniae*, *Mycoplasma hyopneumoniae* and *Sarcoptes scabiei* for examples.
3	**Direct pathogen exposure**
	All susceptible animals are exposed to the pathogen. The pathogen has no long term carrier status. The pathogen then dies out on the farm. New animals are negative to the pathogen. Enteric viruses ï TGE and PED are classic pathogens that may be controlled. PRRSv has been controlled by the method combined with herd closure.
4	**Vaccination**
	All susceptible animals are vaccinated. The pathogen then dies out on the farm. Generally it is important to identify vaccinated from wild/field pathogen infected animals. Aujeszkyôs (PRV) is controlled by vaccination, combined with test and remove.
5	**Segregated early weaning**
	Segregated early weaning utilising maternal colostrum antibodies possibly combined with medication has proved effective at eliminating several pathogens, *Mycoplasma hyopneumoniae* and PRRSv are examples. Toxigenic *Pasteurella multocida* may be eliminated but will need vaccination control and very early removal of the piglets. APP has been eliminated but requires pre-day 8 weaning of the piglets.
6	**Partial depopulation (Swiss Depop)**
	Partial depopulation is where the susceptible population is removed and the pathogen is removed from the remaining adult stock. *Mycoplasma hyopneumoniae* or PRRSv are examples.
7	**Test and remove**
	All infected animals are identified and removed before they spread the pathogen to remaining susceptible animals. This can be very difficult to achieve. Aujeszkyôs (PRV) combined with vaccination has been successfully eliminated. PRRSv has been eliminated by this method.
8	**Herd Closure**
	The pathogen dies out of the farm over time. Combined with vaccination and direct pathogen exposure, PRRSv and Swine Influenza have been eliminated by this method.
9	**Medication Programmes**
	The pathogen has to be susceptible to medication; viruses for example can not be eliminated. *Sarcoptes scabiei* (Mange) and *Haematopinus suis* (Lice) can be eliminated by avomectins. Tilmicosin and tulathromycin has eliminated *Mycoplasma hyopneumoniae* especially when combined with segregated weaning and partial depopulation. Tiamulin may be effective in eliminating *Brachyspira hyodysenteriae* when combined with cleaning and partial depopulation.

Pathogen elimination through
Depopulation/Repopulation

Science points -	
	Negative stock is commercially available
	The pathogen does not exist naturally in the environment or locally common wild animals
	The pathogen can be eliminated from the contaminated building easily/quickly by routine cleaning
Standard downtimes	
	This depends on the diseases to be eliminated. For instance *with Brachyspira hyodysenteriae* (Swine Dysentery) it should be a minimum of 8 weeks
	For routine restock 6 weeks would be the suggested minimum
Depopulation	
	Depopulation means total removal of all pigs and their products from the farm for the downtime period
Depopulation procedures	
1	Rodent control should start and be vigorous. Place water near baits to encourage intake
2	Pig Flow ï calculate the required pig flow model to allow the farm to legally maximise its output. Aim where possible to achieve all-in/all-out in all parts of the farm, in particular the finishing area. Consider all possibilities including batch farrowing to achieve all-in/all-out
3	Obviously as animals are sold, buildings become empty and they are to be cleaned and repaired as they become empty
4	Run down all stocks of medicines, feed and disposables
5	It will probably be necessary to arrange stockperson schedules to ensure that ódirtyô stockpeople do not enter ócleaned buildingsô
Cleaning protocols	
1	Ensure Pressure Washing is carried out adequately
2	But also note in addition:
3	Pay particular attention to the removal of all faecal material. The building should be brushed down thoroughly and then dry cleaned using a knife and scrape to remove all visible faeces. The small amounts should be removed with a dustpan and brush. This has to be very thorough and on your hands and knees
4	Remove dust by vacuuming where possible
5	**Areas of particular note – pigs have long tongues**
	Under and around gate posts and gates
	Corners at the back of pens
	Around fittings i.e. farrowing crates
	Under drinkers and troughs
	Where cracks and holes exit in the concrete
6	Repair all large cracks and holes in concrete by
	Cleaning out where possible
	Pouring in a suitable disinfectant
	Once dry repair by screeding over with concrete
7	All wooden partitions and removable objects should be soaked in disinfectant for a period of 3 to 5 days using metal baths. Place outside in sunlight to dry
8	Drain and clean the slurry channels and pits. Remove all available faeces. Sometimes this is impractical but it is essential to clean to 30 cm below the removable slats
9	Ideally lime wash all surfaces especially up to 2 metres in height and spray with a disinfectant using a knap sack sprayer into the ceiling and loft areas.
10	Ensure that the water supplies are adequately disinfected
11	Repair all equipment to the necessary standards

Water	Ensure adequate flow is obtainable from all drinkers. This may necessitate replacement of all pipelines. Ensure water pressure adequate around the system
Air	Ensure all ventilation systems are thoroughly cleaned. All fans must be checked that they perform as required. Repaint all the blades. Check fan speeds with a tachometer and volt meter
Floor	All floors must be none abrasive. All sharp points are to be removed or covered. Note worn doorways, concrete under water points and around feeders, in particular wet feeding systems. All holes and cracks are to be repaired. Worn rough slats to be repaired or replaced
Feed	Ensure all feeders work as required. All old food needs to be thoroughly removed and sharp edges smoothed. Any holes repaired and if feederôs leak and cannot be repaired they must be thrown away. Feed is the major cost and any waste should be avoided
Vermin	Bird proof all buildings where possible ï future Salmonella controls
Cleaning protocols when farm empty	
	Ensure unit perimeter secure
	Finish cleaning the last building
	Dispose of all medicines, needles and syringes. This should include all medicines
	Remove all disposables from the farm, including all feed. Empty all feed hoppers and feed bins. Ideally all feed should have been eaten
Surfaces	Ensure all surfaces are cleaned. This must include the fridge, chemical store, feed stores, changing rooms and staff room
Midden area	Spread all the midden materials and lagoons and slurry store
	The soil within the proximity of the midden area has faeces still remaining from the old unit. Skin off this area to a depth of 80 cm. Spray the soil with a suitable disinfectant and then rescree over the 80 cm of soil
Straw and other bedding	Old straw remaining from the old unit should be moved and disposed off as this can harbour mice/rats from the old unit
Dogs and cats	Discuss dog and cat protocols. Treatment may be required depending on the pathogens to be eradicated
Tractors	Ensure all tractors and equipment, in particular muck spreading and bob cats, are thoroughly cleaned and disinfected
	Burn all straw and used bedding
	Dispose of all brushes, shovels and scrapes
	Dispose of all overalls, boots and protective clothing
	Purchase clothing for the new clean unit
Farm clean protocols	
1	Pressure wash all buildings
2	Lime wash all buildings
3	Fumigate all buildings
4	Seal all buildings as each building becomes clean
5	Dispose of all clothing, boots and purchase new when whole farm finished
Once whole farm fumigated	
1	Restore water supplies and check all drinkers work. Note when water supplies cleaned deposits can block the drinkers
2	Ensure rodent controls are maintained particularly at the perimeter of the farm
New stock introduction and biosecurity protocols	
1	The new stock require isolation procedures
2	Note biosecurity requirements these obviously vary depending on the health of the incoming stock.

DEPOPULATION AND REPOPULATION CALENDAR OF EVENTS – 7 DAY BATCHES

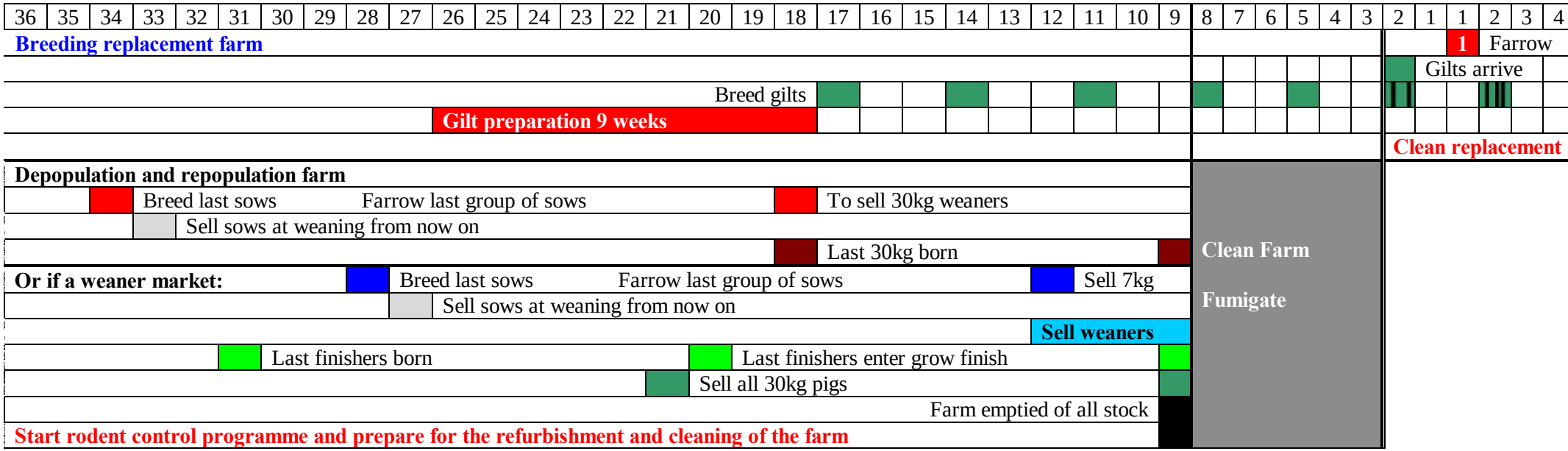


= gilts are bred only over a 7 day period (Friday to Thursday for example). It is essential to get the batches together
The batches of gilts mated in the hatched weeks are mated on the clean farm
Organise gilts using Regumate (Matrix)™ and possibly also use PG600 on the expected day of mating.

= The week of an event

The slaughterweight is assumed to be at 22 weeks of age
Weaners are at max 28 days of age

DEPOPULATION AND REPOPULATION CALENDAR OF EVENTS – 3 WEEK BATCH



= gilts are bred only over a 10 day period. It is essential to get the batches together
The batches of gilts mated in the hatched weeks are mated on the clean farm
Organise gilts using Regumate (Matrix)™ and possibly also use PG600 on the expected day of mating.

= The week of an event

The slaughterweight is assumed to be at 22 weeks of age
Weaners are at max 28 days of age

Pathogen elimination through
Hysterectomy and move piglets to a new farm

Example - *Actinobacillus pleuropneumoniae* elimination

(It is possible to do with a hysterectomy – carefully prepared caesarean but requires detailed surgical care)

Science assumptions – re *Actinobacillus pleuropneumoniae*	
	The organism is not normally present on the skin
	The organism not normally present in the blood
	The organism is not passed through the placenta to the foetus
Sow Preparation Protocols	
	The sow should be presented at 112-114 days of gestation. The day before the hysterectomy, the sow should be washed without causing stress
Day before hysterectomy	
1	It is better not to try to stop the farrowing time, but sometimes it will necessary. Two compounds may be considered. Check that these compounds are legal.
	Progesterone: 300 mg intramuscular day before
	PlanipartÊ (clenbuterol): 10 ml (300 mg) intramuscular dose every 12 hours
2	Ensure that a foster mother is going to be available on the new farm
Preparation protocol	
1	She must not be in labour and giving birth. If any piglets have been born or there is placenta showing, the sow must not be moved off the unit
2	The sow should be gently driven to the site of hysterectomy
3	The truck, driver and support staff must stay at least 50 metres away from the piglet end of the hysterectomy
4	The driver and support staff must wear clean outer clothing on the day of the hysterectomy. Particular areas of concern are the wearing of clean boots and washed hands
5	The truck used to transport the sow should be cleaned and disinfected and not used to move pigs for 12 hours after cleaning and disinfection
6	The breeding company is to ensure all parties know that the hysterectomy is to be carried out the next morning
Hysterectomy site	
1	The hysterectomy site must be secure and discreet
2	The site should be arranged so that the piglet area and dam area are clearly separated by a minimum of 25 metres
3	No staff should move between the two sites at any time
4	After the hysterectomy has been completed all material must be removed and the site disinfected.
5	If the carcase remains at the hysterectomy site, it must be placed in a covered and/or purpose built dog proof building. The carcase must be removed within 24 hours of slaughter. The carcase must have been removed prior to another hysterectomy being carried out
PREPARATION FOR THE HYSTERECTOMY	
DAY PRIOR TO THE HYSTERECTOMY	
Stockpersons Responsibilities	
1	Prepare the bath, ensure that it is thoroughly cleaned and disinfected
2	Ensure the hysterectomy table is thoroughly clean
Within 15 minutes of the start of the hysterectomy	
1	The bath is to be filled to a water depth of 30 cm with hot tap water
2	Add suitable mild disinfectant to the water
3	Move the bath to the clean site of the hysterectomy
4	Have one additional bucket of warm clean water ready to clean post-slaughter
5	If the hysterectomy is not carried out within 25 minutes of filling the bath, then the bath should be refilled with water at the required temperature

Slaughter Procedure	
Three people are required; two stock people (stockperson 1 & 2) and one veterinarian	
1	The piglet area must be ready
2	The sow must be securely snared and restrained by stockperson 1
3	The veterinarian gives stockperson 2 the pithing rod and the knife
4	Both stockpeople must stand behind the veterinarian The veterinarian shots the sow using a captive bolt.
5	Immediately the veterinarian passes the discharged gun to stockperson 2 by the handle, keeping the gun pointing at the floor at all times.
6	The stockperson 2 passes the pithing rod to the veterinarian
7	The veterinarian attempts to insert the pithing rod into the cranial hole. A certain degree of force may be required to fully penetrate the cranium
8	Stockperson 1 must stay behind the veterinarian and continue to restrain the sow on the snare
9	The pithing rod is passed down the spinal cord of the sow and slowly moved in and out until all excessive movement stops
10	**Leave the pithing rod in place until after the hysterectomy**
The Hysterectomy Procedure	
1	The sow is to be rolled out on her back with stockperson 1 holding one hind leg
2	Stockperson 2 pass to the veterinarian the knife and then places the gun back in its gun box
3	Stockperson 2 prepares to bring the hot water bath to the side of the sow
4	The veterinarian starting at the xyphoid process cuts through the skin and fat, down to between the hind legs. Do not penetrate the abdomen. Cut only through skin and fat
5	Penetrate the abdominal cavity at the xyphoid process. Make a sufficiently large hole to allow the hand to be inserted into the abdominal cavity. Reverse the cutting method and raising the abdominal wall with the hand, cut along the linea alba. Take particular care not to penetrate any internal organs
6	Place the knife blade into the muscles of the fore leg
7	Bring the hot water bath to the side of the sow
8	Pour and pull the uterus into the bath. Pull and tear the ovarian end. In some cases the cervical end can even be torn but in most cases the cervical end will need to be severed by the knife
9	Once the whole uterus is in the water bath both stockpeople must briskly walk with the bath to the piglet area
Possible problems during the hysterectomy	
A	**A SMALL HOLE HAS BEEN MADE IN THE UTERUS BUT NO PIGLETS ARE RELEASED**
	Ignore and continue
B	**A LARGER HOLE HAS BEEN MADE IN THE UTERUS AND A PIGLET IS RELEASED**
	A larger hole has been made in the uterus and a piglet is released. Keep pulling the uterus into the water bath and proceed with the hysterectomy. The released piglet is not to be moved to the piglet processing area but is to be dried and returned, whenever possible, to the sow source farm
The piglet site	
DAY BEFORE HYSTERECTOMY	
1	Processing Table
	Ensure the table is cleaned and disinfected thoroughly at least 12 hours before the hysterectomy. The table is designed to have a grill to allow water though but not the uterus and piglets
2	Piglet Transport Box
	Ensure the box is cleaned and disinfected thoroughly at least 12 hours before the hysterectomy. Ensure the box can be warmed effectively. Ensure there is an adequate number of boxes and that they are big enough to take the maximum number of piglets
3	The truck to Transport the Piglets to the new farm
	Ensure the truck is cleaned and disinfected thoroughly at least 12 hours before the hysterectomy

DAY OF THE HYSTERECTOMY	
1	The piglet area should be discretely sited
2	The veterinarian, nurse and stockperson from the destination farm should have clean outer clothing and boots. Plastic outer protectors should be worn
3	Hands should be cleaned prior to arrival and washed with surgical scrub disinfectant. Gloves can be worn by the operators. However, gloves can interfere with the processing time as it can make it more difficult to remove the piglets from the uterus
4	Tools required are: Naval clamps 14 pairs, Sterilised curved blunt ended scissors, Dry towels, 2 bottles RevivonÊ drops
Piglet Processing	
1	The two stockpeople briskly approach the processing table and pour the water and disinfectant onto and through the processing table
2	The two stockpeople briskly walk back to the hysterectomy site
3	All three operators (one vet, nurses and piglet stockperson) open the uterus and remove the piglets. Do not cut into the piglets
4	The veterinarian then moves the blood up the cord towards each pig and placed a navel clamp approximately 5 cm from the umbilicus. The umbilical cord is then cut from the placenta from each piglet.
5	During all this time the nurse and stockperson use dry towels to massage and dry the piglets. The nurse and stockperson must talk to the piglets and encourage the piglets to breath
6	The piglet should squeal and move vigorously before being moved into the transportation box
7	Piglets having problems with breathing, attempt to recover using RevivonÊ dripped on the tongue. Despite the temptation, mouth to mouth resuscitation is not to be attempted as pathogen transmission may occur
8	Once all the piglets are in the transportation box the stockperson, transportation box and transport truck must leave for the new farm
9	Any piglets with any deformity likely to affect production must not enter the piglet transportation box. For example, deformed legs or cleft palate (if noticed)
10	The piglet processing area is now thoroughly cleaned down and all disposable equipment disposed of hygienically (plastic overcoat, gloves etc.,)
At the new farm	
New farm being made – no sow's available	
	The farm facilities must be extremely clean
	Note the new piglets will have received no colostrum and therefore, will have no natural immunity.
	Provide artificial colostrum supplements. Cow colostrum may be a good substitute. Provide 50 ml per piglet at 10 ml per dose by stomach tube.
	Inject each piglet with 3mg ceftiour or 5 mg tulathromycin
New stock being moved to an established farm	
	Induce sows to farrow on the day of the hysterectomy
	Foster pigs of sows as they farrow. If short of sows, box up sowôs natural piglets and give then artificial colostrum and once all pigs are born given them one suckle of the sow
	Hysterectomy piglets must be given priority. When hysterectomy piglets arrive, do not fuss over then. Put shredded paper in the pen and extra lights. Ensure foster sow has not suckled in the last hour, and then just leave the hysterectomy piglets to get on with it.
	Inject each piglet with 3mg ceftiofur or 5 mg tulathromycin

Pathogen elimination through
Segregated Early Weaning
Example – *Mycoplasma hyopneumoniae*

Science Assumptions re *Mycoplasma hyopneumoniae*		
	Sows remain infected all their lives	
	Mycoplasma hyopneumoniae colostrum antibodies remain for 14 day post-consumption	
	M. hyopneumoniae can be killed with Tilmicosin, Tiamulin, Tulathromycin or Chlortetracycline	
	M. hyopneumoniae can be eliminated by cleaning of an offsite nursery	
	The absence of *M. hyopneumoniae* antibodies and PCR is an effective diagnostic tool at 12 weeks of age	
	Source of *Mycoplasma hyopneumoniae* negative pigs is available	
	Mycoplasma hyopneumoniae only spreads 3 km between farms	
Sow preparation programme		
8 weeks pre-farrowing		
	Vaccinate the sows. The success of the programme relies on colostrum antibodies and the key to this is vaccination. Ensure vaccines are stored properly and administered using a 1.5 inch 16 gauge needle.	
	Vaccinations that are possible are, APP, Atrophic rhinitis (toxin), Clostridia, *E. coli*, Erysipelas, *Haemophilus parasuis, Lawsonia intracellularis, Mycoplasma hyopneumoniae*, PRRSv (dead), SIV, PCVII	
	Provide the sows with feedback ï using nursery faeces and diarrhoea from the farrowing house	
4 weeks pre-farrowing		
	Repeat the vaccine and feedback programme	
2 weeks pre-farrowing		
	Provide in-feed medication of Tilmicosin 400g/tonne and Chlortetracycline 800g/tonne to the sows until the piglets are weaned at 10 days of age. Sows may be injected with Tulathromycin at 2.5 mg/kg	
7-5 days pre farrowing		
All sows must be healthy		
Move into farrowing house		
General bacteria	Tetracycline long acting	30mg/kg injection using a 16G 1.5" needle intramuscularly into the neck
Weaner programme		
Day of life		
1	Iron	200 mg injection by a 21G 5/8" needle intramuscularly into the neck
	Colostrum	Artificial colostrum ï possibly using cow colostrum, 50 ml per piglet at 10 ml doses
2	Avomectin	300 µg/kg by a 21G 5/8" needle subcutaneously into the neck
	Ceftiofur	5 mg/kg by a 21G 5/8" needle intramuscularly into the neck
	Enrofloxacin	Oral medicator ï 10mg (not legal in the USA and Australia)
4	Toltrazuril	7mg/kg oral dose ï to control coccidiosis
5	Tulathromycin	at 2.5 mg/kg by a 21G 5/8" needle intramuscularly into the neck
9	Tulathromycin	at 2.5 mg/kg by a 21G 5/8" needle intramuscularly into the neck
10	Weaned move to the off-site nursery - note biosecurity of truck and site	
Post weaning		
	Tiamutin 12.5% solution	180 ppm through the water supply supplied for the first 7 days post weaning
	Chlortetracycline	800 g per tonne of creep feed, to be fed for 21 days post-weaning
	Tilmicosin	400g per tonne of creep feed, to be fed for 21 days post-weaning
	Avomectin	300 µg/kg by a 21G 5/8" needle subcutaneously into the neck
	Tulathromycin	at 2.5 mg/kg by a 21G 5/8" needle intramuscularly into the neck

Loss of Maternal Antibody Protection over Time

Week when most antibody lost	Agent
Week 1	*Escherichia coli*
Week 2	TGE
Week 3	*Haemophilus parasuis*
Week 4	*Pasteurella multocida* and *Bordetella bronchiseptica* (PAR) PRRSv
Week 6-9	Aujeszky's Disease Enterovirus *Mycoplasma hyopneumoniae* PCVII PRC Respiratory Syncytial Virus Swine Influenza
Week 6-10	*Actinobacillus pleuropneumoniae* (but protection may not be present after 3 weeks)
Week 12	Erysipelas
Week 24	Parvovirus

Note if the piglet did not receive colostrum
(due to weakness, mastitis, galactic, fostering, chilling etc.)
then no antibody protection is present

In pigs, no antibodies cross the placenta

Also the loss of antibodies is variable with PRRSv loss starts at 14-20 days

Pathogen elimination through
Partial Depopulation
Example – *Mycoplasma hyopneumoniae*

Science Assumptions re *Mycoplasma hyopneumoniae*	
	Sows remain infected all their lives
	Mycoplasma hyopneumoniae colostrum antibodies remain for 14 day post-consumption
	M. hyopneumoniae can be killed with Tilmicosin, Tiamulin, Tulathromycin or Chlortetracycline
	M. hyopneumoniae survives in the environment for only a couple of days
	The absence of *M. hyopneumoniae* antibodies, PCR and/or IHC are effective diagnostic tools at 12 weeks of age
	Source of *Mycoplasma hyopneumoniae* negative pigs is available.
	Mycoplasma hyopneumoniae only spreads 3 km between farms
Preparation of the programme	
	All animals older than 10 days of days and less than 10 months of age will be removed from the farm
	Farrow to finish farm ï review protocols of partial depopulation with the inclusion of the need to care for piglets from 10 days of age.
	Review the pig flow programme to ensure that sufficient young sows will be available to compensate for the shortfall of gilts that will occur for a 3 month period.
	Cull all sows/boars where necessary to reduce the herd size if appropriate ï with considerations for maintaining pig flow.
	Cull all unhealthy sows and boars.
	The eradication should be programmed for the summer months which will aid environmental removal of the mycoplasma.
	As buildings become empty ensure that a full cleaning, repair and refurbishment programme is instigated.
8 weeks pre-start programme	
	Vaccinate the sows and boars with *Mycoplasma hyopneumoniae*. It is essential to ensure that all piglets get colostrum and are not shedding *Mycoplasma hyopneumoniae* while in the farrowing house. The success of the programme relies on colostrum antibodies and the key to this is vaccination. Ensure vaccines are stored properly and administered using a 1.5 inch 16 gauge needle.
	Provide the sows and boars with feedback ï using nursery faeces and diarrhoea from the farrowing house. It is essential to have all the adults immune to *Mycoplasma hyopneumoniae*.
4 weeks pre-start of the programme	
	Repeat the vaccine and feedback programme

Start of the 6 week eradication programme		
	Ensure that all sows and boars will be provided with 3 kg a day of medicated feed. Boars may require more to ensure adequate medication for their weight or use in combination with injection.	
	Boar alternative medication is via injection ï consider using Tulathromycin (2.5 mg/kg) injection once every 7 days. Weigh boars as necessary.	
	Provide in-feed medication of Tilmicosin 400g/tonne and Chlortetracycline 800g/tonne to the sows. This will be provided for a period of 6 weeks. Tilmicosin may be very bitter ï provide Talin in the feed to assist palatability of feed.	
	In the farrowing house provide 3 kg of medicated feed in the morning feed with unmediated feed in the evening feed.	
	Any sick or inappetant sow (in oestrus for example) injection with Tulathromycin (2.5 mg/kg). If a sow is sick for 3 days euthanase. It is essential that *Mycoplasma hyopneumoniae* be not allowed to remain in weakened adults.	
Management of piglets in the farrowing house to assist survival of 10 day weaned piglets		
Day of life		
1	Iron	200 mg injection by a 21G 5/8" needle intramuscularly into the neck
	Colostrum	All piglets must receive colostrum from sows. If there is any suspicion that a piglet failed to get adequate colostrum euthanase.
2	Ceftiofur	5 mg/kg by a 21G 5/8" needle intramuscularly into the neck
	Enrofloxacin or Tulathromycin	Oral medicator ï 10mg (not legal in the USA or Australia) Tulathromycin is by injection ï note small dose
4	Toltrazuril	7mg/kg oral dose ï to control coccidiosis
5	Ceftiofur	5 mg/kg by a 21G 5/8" needle intramuscularly into the neck
9	Ceftiofur	5 mg/kg by a 21G 5/8" needle intramuscularly into the neck
10	Weaned move to the off-site nursery - note biosecurity of truck and site	
Management of the early weaned sow		
	Place the early weaned sow onto Regumate a day before weaning. Maintain Regumate until normal expected weaning day. This is essential to maintain pig flow. It is possible to provide Regumate via toasted bread.	
Confirming eradication of *Mycoplasma hyopneumoniae*		
Deaths	All deaths should be post-mortemed	
Coughing	Investigate all cases of coughing and sneezing. Note Post-weaning sneezing may occur	
12 weeks of age	The pigs should be tested to ensure that they are negative. Ensure that the testing does not detect maternal colostrum antibodies.	
Sentinel	Place known negative gilts into contact with grow/finish pigs and blood test after one month. Note any coughing experienced by these gilts.	
Time	The farm should be examined serially over a period of at least one year. Utilising clinical examination, blood serology and slaughterhouse tests. Immunohistochemisty of any suspect lesions	

Pathogen elimination through
Vaccination and Test and Remove

Example - Aujeszky's Disease virus eradication programme from a low infected farm

Science assumptions re Aujeszky's Disease Virus	
	Aujeszkyôs Disease Virus is a stable DNA virus
	There is an effective vaccine
	A diagnostic test differentiates between vaccinated and field infected animals
Vaccination	
1	Vaccinate with a gene deleted vaccine all pigs over 10 weeks of age. Continue vaccination for 6 months. This will keep the virus at bay while the herd is cleaned up. Stringent biosecurity measures need to be in operation.
Test and Remove	
2	Blood test all the boars, sows and gilts examine by serology. Blood test 30-50 pigs in the following groups, 30-45 kg, 45-70 kg and 70+ kg range.
	If less than 10% of the sows are positive, remove any positive boars, sows and gilts immediately. Then move to point 3 If more than 10% are positive either depopulate or set up an off site weaning programme. This would need its own programme
3	30 days later, blood test all the boars, sows and gilts examine by serology. Blood test 30-50 pigs in the following groups, 30-45 kg, 45-70 kg and 70+ kg range.
	Any positive boars/sows or gilts remove from the herd immediately. If some of the finishers are positive, ear tag/notch negative pigs are 30 kg, place then around the grower facility and specifically retest these animals each 6 weeks. These are to act as sentinels.
	If all animals are negative go to point 4.
4	Retest 90 days later a minimum of 120 sows (if the unit is a commercial farm) or all the boars, sows and gilts if a breeding farm. Blood test 30-50 pigs in the following groups, 30-45 kg, 45-70 kg and 70+ kg range.
	Any positive boars/sows or gilts remove from the herd immediately and go back to point 3 If some of the finishers are positive, ear tag/notch negative pigs at 30 kg, place them around the grower facility and specifically retest these animals each 6 weeks. These are to act as sentinels.
	If all animals are negative go to point 5.
5	Retest 6 months later, any positive boars/sows or gilts remove from the herd immediately and go back to point 3
	Any positive boars/sows or gilts remove from the herd immediately and go back to point 3. If some of the finishers are positive, ear tag/notch negative pigs at 30 kg, place them around the grower facility and specifically retest these animals each 6 weeks. These are to act as sentinels.
6	If all animals are negative it is highly likely you now have a negative herd. Vaccination programme can be systematically dismantled over the next 18 months.
7	Declare the farm free of Aujeszkyôs Disease Virus

Pathogen elimination through
Herd Closure and Pathogen Exposure

Example - Porcine Reproductive and Respiratory Syndrome
Eradication without Depopulation

Science Assumptions re PRRSv	
	No long term carried status for PRRSv in sows or boars
	PRRSv particles are excreted for less than 100 days following infection (see note at bottom)
	Piglets less than 14 days of age are protected by maternal colostrum deprived antibodies
	Spread of PRRSv is difficult/unlikely over 500 metres
	It is not present in other animals
Difficulties	
	PRRSv is not excreted in many body fluids consistently
	Reproductive problems of PRRSv may be accentuated by the treatment advised
Technique	
	Purchase sufficient young gilts to provide breeding animals for 100 days
	Close the farm to all inputs, excluding PRRSv free semen
Infect all animals on the farm – Pathogen exposure	
	Vaccinate all sows, gilts and boars with a suitable PRRSv vaccine; a live vaccine is acceptable if no previous exposure.
	Obtain tonsilar scrapes from all animals with acute signs. This is made up to vaccinate all sows, gilts, boars and young future breeding stock.
	Practice feedback of faecal materials from acutely ill animals, aborted materials; macerate piglets that die with clinical signs. Feed this material for 14 days.
	At the end of the infection period, throw away all used needles and syringes.
2 weeks later	Vaccinate all sows, gilts and boars with a dead PRRSv vaccine to reduce viral shedding.
	At the end of the infection period, throw away all used needles and syringes.
Herd Closure	
	For 100 days minimum, the farm must be totally closed (excluding PRRSv free semen)
	All piglets over 14 days of age are weaned off the farm for 100 days
	Enhance biosecurity measures
Clean farm	
	At 90 days post-infection, disinfect the entire farm with a suitable disinfectant. Spray the walls, water and air. Wash all clothing and boots. Throw out all used needles and syringes.
Check the effect of the eradication	
1	Purchase 20 PRRSv free gilts.
2	Introduce gilts into the farm and place the animals all around the farm
3	After 21 days, bleed the 20 gilts
4	After 35 days, re-bleed the 20 gilts.
5	If the gilts are negative, declare the farm free of PRRSv and allow the weaning age to increase.
6	If any of the gilts are positive, all the gilts are removed. The farm remains closed for another 30 days and the test repeated.
Post-Control	
	All gilts and boars introduced into the farm through an adequate isolation area are PRRSv negative.
	Ideally practice on-farm AI on the farm
	Do not use a live vaccine on the introduced animals
	Consider dead vaccine use if proved to be effective
	Continue enhanced biosecurity measures.

Porcine Reproductive and Respiratory Syndrome virus Elimination
Calendar of Events

Week 1	Infect all sows and boars ï dead vaccine and own material from farm Ensure all staff well aware of biosecurity measures Isolation animals ï infect all with dead vaccine and own materials Stop live vaccines Move materials from the isolation area? Purchase new stock for 100 days and ensure all animals are exposed Close the herd
Week 2	Continue feed back for 14 days
Week 3	Throw away all used needles and syringes Start 100 day countdown All piglets older than 14 days weaned off farm Limit or cease cross-fostering
Week 4-14	All piglets older than 14 days weaned off farm Limit or cease cross-fostering
Week 14	All piglets older than 14 days weaned off farm Limit or cease cross-fostering Disinfect walls, floors, air and water. Vehicles and utensils. Throw away all clothing, boots, etc. Throw away needles and syringes. Order 20 PRRSv negative gilts.
Week 18	Introduce the 20 gilts into the isolation. Order 20 PRRSv negative gilts.
Week 21	Bleed gilts. If negative, go to next week. Move additional 20 PRRSv free gilts into main farm. If gilts are positive ï immediately remove from the isolation area. Close farm for 30 days and re-start checking program.
Week 24	Bleed gilts in isolation and main farm. If negative, go to next week. If any gilts are positive ï immediately remove from the isolation area. Close farm for 30 days and re-start checking program.
Week 25	Start weaning as normal
Week 27	Bleed all 40 gilts again. If negative. Restart gilt introduction program Declare the farm free of PRRSv

Note:
This above programme has successfully eliminated PRRSv from a number of farms. As science progresses, PCR technology has revealed PRRSv virus in tonsilar tissue for 200 days post-exposure. Therefore, in designing the herd closure programme the health team must consider the relative risks. In certain circumstances a 200 day closure programme may be adopted rather than the 100 day programme discussed.

Pathogen elimination through
Medication
Example – *Sarcoptes scabiei* var *suis* – farrow to wean unit

Science points re *Sarcoptes scabiei* var *suis*	
	Avomectin remain active in the pig for 7 days post-treatment
	Sarcoptic eggs are resistant to avomectins
	Sarcoptic eggs hatch in 5 days
	Sarcoptic mites may live off the host for 21 days, but in the summer months this is reduced to 5 days
	Boars are difficult to estimate their weight and are often underdosed ï a major reason for the programme failure
Animal	**Programme**
Suckling pigs	Inject with an avomectins at 300 µg/kg via a 21 gauge $^{5}/_{8}$ " needle, using an insulin syringe by injection in the neck
Gilt pool	In feed medication for 7 days, with an inclusion of avomectin in-feed at 100 µg/kg bodyweight. Ensure all animals eat 2.75 kg per day.
Breeding and pregnant sows	In feed medication for 7 days, with an inclusion of avomectin in-feed at 100 µg/kg bodyweight. Ensure all animals are fed 2.7 kg of feed per day ignore condition score
Lactating sows	Feed 2.7 kg of the dry sow ration, with an inclusion of avomectin in-feed at 100 µg/kg bodyweight in the morning for 7 days. Feed lactator in the evening
Boars	Feed dry sow ration, with an inclusion of avomectin in-feed at 100 µg/kg bodyweight. For large boars increase quantity feed. For instance a 200 kg boar feed 2.7 kg per day for 7 days; 250 kg boar feed 3.3 kg per day for 7 days and for a 300 kg boar feed 4 kg per day. Or inject with Avomectin 300 µg/kg
Hospital pens	Inject all pigs with an avomectin at 300 µg/kg in the neck
All adults off feed for more than 24 hours	Inject with avomectin at 300 µg/kg bodyweight in the neck. Note sows in oestrus
Buildings	At the end of the 7 day animal treatment period spray all houses with amitraz 0.1% at 40 ml per 10 litres of water dilution using a knapsack sprayer
Clothing	Stockpeople attending to the grow/finish herd should not wear the same overalls when attending to the breeding herd
	At the end of the 7 day animal treatment period all overalls and boots should be washed thoroughly, disinfected and re-washed in a amitraz 0.1% solution at 40 ml per 10 litres of water dilution
Repeat medication programme with another injection and 7 day medicated feed	
Feed bin management	All feed lines should be flushed with normal food after the 7 day period to remove any treated feed material.

If this programme is combined with a partial depopulation or a clean pen break system, mange can be eliminated from a farrow to finish farm for more detail consult with your veterinarian

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