Australian Exotic Diseases

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Australian Exotic Diseases of Pigs

Australia occupies a unique position in the world of pig health. Almost all current major economic diseases of the pig are absent from the Australian pig population. The population enjoys a health status not seen otherwise on a global situation for over 20 years.

Introduction of pigs from any 'foreign' genetic source has the potential of introduction of at least four major pathogens – Swine Influenza (numerous forms); Porcine Reproductive and Respiratory Syndrome (PRRSv); the current global scourge – recently introduced into the Americas (2004) – the virus (probably) responsible for Postweaning Multisystemic Wasting Syndrome (PMWS) and Transmissible Gastroenteritis Virus (TGE). While there are good diagnostic tests for three of these pathogens, the cause of PMWS is currently not confirmed. A list of the notifiable diseases of Pigs in Western Australia is reported in Appendix I. Notable exceptions are Epidemic Diarrhoea Virus and Porcine Respiratory Coronavirus. In addition, Appendix II reports a list of the zoonotic diseases of pigs.

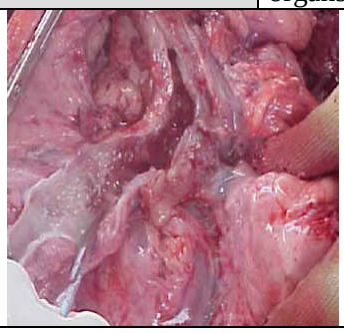
This paper briefly summaries the clinical signs of the major exotic diseases of pigs.

Zoonotic Diseases:

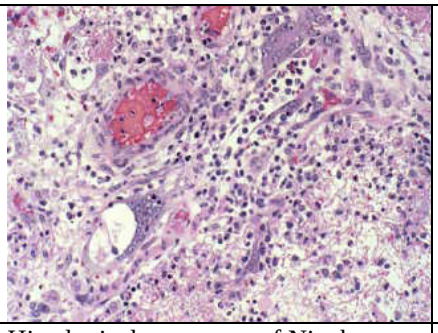
Nipah, Rabies, Porcine Cysticercosis and Trichinellosis

Nipah

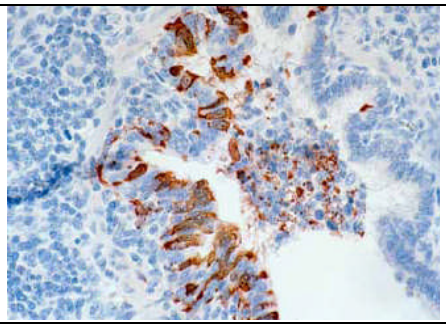
Age group	Weaners, growers and finishers and adults
Clinical signs	
Weaners	Mild to severe coughing. High morbidity but low mortality
Sows and boars	Moderate to severe respiratory signs with dyspnoea, convulsions and death. Death can occur within several hours.
Post-mortem Lesions	
	Varying degrees of consolidation of the lungs, primarily the diaphragmatic lobes (prominently thickened interlobular septa). Kidneys show signs of congestion. Other organs normal



Gross consolidation in the lung



Histological apparence of Nipah



Immunohistochemistry for Nipah

Trichinellosis

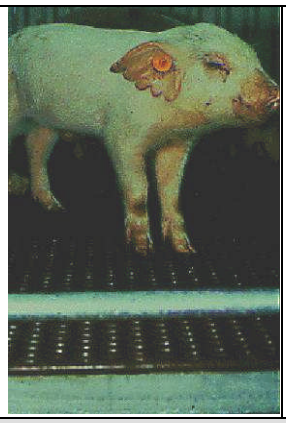
Trichinella spiralis in diaphragm muscle of a pig. The parasite is important as a zoonotic diseases resulting in severe muscular pains and swelling of the face. Rodent control is vital to the elimination of the parasite within the pig population.

Diseases which kill other species of mammals

Aujeszky's Disease (Pseudorabies)

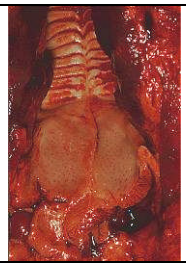
Age group	All age groups
Clinical signs	
Naive herds	
Neonatal pigs	Present with a range of severe central nervous signs from fitting to severe incoordination. The piglets may present as sitting like a dog due to posterior paralysis. Mortality is high
Weaned pigs	Central nervous signs may be reduced and an increase in respiratory signs
	Respiratory diseases often associated with secondary infections
	Animals can waste and suffer ill thrift and are often stunted
Growing pigs	The CNS signs reduce and the respiratory signs increase. The degree of respiratory disease depends on secondary infections
Adults	Reproductive signs predominate. Sows may abort and animals infected close to term give birth to stillborn or weak piglets
On established herds	May be few clinical signs
In other species	The pig is the natural host for Aujeszky's Disease
	In other animals the disease either causes no problems or is invariably fatal
	In cats, rats and mice the disease kills rapidly and this can be important in diagnosis
	Dogs present with a rabid signs, hence Pseudorabies
	Cattle and sheep and rarely horses present with a mad-itch
	Aujeszky's Disease does not affect man

Dead weaned pigs from an acute Aujeszky's Disease outbreak. Note the dead farm cat.



Weaned pig showing signs of severe depression. The animal also presented with pneumonia and head pressing

Post-mortem Lesions	
	Gross lesions are often absent or minimal
	A serous to fibrinous rhinitis is common and a necrotic tonsillitis. This does require detailed examination of the head
	Respiratory lesions of complicated pneumonia often present
	The liver and spleen typically have yellow-white necrotic foci (2-3 mm)
	A necrotic placentitis and endometritis may be observed. In aborted piglets there may be necrotic lesions in the lungs, liver, spleen and tonsils
Post-mortem findings	



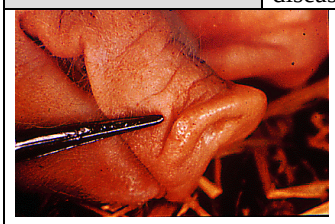
Normal tonsils at the back of the pigs mouth

Necrotic debris in the nasal passageways and tonsils in a pig with Pseudorabies

Diseases which are multispecies

Vesicular diseases
– Foot and Mouth, Swine Vesicular Disease and Vesicular exanthema

Age group	All ages of pigs can be affected
Clinical signs	
Foot and Mouth is the definitive disease: The other diseases present with similar signs and are relevant because they may be confused with foot and mouth	
	Incubation period 1 to 5 days but can be 21 days
	Fever to 40.5•C
	Skin around the snout, lips, tongue, inside the mouth, around the coronary band and the soft skin on the feet becomes whiter (blanched). Vesicles may develop on the sow's teats
	Vesicles (blisters) develop
	Vesicles rupture up to 24 hours after development and if no secondary infection occurs healing is rapid
	The animals are lame. Lesions in the mouth may not occur obviously in the pig
	With the feet, the hoof may become detached, revealing the painful raw tissues underneath. The hoof can re-grow, but is often deformed. This can take several weeks
	The disease affects nearly all susceptible animals, but few animals will die specifically with the disease



One day un-ruptured vesicle on the snout

Ruptured vesicle on the snout

Horn separation

Ruptured vesicles and some hoof separation

Blanched un-ruptured vesicle

Vesicles on feet

Pig lame with FMD

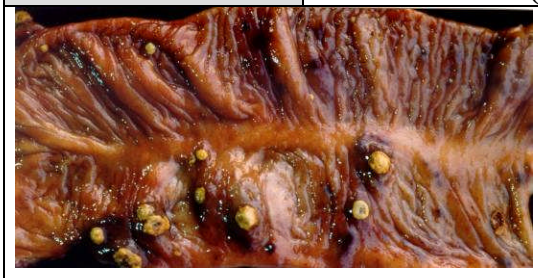
Post-mortem lesions	
	Vesicles, generally ruptured, in the mouth, nose and on the feet

Diseases which are pig specific.

Classical and African Swine Fever, Swine Influenza, Porcine Reproductive and Respiratory Syndrome, Postweaning Multisystemic Wasting Syndrome, Transmissible Gastroenteritis, Epidemic Diarrhoea and Porcine Respiratory Coronavirus and Enterovirus encephalomyelitis (Teschen Disease).

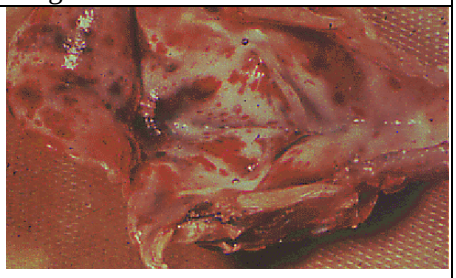
Classical and African Swine Fever

Age group	Any age group of pig can be infected with CSF or ASF
Clinical signs	
	It is not possible clinically to distinguish between CSF and ASF
Naive herds	Initially a few pigs appear drowsy and less active, with some anorexia and they may appear chilled
	Within days, pigs will present with a marked fever (41-42•C), sometimes with a reddening of the skin
	The pigs develop a conjunctivitis and constipation leading to yellowish diarrhoea
	The pigs appear chilled and will huddle together
	A few pigs may convulse before they die
Piglet with multiple haemorrhages over the skin	Pigs start to die with a spreading purple discoloration of the skin. Death often occurs some 10 to 20 days post-infection
	Pigs which survive will be chronically affected with severe retardation of growth and often present with arched backs
	In the adult herd, returns, abortions, and an increase in mummified and stillborn piglets
On established herds	
Congenital infection	Piglets infected from their mothers during pregnancy can result in abortion, mummification, malformations (may present with a congenital tremor with cerebral hypoplasia with Classical Swine Fever), stillbirths and weak born piglets. Piglets born from CSF infected mothers may remain healthy but continually spread the disease throughout their lives
Rest of the herd	An almost in apparent infection can also be present on chronically infected herd. These herds can be very difficult to identify
Peracute	The pigs may die so rapidly that there are few post-mortem signs
Acute	Multiple haemorrhages throughout the carcase
	Swollen, oedematous and haemorrhagic lymph nodes
	Infarction of the spleen (large areas where the blood supply has been cut off resulting in blood filled blebs on the surface of the spleen)
Chronic	In CSF ulceration (button ulcers) can be seen in the large intestine



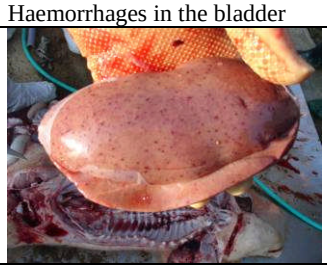
Button ulcers in the large intestine

Haemorrhages in the bladder



Haemorrhages on the epiglottis and larynx

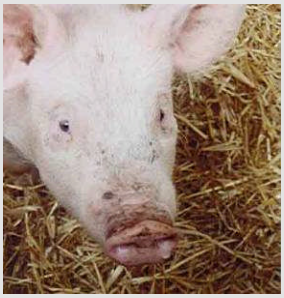
Splenic infarcts



Petecial haemorhages kidney

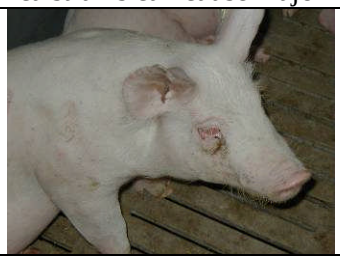
Swine Influenza

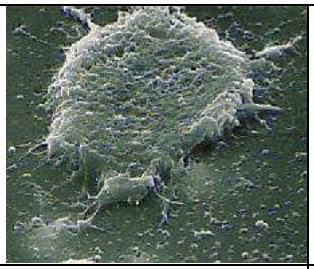
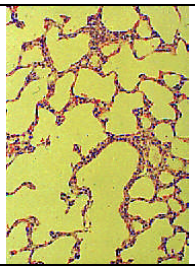
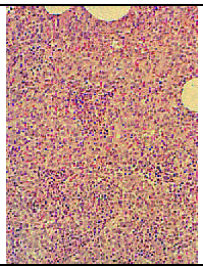
Note there are at least 7 different types pig adapted.
H_1N_1, H_3N_2 and H_1N_2 are particularly problematic.
Note there are a variety of human and avian H and N antigens becoming interwoven in the traditional pig types.

Age group	All ages can be affected
Clinical signs	
 	Naive herds Explosive outbreaks with all or many animals becoming ill at the same time.
	Disease much more common in the Spring and Autumn
	Animals present with inactivity, depression, huddling/pilling. They are anorexic. The animals often are mouth breathing and breathing is laboured. When the animals are moved many cough, some uncontrollably (paroxysm coughing). They often have a nasal discharge and the eyes are puffy. Their rectal temperature increases to 40.5-41.5•C. As the disease progresses loss of weight may be seen. Mortality is generally low. The high rectal temperature in breeding stock can result in abortions, infertility (a boar can become sub-fertile for 6 weeks), production of small weak litters and increased stillbirths. Recovery generally starts 5 to 7 days after the first clinical signs
	Established Herds Annual re-infection appears, possibly from carrier pigs or the natural spread to younger naive pigs who present few signs in the summer months.
Post-mortem Lesions	
	There may be few lesions seen in uncomplicated cases. There may be firm lobular lesions with interlobular oedema. Associated lymph nodes may be enlarged. The trachea can be filled with froth. The Swine Influenza causes problems because it damages the lining of the trachea destroying the mucociliary escalator. In combination with pasteurella the gross appearance of the lung is extremely similar to *Mycoplasma hyopneumoniae* infections.

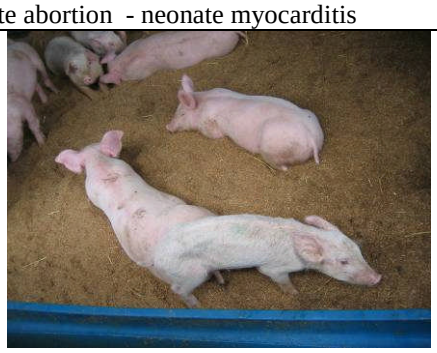
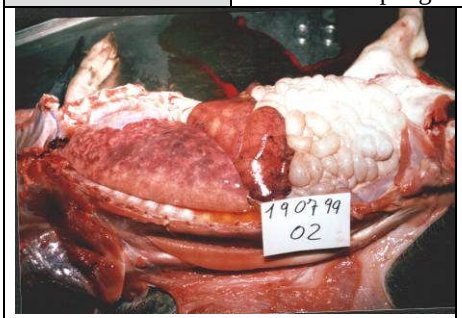
Porcine Reproductive and Respiratory Syndrome Virus

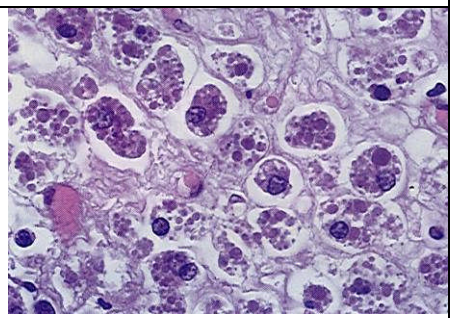
Age group	Adult: Clinical signs generally reproductive, mild fever and anorexia
	Piglets through to finishing: clinical signs generally associated with secondary infections
Clinical signs	
Naive herds	Reproductive losses and a decreased farrowing rate
	Early farrowings, at 105 to 112 days
	Increase in stillborn, mummified and weak liveborn pigs
	Increased pre-weaning mortality often associated with increase in bacterial infections for example diarrhoea and greasy pig disease
	Increased numbers of unthrifty pigs post weaning
	Increased nursery mortality often associated with an increase in bacterial infections for example post-weaning scours and meningitis
On established herds	
Neonatal Pigs	Respiratory distress, unthrifty and failure to thrive. There is generally an increase in secondary bacterial infections- scour and pneumonia
Growing pigs	Increased mortality Decreased appetite Fever Rough hair coat, unthrifty pigs
	Increased respiratory problems, pneumonia and atrophic rhinitis
	Increased secondary bacterial infections for example meningitis, Greasy pig disease
Adults	North America strains can cause major reproductive problems with massive abortions

			
Later mummified piglets with early farrowing	Sick pig with complicated PRRS	“Blue ears” in a sow	Abortions

Post-mortem lesions				
	There are very few visible post-mortem changes associated with PRRS, majority of the signs relate to secondary infections. Histologically the major finding is a interstitial pneumonia and lack of air spaces. The disease selectively kills the lung macrophage, essential for the defense of the lung. The macrophages are killed or damaged for 26 days. After 7 weeks of age the alveolar macrophage becomes more resistant to PRRSv infection			
				
	Healthy macrophage	Dead macrophage	Normal lung	Interstitial pneumonia

Postweaning Multisystemic Wasting Syndrome

Age group	Post weaning from 4 to 16 weeks of age (15 -50 kg). Males more susceptible
Clinical signs	
	Note this affects pigs 1 to 2 weeks after weaning it is very different from the wasting/poor weaner who fails to eat or drink adequately after weaning. These weaners have started to grow and then collapse quickly. Extremely poor response to antibiotics.
	Many pigs present with a high fever (40-42C)
	Affected pigs are listless and seek a cool area of the pen - near drinkers or along an outside wall
	Pigs waste very rapidly and develop a hairy coat and runted appearance
	Some pigs also may develop a slight cough, difficulty breathing and a slight diarrhoea, but this could be associated with secondary infections
	The lymph nodes may be palpable as grossly enlarged
	Pigs may go pale and yellow
	Generally this affects some 25% of the pigs in the pen, the remaining pigs can look well and unaffected. Mortality rates can exceed 25%
	The disease takes about 3 weeks to go through a group of pigs
	Many pigs will die although it will take several weeks.
	Conjunctivitis may be seen
	There increasing reports of late abortion - neonate myocarditis
	Swollen lymph nodes are seen in the inguinal region and can be visualised and palpated
	The pigs are wasted. They are often smaller than their pen mates. Secondary infections are common such as Glasser's Disease.
Post-mortem Lesions	
	Post mortems can grossly be very disappointing or only reveal secondary infections with Pasteurella, streptococci or *Haemophilus parasuis*. However more detailed will reveal the swollen lymph nodes cases which progress to lymph node necrosis and reduction. Specific histological changes are being recognised - syncitial formation (cells merging together) and cytoplasmic basophilic intracellular inclusions. Lesions may be seen in 4 day old piglet heart muscle. Macrophages 'soak' up Circovirus II without significant change in their function. Circovirus II particles are therefore found in all areas where macrophages are working.
	
There may be very few post mortem signs. In the pig above presented with enlarged lymph nodes. The liver was also a tan orange colour which is quite often seen.	The swollen lymph nodes in the inguinal region.



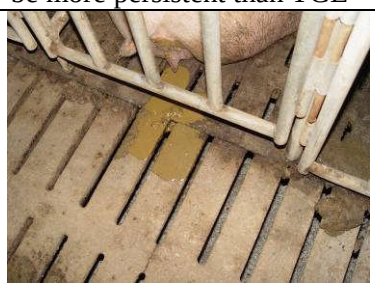
H&E section of lymph node. At histology intracytoplasmic inclusion bodies are seen. There is also a proliferation of cells in the lymph nodes. PCV II in immunohistochemistry

Porcine Epidemic Diarrhoea and Transmissible Gastroenteritis

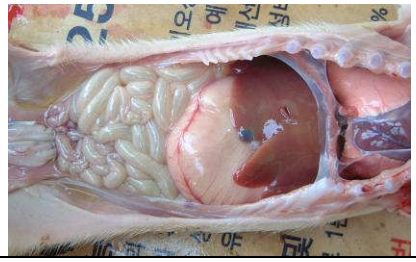
PED and TGE are discussed as the same disease as the clinical signs are extremely similar in Asia. PED is more of a threat to Australia given its location. TGE is more severe a disease in Europe and America whereas PED is more severe in Asia.

Age group	Type 1 affects all age groups but not suckling piglets Type 2 affects all age groups, clinical signs particularly severe in naive piglets but is not TGE virus – another coronavirus. The disease is reported in Europe and Asia but not in the Americas or Australia
Clinical signs	
Acute Naive herd	Explosive outbreak similar to TGE
	Mortality of piglets may reach 80%
	Acute watery diarrhoea in piglets
	Diarrhoea and vomiting may be seen in all age groups
	Problems persist for 4-6 weeks
	The condition can occur at any time but is more severe in the winter
Endemic herd	Little or no problem virus progressively dies out
	Disease may be more persistent than TGE

Piglets with PEDV



Sow diarrhoea with PED



Dilated small intestine

Post-mortem Lesions	
	Lesions are mainly in the jejunum and ileum. The duodenum is less affected. The lesions are villus atrophy. The pH of the intestine changes to acidic. In *Escherichia coli* infections the pH becomes more alkaline

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	Test and remove	Herd closure	Medication programmes
African Swine Fever	A	■							
Aujeszky's Disease Pseudorabies	B	■	▨		■		■		
Brucella suis	B	■							
Classical Swine Fever	A	■							
Circovirus I and II									
Enterovirus									
Epidemic diarrhoea virus		■	■	■					
Foot and Mouth virus And other vesicular viruses	A	■							
PMWS		▨							
PRRSv	B	■				■	▨	▨	
Swine Influenza virus									
TGE	B	■	■	■					
Trichonella spiralis	B								

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 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
African Swine Fever	A	■	■	■	■	■		■	■	■			■	■	■		
Aujeszky's Disease Pseudorabies	B	■		■	■	■	■	■	■	■			■	■	■	■	
Bordetella bronchiseptica		■		■	■	■		■	■	■		■	■	■	■	■	
Brucella suis	B	■		■	■	■			■	■		■	■	■	■		
Classical Swine Fever	A	■	■	■	■			■	■	■		■	■	■	■	■	
Circovirus I and II		■	■	■		■		■	■								
Enterovirus		■	■	▨	▨	■	■	▨	▨	■	■	■	▨	▨	▨		
Epidemic diarrhoea virus		■		▨	▨	■		▨	▨			■	▨	▨	▨		
Foot and Mouth virus And other vesicular viruses	A	■	■	■	■	■	■	▨	▨	■		■	▨	▨	▨	■	
PMWS		■	???	■		■	■	■	■				■	■			
PRRSv	B	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
Swine Influenza virus		■		■	■	■	■	■	■	■			■	■	■	■	
TGE	B	■		▨	▨	▨	▨	▨	▨	■			▨	▨	▨		
Trichonella spiralis		■	■							■							

Appendix I
Notifiable and Reportable Diseases of Pigs in Australia

Vesicular diseases	Foot and Mouth	Picornovirus
	Swine Vesicular Disease	Picornovirus
	Vesicular Exanthema	Calicivirus
	Vesicular Stomatitis	Rhabdovirus
Fever diseases	Classical Swine Fever (Hog Cholera)	Pestivirus
	African Swine Fever	Poxvirus
Others	Anthrax	*Bacillus anthracis*
	Aujeszky's Disease (Pseudorabies)	Herpesvirus
	Brucellosis	Brucella spp.
	Chagas' Disease	*Trypanosoma cruzi*
	Japanese encephalitis	Flavivirus
	Menangle Virus infection	*Paramyxoviridae*
	Nipah Disease	Hentavirus
	Porcine Circovirus 2 (pathogenic)	Circovirus
	Porcine cysticercosis	*Taenia solium*
	Porcine myocarditis	Pestivirus
	Porcine reproductive and respiratory syndrome	Arteriovirus
	Post-weaning Multisystemic Wasting syndrome	Unknown viral?
	Rabies	Rhabdoviridae
	Rinderpest (pigs carriers)	Paramyxoviridae
	Swine Influenza	Orthomyxovirus
	Teschen/Talfan (Encephalomyelitis)	Enterovirus
	Trichinellosis	*Trichinella spiralis*
	Tuberculosis	*Mycobacterium bovis*
	West Nile Virus infection	Flaviviridae

Pathogens notably not included are Epidemic Diarrhoea and Porcine Respiratory Coronavirus.

Appendix II
Zoonotic diseases of pigs

Anthrax - *Bacillus anthracis*
Brucellosis
Camplyobacter jejuni
Chagas' Disease – *Trypanosoma cruzi*
Chlamydia
Clostridium perfringens type A
Erysipelas - *Erysipelothrix rhusiopathiae*
Escherichia coli
Japanese B encephalitis
Louping ill
Leptospirosis
Nipah disease
Pasteurellosis
Rabies
Ringworm
Salmonellosis
Streptococcus suis II
Swine Influenza
Taenia solium
Toxoplasmosis
Trichinella spiralis
Tuberculosis
Vesicular diseases
Yersina enterocolitica