Disorders of the urinary tract

Diseases present in	Australia	Europe/Asia	North America
Clinical anatomy of the urinary tract			
Pyelonephritis and cystitis	Yes	Yes	Yes
Nephroblastoma	Yes	Yes	Yes

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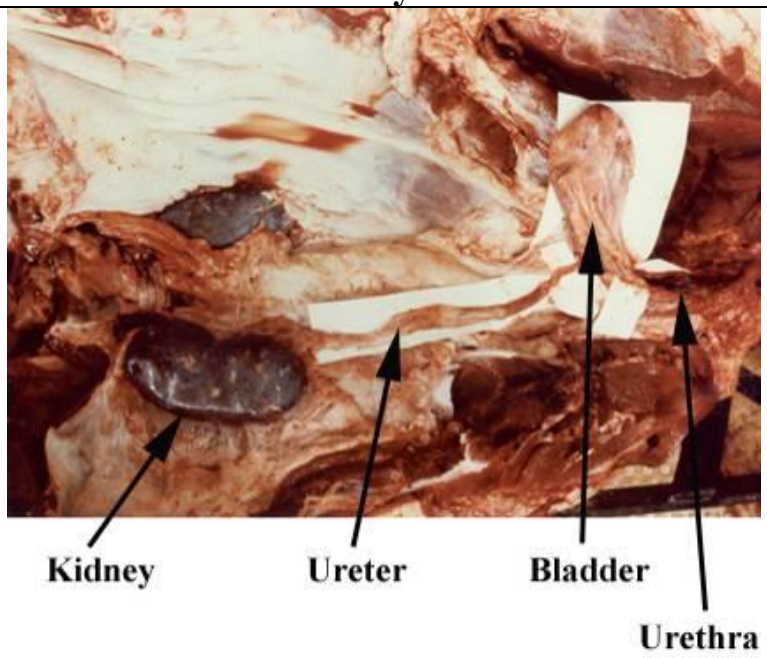
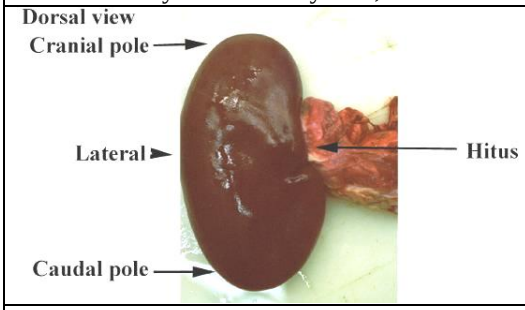
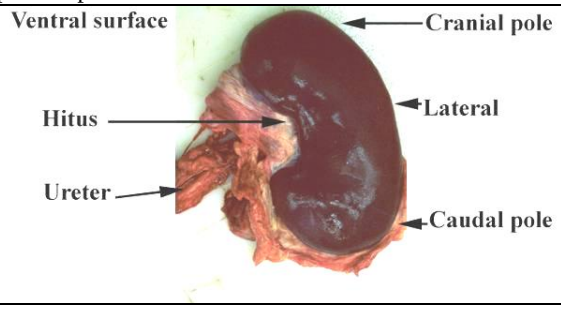
Clinical Gross Anatomy of the Urinary Tract



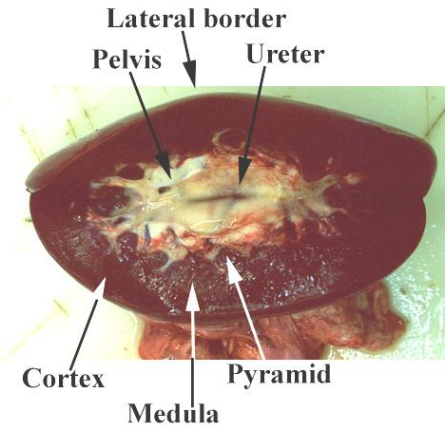
Gross anatomy of the urinary tract, ventral view with the pelvis opened



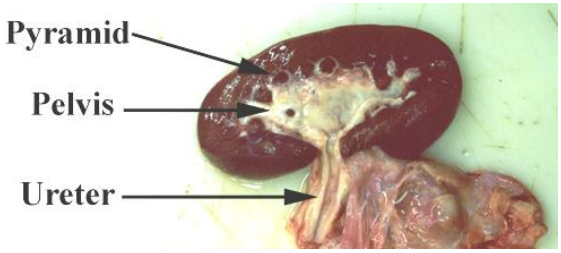
The dorsal view of the kidney (check poles)



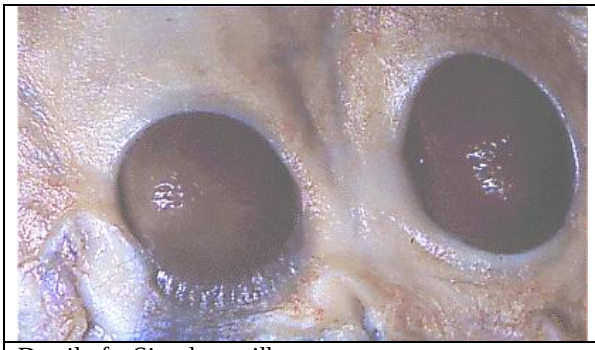
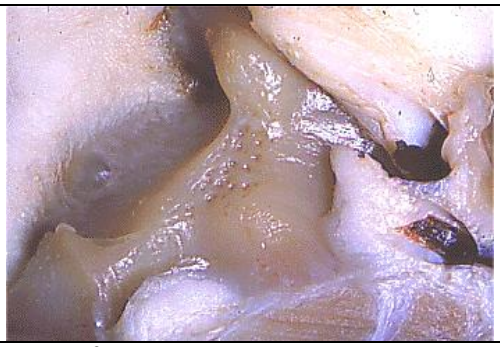
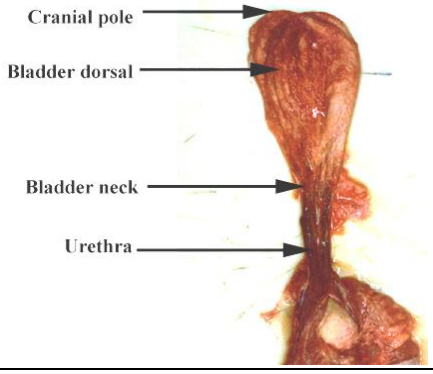
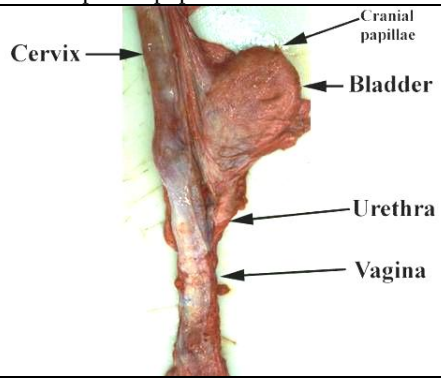
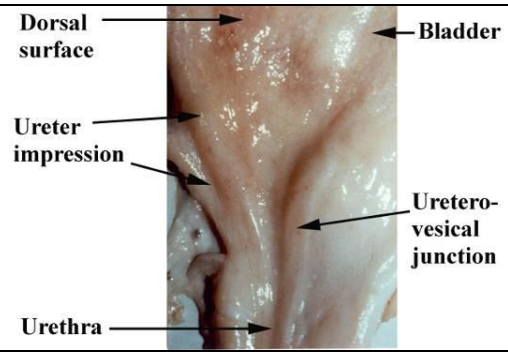
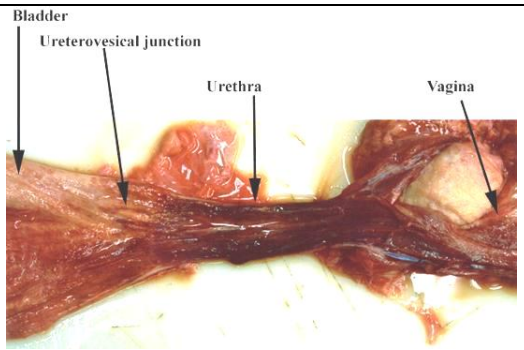
The ventral view of the kidney

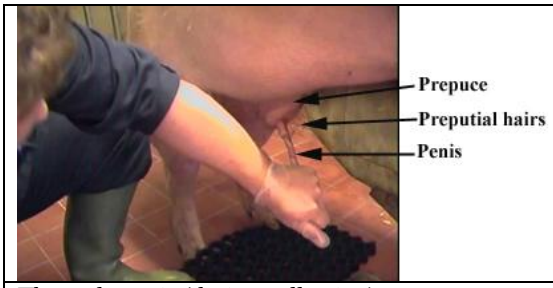
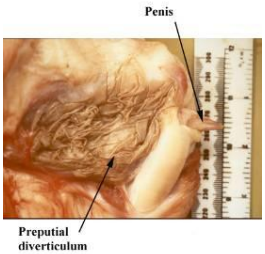
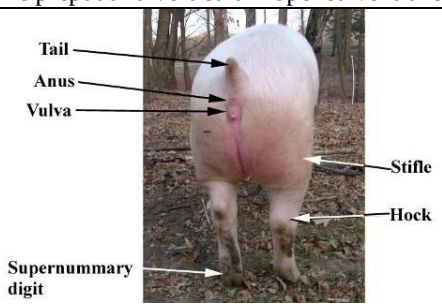
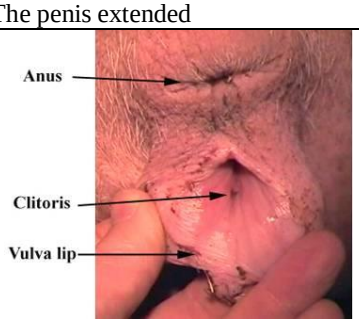


The pelvis opened alone lateral border of kidney

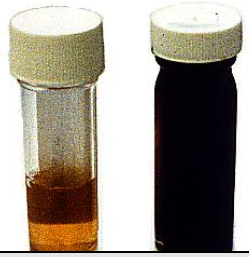


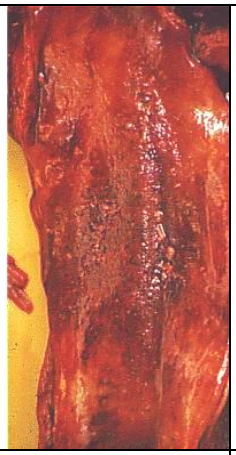
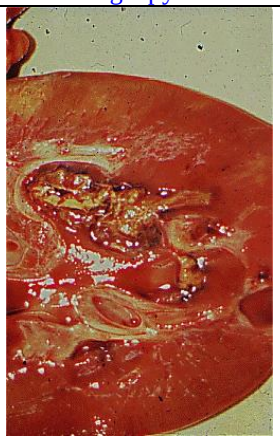
Longitudinal cross-section of kidney with ureter opened

	
Detail of a Simple papillae	Detail of a compound papillae
	
The mucosal surface of the bladder and ureter in the male	The parietal surface of the bladder in the female
	
The ureterovesical junction	The proximal urethra

<table>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>The male penis (during collection)</td><td>The preputial diverticulum opened ventral surface</td></tr>
<tr><td>  </td><td> 
</td></tr>
<tr><td>The penis extended</td><td>The rear of a sow</td></tr>
<tr><td> 
</td><td>  </td></tr>
<tr><td>Detail of the open vulva</td><td>Normal urine in the sow, the more concentrated (right yellow) is a first morning collection</td></tr>
</table>

CYSTITIS AND PYELONEPHRITIS

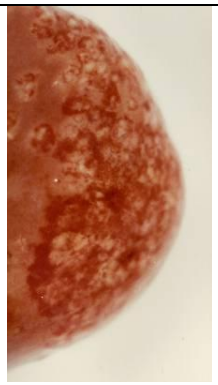
Definition	Infection of the bladder with resulting ascending infection to the kidneys
Causal agent	Bacterial infection of the bladder associated with *Actinobaculum suis*, *Escherichia coli* (*E. coli*) and streptococci.
Environmental factors	Poor urination and water availability
Age group	Adult sows particularly parity 3+
Clinical signs 	Acute:- Post -service. Urinating blood, off food, collapse, sudden death, hypothermia. Chronic:- Any time. Urinating smoky to red/blood urine. Rapid breathing, off food, weakness in hind legs, collapse and death. Unlikely to be a herd problem if annual sow death % less than 5% Photo shows a normal urine on the left and blood stained urine on the right from a sow with cystitis
Infectivity	*Actinobaculum suis* is a normal inhabitant of the boarôs prepuce. The sow becomes infected at breeding
Incubation period	Very variable depending on the extent of damage to the sowôs bladder
Post mortem findings	
Acute	Acute catarrhal haemorrhagic ulcerative cystitis with thickened bladder wall. Acute changes to the ureterovesical junction. Acute haemorrhagic ureteritis occasionally with occlusion and torsion. Acute renal failure with haemorrhagic pyelitis

			
Acute catarrhal haemorrhagic cystitis	Ureteric torsion ï in this case streptococci infection	Ulcerated megaureter	Acute pyelonephritis

Chronic	Chronic and acute catarrhal haemorrhagic cystitis with thickening of the bladder wall. Swollen chronic changes to the ureterovesical junction. Ureteritis occasionally unilateral. Chronic active interstitial nephritis and pyelonephritis

Chronic cystitis

Acute tearing of the ureterovesical junction



Chronic active pyelonephritis

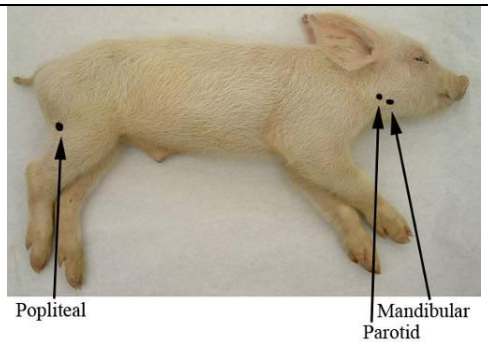
End stage kidney

Treatment	
Individual	Loose house and exercise to encourage urination
	Continuous access to troughed water
	Lincocin and tetracycline by intramuscular injections into the neck using a 1.5" 16g needle
Herd - Encourage regular and frequent urination	
	During the problem period check all sowsô post-service (0-28 days) urination for any blood. Treatment more effective when early
	Feed in the morning and heat check with a boar in the afternoon, ensure all sows rise and urinate
Improve water availability	
	Lactating sows should receive water at a flow rate of 2+ litres per minute. Gestating sows 1.5-2 litres per minute
	Feed consumption on day 18 of lactation should approach 10 kg per day. Feed intake is a good indication of water availability
	Regularly maintain water supplies. Particular areas to examine are water source; drinking device; accessible drinkers and management of drinkers
Farrowing house management	
To limit trauma and infection of the vagina and bladder	
	Improve hygiene behind the sow by manually removing faeces 3 days prior and 7 days post-farrowing. Very dirty rear regions should be cleaned with soap and water
	Reduce manual farrowing as much as possible, use plastic gloves and clean hands
	All sows manually farrowed should receive an appropriate antibiotic by 16g 1.5" needle intramuscularly into the neck
	Encourage the correct use of oxytocin at 5 IU doses
	Ideally increase lactating length to 24 days
Breeding area hygiene	
	At all times stalled sows must be separated for her urine and faeces
	Clean all soiled rears of the sow particularly prior to service
	Avoid contact with the boar's penis during service
	Ensure that the underline of the boar is kept clean by managing the boar in a clean dry environment
	Ensure service is carried out on a good non-slip floor
	Do not serve lame sows with boars, only use AI
	Cease heat checking by 'thumbing'
Zoonotic	None

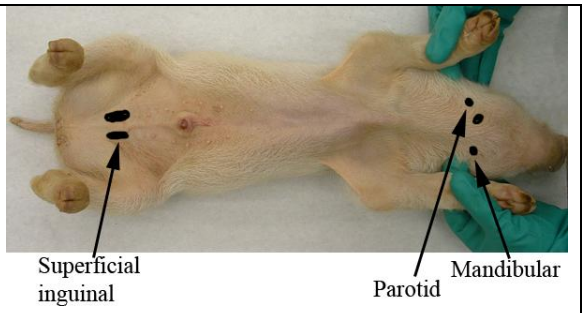
Disorders of the lymphatics

Disorder present in	Australia	Asia	North America
Clinical anatomy of the lymphatic system			
Porcine Circovirus Associated Diseases	Yes	Yes	Yes
Post-weaning Multisystemic Wasting Syndrome	No	Yes	Yes
Leukaemia - See Tumors of the pig in Diseases of the Reproductive tract	Yes	Yes	Yes

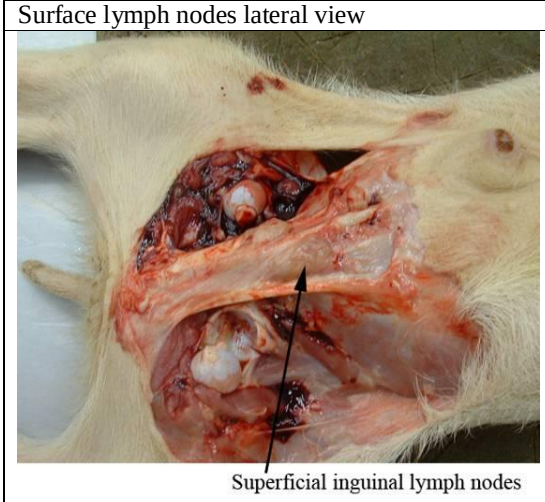
Clinical gross anatomy of the lymphatic system



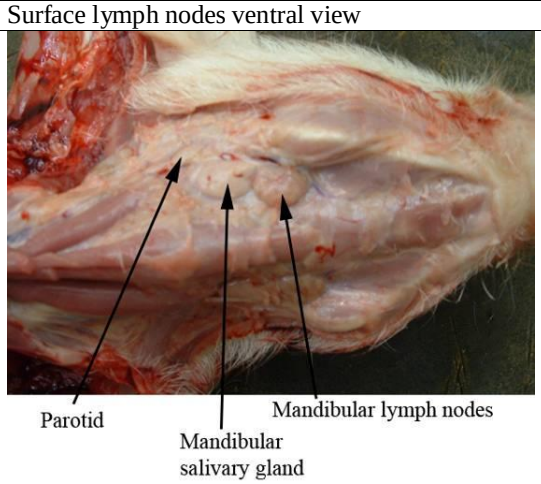
Surface lymph nodes lateral view



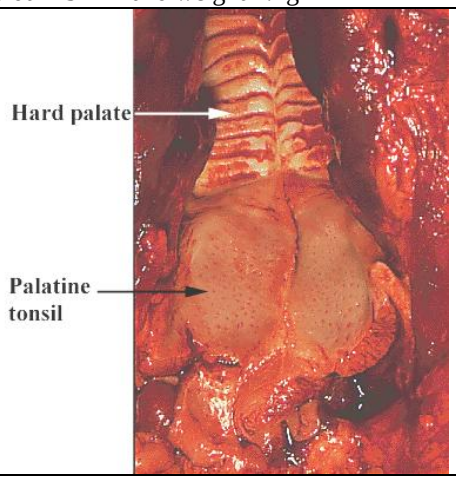
Surface lymph nodes ventral view



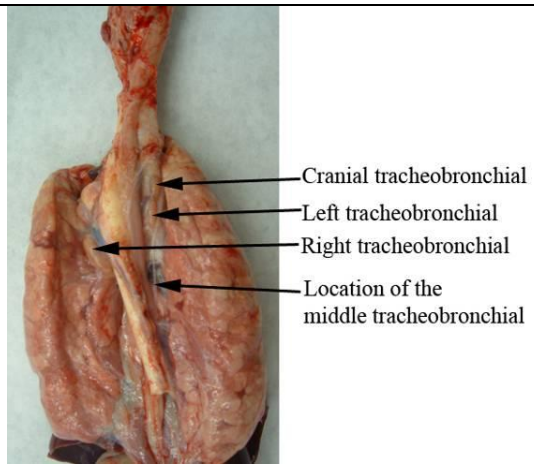
Superficial inguinal lymph nodes
normal size in a 25 kg pig average length 38mm, width 19 mm and weight 4.2g



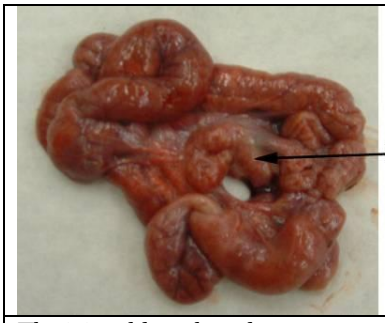
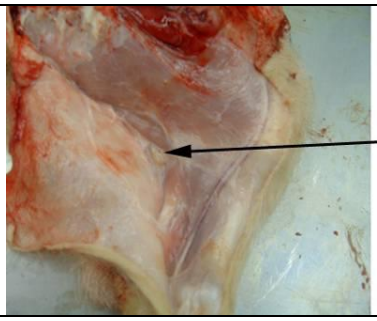
Lymph nodes readily visible in the neck



The tonsils ï ventral view



The major lymph nodes of the respiratory tract ï dorsal view

	
The jejunal lymph nodes	The superficial popliteal lymph node

Note there are hundreds of lymph nodes scattered throughout the pig, the ones selected are useful to check during a clinical and post-mortem examination, which if enlarged may indicate the necessitate to investigate further.

PCVAD – PORCINE CIRCOVIRUS ASSOCIATED DISEASES

Causal agent	Porcine Circovirus II ï and conditions where the virus may be found in high numbers. Extremely small DNA virus (genome in a circle) none enveloped. Name extremely confusing as PCVII is present in almost all pigs and therefore if isolated can be ñassociatedò with any condition.
Age group	Foetus - death abortion Weaner ï PCVAD, PMWS Grower ï PCVAD, PMWS, PDNS, Granulomatous enteritis Adults ï abortion and no symptoms
Clinical signs	
Foetus	Abortion, infertility, mummification and stillborn piglets
Weaner	If the pigs are severely stressed with primary pathogens or management problems. Parvovirus and PRRSv can play significant roles in the induction of a PCVII problem. However, the problem will generally present as a single batch or a series of batches but only while the management/diseases problems persist.
	PMWS - 15-60 kg pigs present with acute wasting ï generally within 4 days becoming extremely emaciated. Surrounding pigs are normal and then waste rapidly. Mortality generally extremely high ï 20% or more. Death is associated with other infections already on the farm.
Grower	May present with part of the weaner PMWS issues on the farm. Growers may present with PDNS, however, role of PCVII in PDNS is not determined. Granulomatous enteritis may be associated with PCVII and results in ileitis and wasting disorders. However, not all cases of Granulomatous enteritis are associated with PCVII.
Adult	Abortion is described. However, reproductive effects are minimal/non-existent. Could play a role in SMEDI syndromes on farms.
Normal pig	Most pigs and almost all pig farms are infected with PCVII completely asymptomatically.

Foetus myocarditis

PCVAD ï PCVII + feeding issues

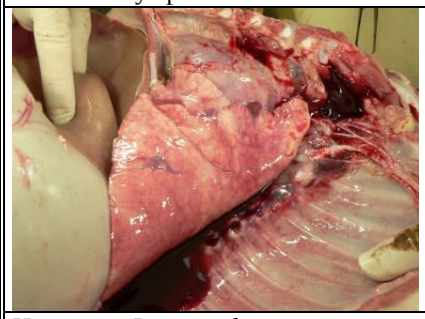
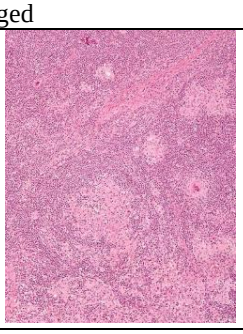
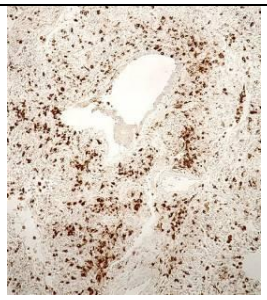
PMWS in a 20 kg weaner

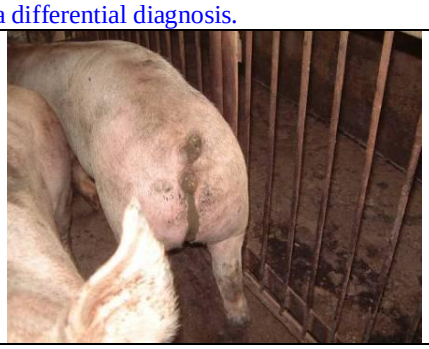
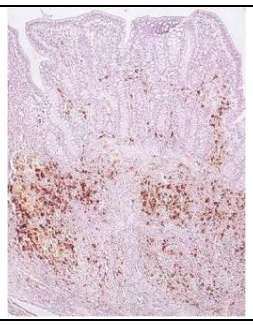
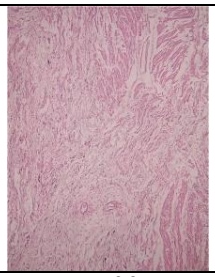
PDNS

Abortion

Normal pigs with PCVII

Infectivity	
	PCVII is extremely resistant virus.
Transmission	
	PCVII can be found in semen
	PCVII occurs normally on all farms
Post-mortem Lesions ï note PMWS or PDNS see separate pages	
Normal pig	None
Weaner - PCVII	Pigs with enhanced wasting in excess of normal expectations
	Single or generally enlargement of lymph nodes.
	Liver may be pale. With associated starvation the pig may have a gastric ulcer. Lungs may present with a histiocytic interstitial pneumonia. There may be enlarged kidneys with white spots visible on the surface.
	Histological lesions include: lymphoid depletion, granulomatous inflammation with syncytial formation. Histiocytic infiltration. Presence of botryoid basophilic intra-cytoplasmic inclusion bodies which stain for PCVII by immunohistochemistry. Note these lesions are identical to those associated with PMWS. There will be no increase in PDNS cases.

		
Prominent lymph nodes	Pale liver	Enlarged, kidneys with white spots
		
Histiocytic Interstitial pneumonia	Gastrohepatic lymph node enlarged	Other lesions depending on primary cause ï Salmonella colitis
		
Severe pneumonia ï Pasteurella as a primary problem	Lymphoid depletion in the lymph node	Immunohistochemistry for PCVII

Grower	Granulomatous enteritis. This might be confused with PIA/ileitis and may be considered to be a differential diagnosis.	
		
	Granulomatous enteritis	Granulomatous enteritis with associated PCVII IHC
Foetus	Foetal myocarditis with associated PCVII PCVII may act as a SMEDI virus in the pregnant sow resulting in death of the piglets ï the stage of pregnancy results in a variety of clinical signs ï infertility, embryonic death, mummification and stillborn piglets.	 
		Myocarditis of foetal heart with ICH for PCVII
Diagnosis		
	Immunohistochemistry and characteristic histology changes	
	PCR unrewarding as all pigs positive. Antibody analysis generally unrewarding	
	Note need at least 5 lymph nodes to be considered a generalised problem	
	Antibodies and virus isolation generally unrewarding as virus ubiquitous	
	Move piglets to a separate ideal environment ï with PMWS the weaners will still die, with PCVAD mortality problems will cease.	
	With management changes post-weaning mortality will fall below 1.66xsd of normal herd mortality over period of 2 months	
Treatment		
Normal pig	Ensure feedback programmes are adequate to ensure stable herd immunity	
	Ensure good pig flow management to achieve all-in/all-out	
PCVAD (not PMWS)	Resolve management and pathogen overload problem	
	Post-weaning feeding regimes	
	Pig flow and internal biosecurity	
	Resolve PRRSv and SIV problems and associated biosecurity issues	
	Vaccination may be considered, but expensive and management issues will need to be addressed eventually anyway. Vaccine may improve growth rates by 30g a day.	
PMWS	Vaccinate using PCVII pre-farrow to the sow or piglets in farrowing house or at weaning	
	See PMWS advice sheets	
Common differentials		
	PMWS, Ileitis other causes of pneumonia and wasting. Other causes of abortion. Note a transient lymph node enlargement is normal in healthy young pigs ï PCV2?	
Zoonotic implications		
	None specifically. May increase prevalence of meningitis and salmonella which are zoonotic.	

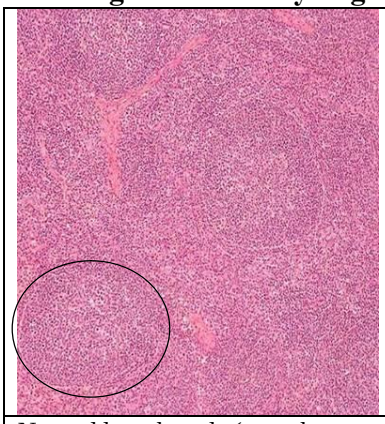
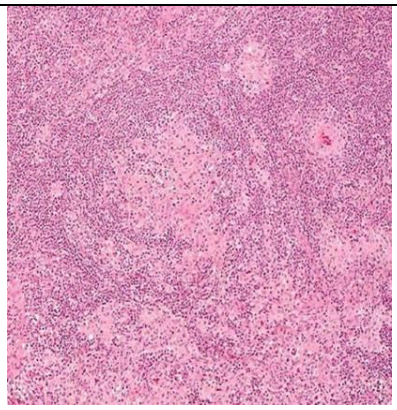
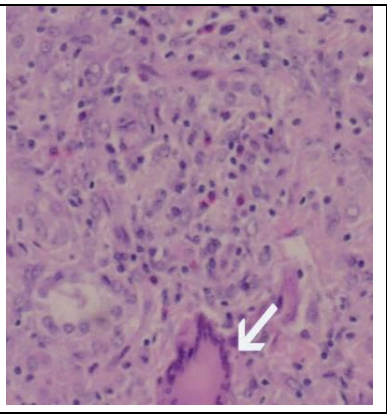
PCVAD HISTOLOGICAL SCORE

A Porcine Circovirus Associated Disease score can be made by histological examination. The score assesses lymph nodes or other lymphoid tissues.

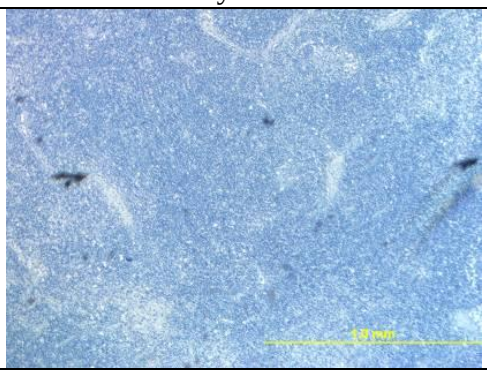
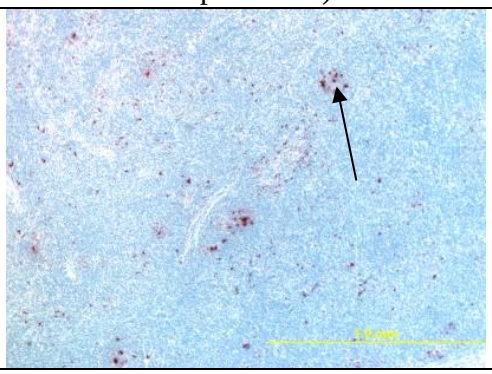
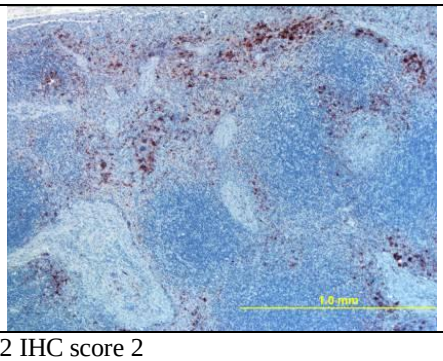
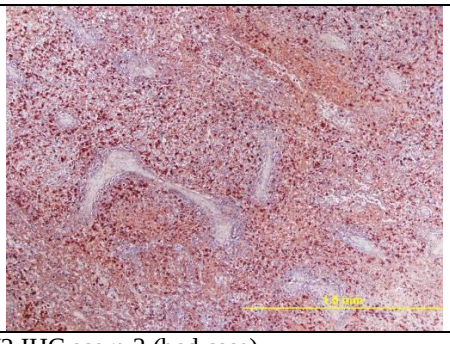
The tissues are examined for three characteristics:

The degree of lymphoid depletion on a 0-3 scale

The degree of histiocytic granuloma formation on a 0-3 scale

		
Normal lymph node (note the circular follicles ï outlined)	Lymph node with lymphoid depletion ï lack of cells and the folliclar picture is lost	A granuloma (multinucleated cell) in a lymph node

The degree of PCV2 in the tissues as assessed using IHC (Immunohistochemistry)[1]
on a 0-3 scale based on the degree of staining and percentage of follicles with positive staining. Positive indicated by the brown stained areas (arrowed for example below)

	
PCV2 IHC score 0	PCV2 IHC score 1
	
PCV2 IHC score 2	PCV2 IHC score 3 (bad case)

A score of 1 is 10% or less of the follicles have IHC PCV2 present
A score of 2 is 10 to 50% of the follicles have IHC PCV2 present
A score of 3 is more than 50% of the follicles have IHC PCV2 present. This may be visible by the naked eye.

Interpretation

Add the score for each of the criteria together and divide by 3.
If multiple tissues are examined ï ideally 5, the tissues are added together and divided by the number of tissues.
Suggested samples: Tonsil, spleen, superficial inguinal, bronchial and mesenteric lymph nodes

PCVAD score	0	Negative
	1	Mild
	2	Moderate
	3	Severe

The PCVAD score can be a useful guide to interpretation of histological lesions found in Post-weaning Multisystemic Wasting Syndrome (PMWS). However, note that PMWS is a clinical condition and cannot be diagnosed on pathological findings only.
PCV2 clones can produce all the histological lesions of PCVAD in an individual pig without the clinical signs of PMWS.

Post-weaning Multisystemic Wasting Syndrome

Using the PCVAD score ï A score of 2 or 3 in over 50% of the pigs examined would be suggestive but must be combined with a rise in mortality ï for example using statistical process control with the upper limit set at 1.66*sd above the mean (EU definition).

Normal vs PMWS cases

The difficulty in the diagnosis of PMWS is differentiation from the normal[2].

Test	Normal pig	PMWS expectations
PCV2 antibodies	80% +	100%
Lymphoid depletion	to 60%	90+%
Granuloma formation	to 10%	40+%
Intra-cytoplasmic inclusions	Rare	Common
IHC PCV2	0-1	2-3
PCVAD score	0-2	2-3

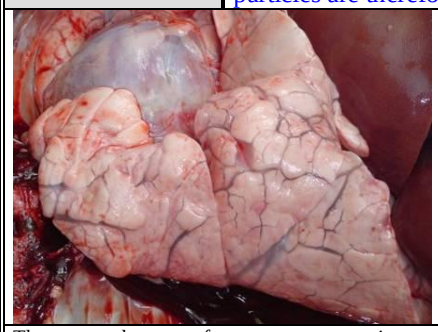
An outbreak of PMWS

POST-WEANING MULTISYSTEMIC WASTING SYNDROME

Other names	PMWS
Causal agent	At present unknown. Porcine circovirus 'type II' is responsible for many of the pathological findings. However, Circovirus II (PCV II) can be isolated on nearly every farm and in countries negative to PMWS. Circovirus are small non-enveloped DNA virus containing a unique single-stranded circular genome
Distribution	The problem is recognised worldwide ï not present in Australia
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 (40-42°C)
	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 latter 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 Glassers.
Infectivity	
	Porcine Circovirus II is very contagious. Circovirus is shed via most routes

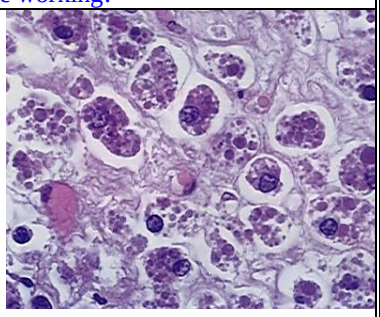
Post-mortem Lesions

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. Note some lymph nodes are more obvious because normal surrounding fat has been removed. Be careful about stating lymph node actually enlarged. Histological changes are identical to PCVII infection on non positive farms - syncytial formation (cells merging together) and cytoplasmic basophilic intracellular inclusions. Lesions may be seen in 4 day old piglet heart muscle. Macrophages ósoakô 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. Oedema in a variety of organs, lung and colon for example is not uncommon, without other gross pathology

There may be evidence of congestive heart failure ï a probably cause of the oedema. Gross pathology including enlarged lymph nodes is not conclusive



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

Diagnosis

Clinical picture. There is no diagnostic test for the live animal. Circovirus serology or PRC not useful as too common. Histological findings identical to PCV2 infection ï in farms without PMWS

Post-mortem picture with swollen lymph nodes
Note superficial inguinal lymph node normal size at 25kg average length 38mm, width 19 mm and weight 4.2g.

The histological picture from submitted lymph nodes, including IHC. Note that macrophages may carry the virus in large numbers without causing any impact on the macrophage function.

Ruling out other causes

Treatment

Vaccination against PCV II either using sow-pre farrowing or piglet at weaning vaccination

Serotherapy can be used to good effect in countries where vaccine not available

Mange farm using all-in/all-out protocols. Age segregation may help control.

Provide pigs with a good environment to limit effects of secondary infections

Separate weaners who show signs of the disease to reduce the level of the disease in the pen

Have good gilt introduction protocols to ensure gilts are well acclimatised before entry into the main unit.

Feed-back of on-site nursery faeces is essential. Consider the use of tonsilar scrapes.

Minimise cross-fostering

Common differentials

Any other cause of wasting in 15 to 60 kg pigs, Glassers, chronic pneumonia, Ileitis, internal abscessation. Lymphosarcoma tends to affect individual older animals. The mortality levels are very high in PMWS. Note enlargement of lymph nodes associated with septicaemia, Brucellosis, Erysipelas, Tuberculosis, PRRSv, Toxoplasma, CSF, ASF, septic thromboemboli, diffuse neoplasia. Note a transient lymph node enlargement is normal in healthy young pigs ï PCV2?

Zoonotic implications

None

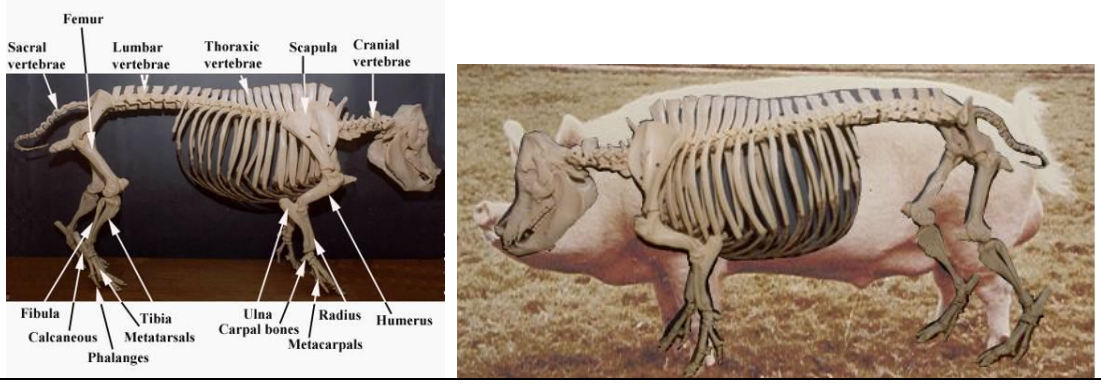
Disorders of the locomotor system

Diseases present in	Australia	Europe/Asia	North America
Anatomy of the locomotor system			
Pig Tracts			
Young pig lameness issues			
Mycoplasma arthritis	Yes	Yes	Yes
Joint ill	Yes	Yes	Yes
Trauma	Yes	Yes	Yes
Skin abrasion in the piglet and weaner	Yes	Yes	Yes
Ulceration and erosion injuries	Yes	Yes	Yes
Bursitis	Yes	Yes	Yes
Splayleg	Yes	Yes	Yes
Adult lameness issues			
Bush foot	Yes	Yes	Yes
Osteocondrosis desicans (OCD)	Yes	Yes	Yes
Femoral head fracture ï epiphyseolysis	Yes	Yes	Yes
Split hips	Yes	Yes	Yes
Shoulder sores	Yes	Yes	Yes
Ulcerated granuolma	Yes	Yes	Yes
Overgrown feet	Yes	Yes	Yes
Erysipelas and adult arthritis	Yes	Yes	Yes
Broken legs	Yes	Yes	Yes
Infected joints	Yes	Yes	Yes
Conformation problem	Yes	Yes	Yes
Growing stock	Yes	Yes	Yes

Lameness in pet pigs

Clinical gross anatomy of the locomotor system

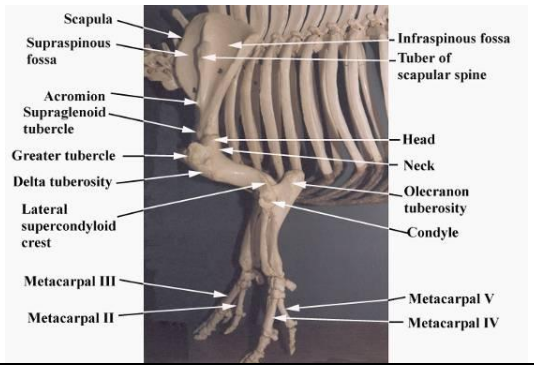
General skeletal anatomy



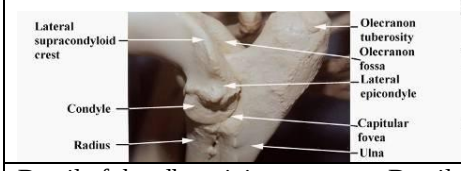
Lateral view of the porcine skeleton and superimposed on the pig outline

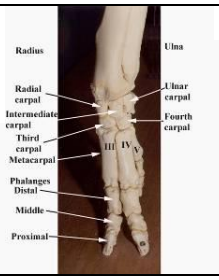
Detail of the spinal column

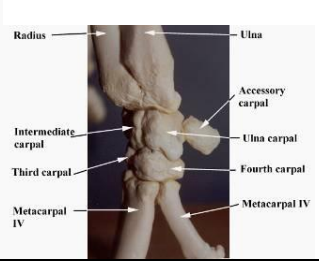
Forelimb skeletal anatomy



Lateral view of the forelimb

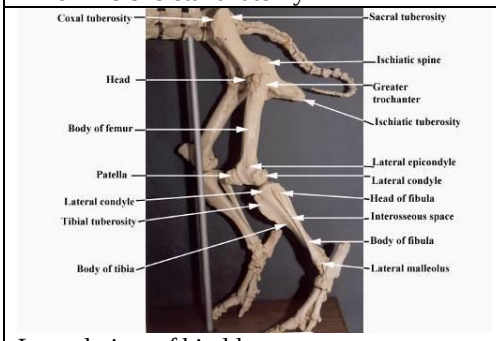




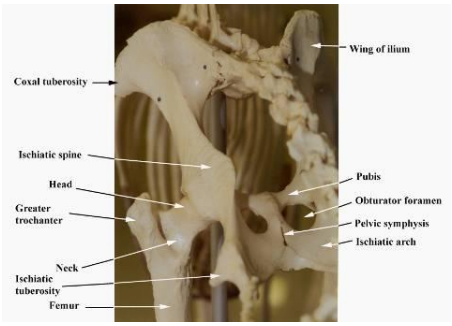


Detail of the elbow joint Detail of the dorsal carpus Detail of the lateral carpus

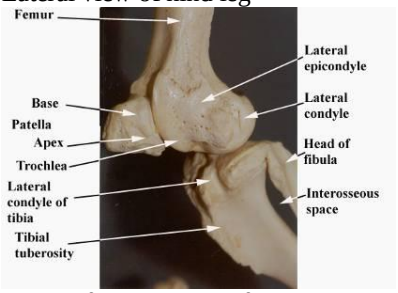
Hind limb skeletal anatomy



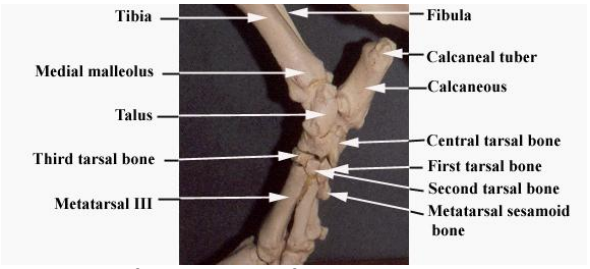
Lateral view of hind leg



Cranial view of the pelvis

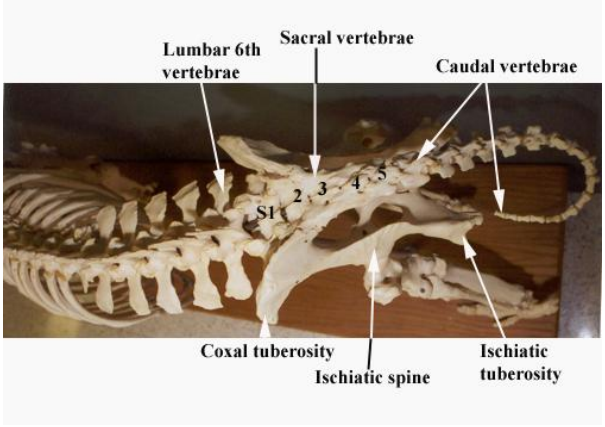


Detail of lateral view of knee

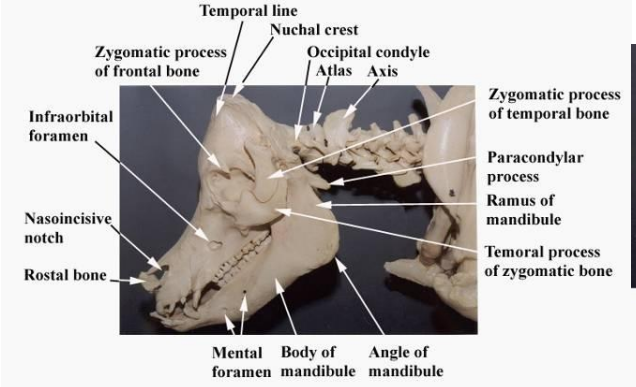


Detail of lateral view of hock

Head and rear skeletal anatomy



Dorsal view of the pelvis and tail region



Lateral view of the head

Detail of the dentition, lateral view

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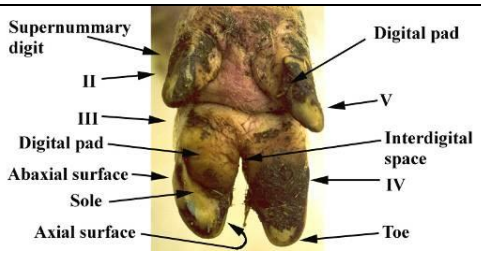
<td> 
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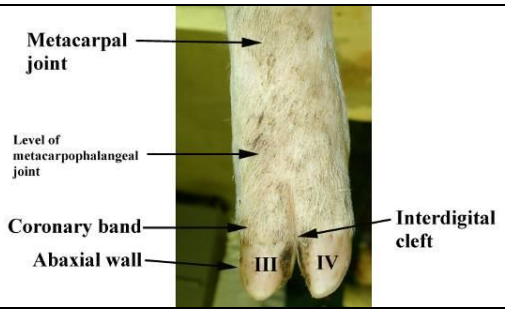
<td> 
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<td>The plantar view of the foot</td>
<td>The dorsal view of the distal front foot</td>
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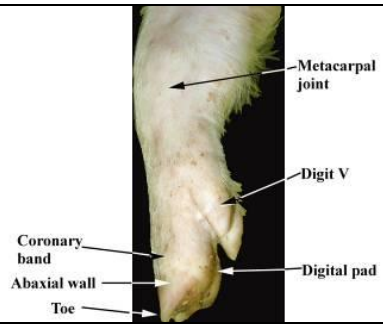
<td> 
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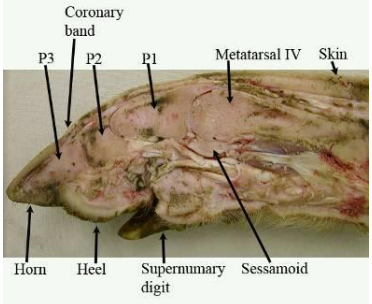
<td> 
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<tr>
<td>Lateral view of the distal front foot</td>
<td>Sagittal section through a digit (digit IV hind)</td>
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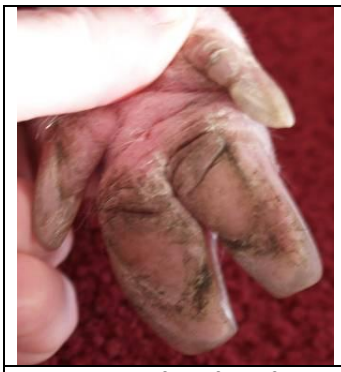
Pig (*Sus Scrofa*) Tracks



The bottom of the front feet. This particular pig would drag its front feet occasionally, hence the blunting of the toe.

Impression of the front foot. The supernumerary digits of the front foot tend to be longer and more prominent than the hind.

The bottom of the hind feet

Impression of a hind foot with the typical deep U shape

When following pigs, along the track there will be scratch and rub areas, possibly with wallows. There will be rooted soil with grasses neatly clipped by the pigôs teeth.

The tracks shown are a trotting gait. The supernumerary digits are not always registered

Side view of the foot. The supernumerary digits just contact the ground

Note that the hind hooves register almost precisely atop foreprints and that the track pattern is regular and very straight.

Mother and piglets tracks

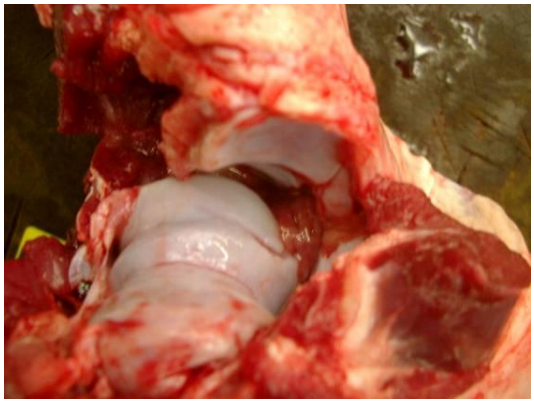
LEG CONDITIONS IN YOUNG AND GROWING PIGS

In the pig it is difficult to examine their feet. If you suspect a foot problem do it first while the pig is lying down.

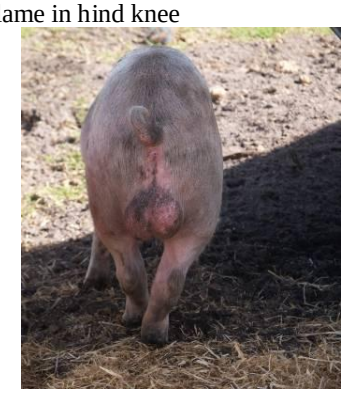
Mycoplasma arthritis

Mycoplasma arthritis caused by *Mycoplasma hyosynoviae* affects growers to young adults. Animals present with a sudden lameness of the legs. One hind leg being more severely lame is quite common. There may be swollen joints but quite often there are few outward signs on the leg apart from lameness. Typically, the condition is seen in a new group of gilts/boars 10-14 days post arrival onto the farm.

Gilt lame in hind knee



Inflamed synovia in elbow joint



Recently introduced lame boar

The environment plays a role in the clinical expression of Mycoplasma arthritis

Pathology - In acute cases, the affected joints presented with a non purulent synovitis.
Treatment - Treatment is to use mycoplasma active antibiotics, for example Tiamutin or Lincomycin.
Control - Control can be difficult when the condition affects incoming gilts. Ensure there is a sufficient introduction period for the gilts to recover fully from their lameness before breeding. A number of growing/finishing pigs are diagnosed as mycoplasma arthritis but are actually sprains from chasing and bullying and therefore heal spontaneously. Review pen layout, size of steps and floor condition.
Diagnosis - Antibody examination of synovial fluid. Note serum is normally positive in most pigs both clinically affected and unaffected.

Joint ill

The organism generally associated with joint ill is *Streptococcus suis* I in particular. Many other species of streptococci can be involved. Note also *Arcanobacterium pyogenes* may play a role. Pigs present with an acute swelling of one or more of the joints and may be acutely lame. With time the joint swellings resolve.

Large infected shoulder joint

Abscess on the hock joint

Post mortem - A purulent tenosynovitis which can be very severe. Multiple joints may be affected.
Treatment - Use joint active antibiotics to which streptococci are sensitive ï for example Lincomycin.
Control - Review floor consistency. Rough floors are a major cause of stress. In the farrowing house consider lime washing to reduce the roughness of the floors. Check teeth clipping and tail docking equipment. On many farms these pieces of equipment are dirty and infect the piglet during processing. Stopping teeth clipping has stopped the condition on a number of farms.

Trauma

Unfortunately injuries do occur in pigs and if they are severe euthanasia may be the only option. The weaner on the left had a broken elbow. The piglet on the right had a broken back caused by being stood on by the sow. In both of these cases there was no effective therapy.

Skin abrasion in the piglet and weaner

Abrasions to the carpus are very common in the piglet and weaner, and almost can be classified as normal in most pig farms. They arise from the suckling motion/activity of the carpus on the floor of the farrowing crate. The lesion develops into a callus and presents few obvious health problems, however, may progress to joint ill. Proper care and attention to farrowing floors is to be encouraged to reduce the severity of the problems as much as possible.

Carpal injuries from rough farrowing house floors

Very severe carpal erosion which has resulted in exposure of the joint.

Ulceration and erosion injuries

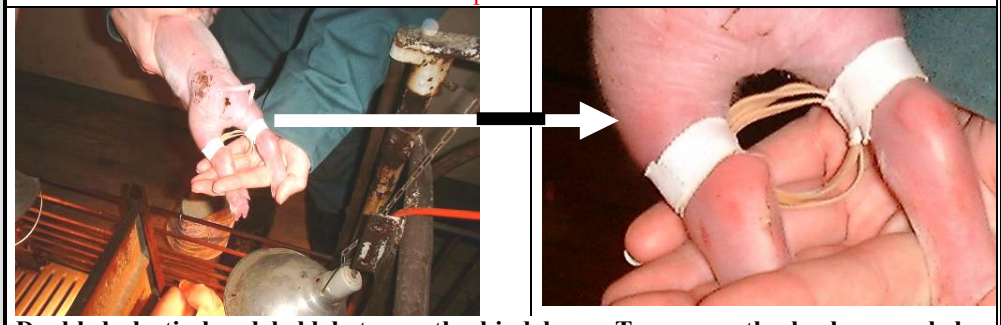
Erosions are unfortunately not uncommon on pig farms. They are generally associated with rough flooring or sharp contact surfaces. They are very common with new floors. In general removing the animal to a compromised pig pen, ideally with bedding such as straw and covering the exposed tissues with wound sprays. Secondary infections are not uncommon if the animal remains in a dirty abrasive environment. Review the environmental conditions. Consider limewashing floors and walls to reduce sharp points.

Bursitis

Bursitis is liquid filled protective swellings over joint surfaces. The body responds to the chronic injury by covering the area with thickened skin with underlying liquids, generally from a tenosynovial surfaces. They can lead to unsightly swellings and may lead to rejection of selected breeding animals.

SPLAY LEG

Causal agent	Environment, genetic and mycotoxins
Other names	Straddlers, Myofibrillar hyoplasia
Age group	Piglets within hours of birth. Males more affected
Clinical signs	
Acute	Piglet shortly after birth has splayed back and occasionally front legs. The effect seriously affects the pigletôs ability to dry, suckle and get out of the way of the sow, therefore pre-weaning mortality is increased 
Infectivity	
	None. The disease only affects individual
Cause	
 **sow slipping in the farrowing house**	Environmental ï slippery floors especially behind the sow
	Piglets staying wet and cold too long
	Low birth weight piglets
	Stressed sows at farrowing more prone to deliver splay leg piglets
	Zearalenone (F2) toxin may be associated with increased incidence
	In some cases there is a genetic component to the problem ï Landrace more common than in Large White
Post-mortem Lesions	
	Hypoplasia of the muscles of the back ï longissimus dorsi and the biceps femoris muscles
Diagnosis	
	Clinical signs very characteristic

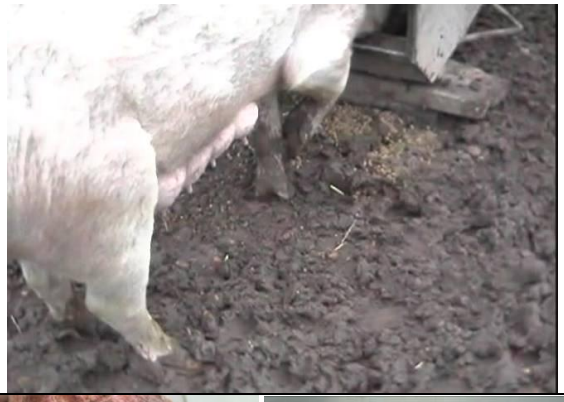
Treatment	
Individual	If all four legs euthanase piglets
	If hind legs only affected, tape legs together
	Massage hip area of the affected piglet
	Provide support for the back legs using tape and bands. Do not apply too tight to cause circulation constriction. Remove as soon as possible- after 48 to 72 hours
	 **Doubled elastic band held between the hind legs. Tape over the back may help stabilise the back as well**
	Whatever treatment is pursued, it is essential to provide adequate colostrum within 6 hours of birth
Control	Repair or replace farrowing house floor in particular behind and sides of sow
	Paint floor with lime wash to increase adhesive properties of floor
	 **Rear of crate lime washed**  **Sow too large/long**
	Farrow piglets in the passageway behind the sow to allow a dryer and cleaner environment
	Place mats or feedbags behind the sow during farrow
	Review gestation feeding. Increase feed intake from day 90 to 110 of gestation. Birth weights need to be greater than 1.2 kg
	Reduce gestation stress. Place sows into farrowing house at least 5 days before farrowing. Ensure sow housing adequate ï length of sides, floor no draughts etc
	Do not breed from splay leg gilts or boars. While the animal recovers permanent damage may have been incurred
Common differentials	
	Spinal injury. Trodden on by sow
Zoonotic	None

LAMENESS IN ADULTS

Sow lameness is not uncommon and is a major cause of culling or euthanasia on the pig farm.

Bush foot/swollen foot

Infection enters the foot through a number of routes Following a puncture or trauma wound to the lower leg.
Toes can become trapped and torn in slats.
Open wounds are not uncommon following abrasion from rough floors. Treatment must be vigorous. Failure to respond quickly usually leads to euthanasia. Move the pig to a compromised pig pen with good footing, ideally straw based. Inject with Lincomycin or other suitable antibiotic. Ensure the pig is encouraged to rise regularly ï several times a day. Make adequate provision for food and water.



The infection can spread from the coronary band into the foot resulting in severe necrosis of the internal tissues, including osteomyelitis. Once the infection has penetrated the internal tissues, treatment generally hopeless. In the early stages, remove to a bedded hospital area and treat vigorously. Review flooring, particularly slat quality.

Osteochondritis dessicans (OCD)

In young growing adults, osteochondritis may be seen. Note that OCD lesions are very common and are only clinically painful when the lesion is severe enough either to remove the joint cartilage revealing the underlying bone within the joint or synovial tissue becomes trapped within the joint or significant numbers of joint mice (pieces of cartilage or bone) are present. A pig with small cartilaginous erosion is likely to be an incidental finding. The picture shows a moderate erosion of the ulna radius.

The OCD lesion is the rough looking area on the right area of the joint.

Femoral Head Fracture – epiphysiolysis

This is a specific form of osteochondrosis which affects the neck of the femur. Following trauma, often associated with bullying, pushing through a narrow doorway or a mating injury, the young sow presents with sudden unilateral hind limb lameness with collapse of her gluteal (hip) muscles, mainly on one side. There is no effective treatment.

Split Hips

If a sow falls or does the splits, she can tear pelvic muscles resulting in an inability to rise. There is generally no effective treatment and euthanasia must be carried out as soon as the decision is made that the pig will not recover and at the most seven days after onset of the injury. Control the problem by reviewing the floor and lying patterns of the sows.

Shoulder sores

Classically seen in the later stages of lactation and generally associated with a thin sow. Some of the lean modern sows may easily develop shoulder sores. The problem is ischaemic (no blood supply) necrosis over the shoulder blade. Treatment is to keep the wound clean until weaning. After weaning place the sow in a compromised pen with straw. Feed the sow to restore body condition. Healing is normally complete within a month. The sow, however, should be bred as normal after weaning.

Ulcerated granuloma

A large granuloma develops on the fore or hind leg of the sow. The lesion looks more severe than the behaviour of the animal would indicate. There is no effective treatment. Lesion size can be controlled by housing on straw. Culling may be beneficial. The slaughterhouse veterinarian may become very concerned about the lesion, therefore, telephone and discuss any welfare or transportation issues before sending in the animal. On occasions *Borrelia suis* may be a specific cause

Overgrown feet

Overgrown feet are not uncommon on pig farms particularly in certain lines of pigs. Pig feet should be regularly inspected and trimmed, ideally immediately after farrowing. Sows do not like having their feet trimmed. Note sowôs feet can be very hard and may be difficult to trim. Using a small grinder can be very effective. Overgrown feet contribute to preweaning mortalities by making the sow clumsy.

Erysipelas and adult arthritis

Erysipelas is covered in detail elsewhere. However, it is a major cause of chronic arthritis in the sow and boar. Unfortunately vaccines do not cover the problem. Treatment is difficult and unrewarding. Relief may be provided through painkillers given by mouth (hide in an apple or chocolate). This may be particularly important in breeding boars or boars on an AI stud.

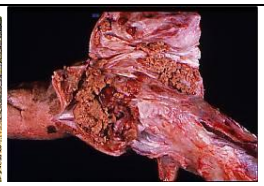
Arthritic boar

Broken legs

Unfortunately broken legs occur on farms. On several occasions it is associated with poor building design or failure due to wear and tear, for example due to holes appearing in the floor. Sows sleeping in a stall area may be trampled on by other sows and breakages occur. Miss-sizing boars and young sows can also lead to catastrophic breakage of the humerus. It is unlikely that nutritional imbalances are the cause of leg breakages, but it must be investigated when breakages become a óherdô issue. Gilt may have weakened bones with osteoporosis at weaning.

Infected joints in the leg

Trauma to the legs can result in infection into the tissues around the joint and muscles. When the infection is severe enough to cause severe lameness and collapse the response to treatment in generally poor.

Sow with a swollen ankle which at postmortem shows severe infection

Conformation problems

Conformation of the sow and boar varies depending on the breed. Discuss with your breeding company specific conformation of the stock.

Specific conformation errors:

Hind legs under abdomen

Toes pointing

Forelegs too straight

Excess muscling

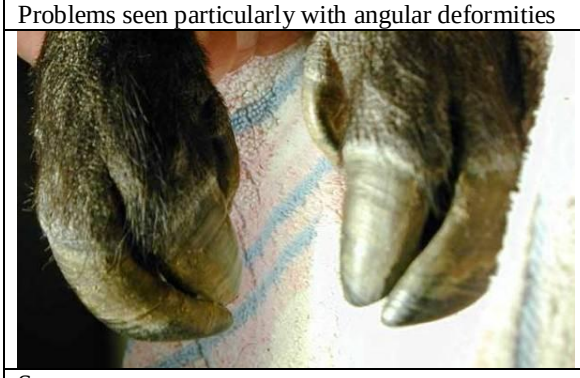
Dipped shoulders

Misshapen and uneven toes

LAMENESS IN PET PIGS

<table>
<tr><th colspan="2">Conformation concerns</th></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Leg length ï good length of leg</td><td>Leg length ï too short</td></tr>
<tr><td colspan="2">Leg angle</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Good leg angle ï good foot wear</td><td>Dropped pasterns, supernumerary digits are in contact with floor</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">Inversion of the foot ï varus weight moved to the lateral foot</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">Toes point outwards ï valgus ï lateral deviation ï weight moved to the medial foot</td></tr>
</table>

Problems seen particularly with angular deformities



Screw toes

Rolled hoof wall

Other toe and lower leg deformities

Splaying of toes

Genetic abnormalities ï mule foot

Uneven toes, enlarge lateral toe

Toes overgrowth

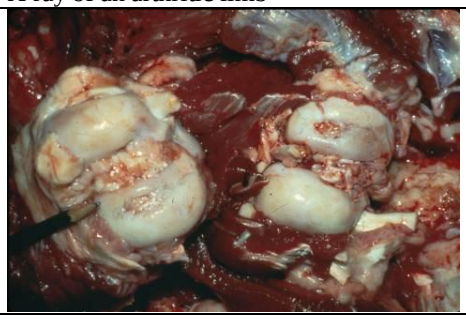
<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Hoof craw, from coronary band.</td><td>Corn ï swollen heel</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td colspan="2">Overgrowth of supernumerary digit</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Interdigital growth</td><td>Interdigital abscess</td></tr>
</table>

General locomotor problems

Arthritic pig ï middle aged

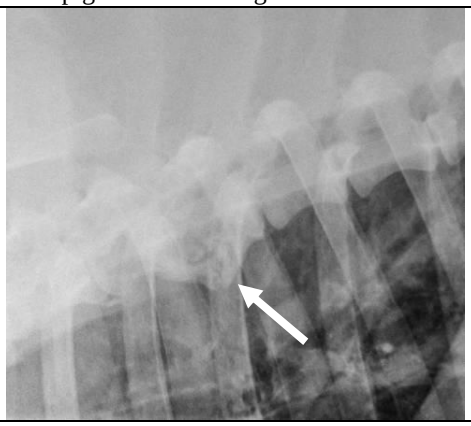
X ray of an arthritic limb

OCD in a growing pig

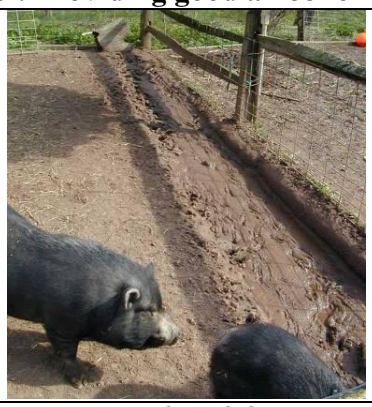
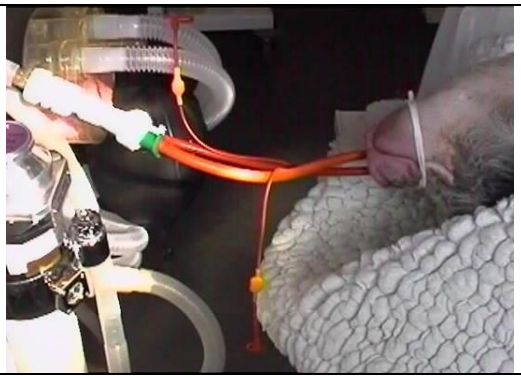


OCD lesions ï these can be very common

Infected leg following trauma as shown at postmortem ï another pig stood on the leg



Paralysis of the hind legs occurs due to a number of reasons ï example shown was a invasive lymphoma growing adjacent to the spinal column - arrow

Control: Providing good a hoof environment	
	
Muddy paddocks make for soft feet	Poor welfare conditions, often related to poor foot care
	
Straw can be very clean but is none wearing	An area of screenings will allow the pigôs feet to wear more normally
Treatment	
	
Trimming while conscious	Trimming under anaesthesia

Notifiable and zoonotic diseases of pigs

Diseases notifiable to the Office International des Epizootics (OIE ï World Organisation for Animal Health)
Zoonotic diseases of Pigs

Other diseases:

- Anthrax
- Enterovirus encephalomyelitis
- Japanese Encephalomyelitis virus
- Nipah
- Porcine cysticerosis ï See Diseases of the intestinal tract - Parasites
- Rabies
- Rinderpest
- Typanosoma
- Toxoplasmosis
- Trichonellosis ï See Diseases of the intestinal tract - Parasites

Procedure if you suspect a notifiable disease condition
Reducing health risks to farm staff and veterinarians

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
Atrophic rhinitis of swine - Toxigenic *Pasteurella multocida*
Aujeszky's disease / Pseudorabies
Echinococcosis/hydatidosis ï *Echinococcus granulosus*
Enterovirus encephalomyelitis
Leptospirosis
New world screwworm (*Cochliomyia hominivorax*)
Old world screwworm (*Chrysomya bezziana*)
Porcine brucellosis
Porcine cysticercosis ï *Taenia solium*
Porcine reproductive and respiratory syndrome
Rabies
Transmissible gastroenteritis virus
Trichinellosis - *Trichonella spiralis*

Zoonotic diseases of pigs

Anthrax
Brucellosis
Camplyobacter jejuni
ChagasôDisease ï *Trypanosoma cruzi*
Chlamydia
Clostridium perfringens type A
Ebola (Reston)
Erysipelas
Escherichia coli
Hepatitis E virus
Japanese B encephalitis
Louping ill
Leptospirosis
Nipah disease
Pasteurellosis
Rabies
Ringworm
Salmonellosis
Streptococcus suis II
Spirometra erinacei
Swine Influenza
Taenia solium
Toxoplasmosis
Trichinella spiralis
Tuberculosis
Vesicular diseases
Yersina enterocolitica

NIPAH DISEASE

Origin of name	From the village, Sungai Nipah, Malaysia, where the virus was isolated from the first human victim
Causal agent	Virus ï a paramyxovirus closely related to the Hendra virus
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.
Infectivity	
	Infection via oral route with incubation period of 14 to 16 days.
	Dogs and flying foxes have been found to be seropositive
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
Diagnosis	
	Virus isolation and serological
Treatment	
	None, notifiable disease. Inform government vet with any suspicions
Common differentials	
	Actinobacillus pleuropneumonia. *Haemophilus parasuis* in adults
Zoonotic implications	
	Very fatal to man, out of 258 people infected 100 died
	Mild to severe clinical signs, characterised by fever and headaches of varying severity. Patients become drowsy and disoriented leading to coma. Majority of patients developing coma die.
	Incubation period in man one to three weeks

ANTHRAX

Pig with a swollen neck

Anthrax is caused by the bacterium *Bacillus anthracis*. When this bacterium infects a pig there may be very few clinical signs, but occasionally the bacteria results in an acute illness, fever, respiratory distress and sudden death.

Anthrax should be suspected in any pig found suddenly dead with a swollen neck with copious blood tinged mucus and large haemorrhagic lymph-nodes.

When suspicious, make an incision into the swollen neck region and take some of the lymph fluid. Do not fix the slide with heat, allow to air dry. *Bacillus anthracis* does not form the characteristic capsule readily in pigs and the capsule that does form is broken down with heat. If the suspicions are confirmed, stop the post-mortem and inform a government veterinarian. In pigs the spleen is not enlarged as in cattle.

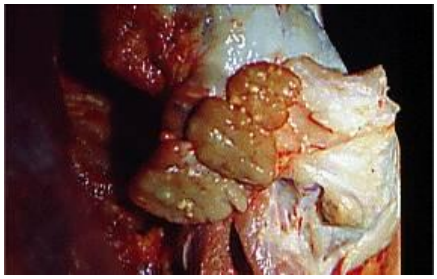
Take great care with diseases animals and the carcase as anthrax is zoonotic.

The source of *B. anthracis* is normally through contaminated feed. Outdoor sows may contract spores through the soil or contact with carcasses.

RABIES

Rabies is caused by a Rhabdovirus. The disease is rare in pigs. Pigs however, like all mammals may become infected if bitten by an affected animal ï for instance a Raccoon in the USA.
Following an extremely variable incubation period, sometimes over 100 days, the pig suddenly develops clinical signs of incoordination and dullness which within days progresses to prostration and death. Diagnosis can be problematic as post-mortem lesions may be non-descript. If suspicious submit the whole carcase to a diagnostic laboratory. There is no treatment. Control is via good biosecurity, limiting pigsô access to other wild mammals. This can be impossible in outdoor or pasture pigs. Pet pigs may be vaccinated every three years using a standard canine rabies vaccine, but note the vaccine is not licensed or proven on pigs.

TUBERCULOSIS


Swollen neck lymph node with nodules

Pigs are susceptible to *Mycobacterium tuberculosis*, *M. bovis* and *M. avian/intracellulare* complex. Majority of the cases are associated with *M. avian/intracellulare* complex resulting in nodules in the lymph nodes of the neck and small intestine.

This may result in head and possibly the whole carcase if the case is more progressive. Many of these TB nodules actually reveal *Rhodococcus equi* rather than mycobacterium. There are no clinical signs in the pig.
The source of the infection can include:

- Outdoor pigs ï badges and poultry manure
- Sawdust and shavings
- Peat ï particularly if unpasteurized when used in as piglet gut conditioners in the farrowing house
- Water contamination

Infected pigs can be identified by routine TB testing.

JAPANESE B ENCEPHALITIS VIRUS

Japanese B Encephalitis virus is common in South Asia. The virus belongs to the Flaviviridae family. The disease causes few problems in the pig, perhaps being associated with sporadic reproductive problems. The significance of the disease is associated with public health. The major clinical sign, when there are any, may include testicular degeneration and loss of fertility in the male and the birth of abnormal piglets with mummification. The virus may be responsible for abortion in the sow. The disease is spread by mosquitoes. Ensure that there are no water traps, note lowered curtains in the summer.
In areas where Japanese B Encephalitis virus is common, vaccination is possible prior to the mosquito season.

WEST NILE VIRUS

West Nile Virus is another Flaviviridae and it remains to be demonstrated if West Nile Virus is implicated in reproductive problems in pigs.

ENTEROVIRUS ENCEPHALOMYELITIS

The clinical disease is called Teschen or Talfan and is associated with porcine enterovirus serotype 1. The disease agent is extremely common and widespread. The clinical signs are more common in weaned or growing pigs that develop an ascending paralysis particularly of the hind legs leading to a swaying gait and ultimately total paralysis.

Diagnosis can be confirmed by paired serology. There is no effective treatment. Control is by good introduction and acclimatization programmes, particularly of gilts and ensuring adequate colostrum intake of piglets.

TOXOPLASMOSIS

Toxoplasmosis is caused by the protozoa *Toxoplasma gondii*. This is a zoonotic disease. Cats are the primary host. Initially pigs become infected by ingesting feed or water contaminated by cat feaces. The pigs can then spread the parasite within a group by biting and vices, eating infected rodents and through feedback of placenta. There are no real specific clinical signs in the pig. The disease is significant from a meat hygiene aspect.

TYPANOSOMA

Typanosoma simiae can cause an acute infection in the pig. The pig develops very high fever, shivering and dies. It should be considered as a major cause of death in high Tsete fly infested areas.
Differentiate from African Swine Fever ï which generally kills many pigs at the same time and occurs in non tsete fly areas. Blood smear will reveal *T. simiae*. *Typanosoma brucei* may also cause mortality in pigs.
Pigs can act as a reservoir for *T. rhodesiense* or *T. gambiense* making pigs important in the spread of sleeping sickness. This is important given the close association with man and pigs. Although pigs can also be positive in the control of Tsete flies as they cut down the thickets near African homesteads.

Suspected Exotic Disease Protocols

Client suspects an unusual or potentially exotic disease	
	Request client seal the property
	Place keep out notices at all public entrances
	Request that all personnel remain at the property until the government vet arrives
Veterinarians responsibility	
	Wear disposable outer clothing and only wear farm boots
	Take disinfectant concentrate in the car
	Ensure you have a camera and mobile phone which works
	Ensure you have a rectal thermometer
	Upon arrival examine stock carefully
	Photograph and catalogue any observed clinical signs
The veterinarian suspects an unusual or exotic disease	
	Phone practice to inform partners. Email photographs of clinical signs
	Phone Department of Agriculture Veterinarian
	Provide full name and address of the farm and GSP location if possible
	Provide clear details of how to get to the location of animals and farm
	Email photographs and clinical details of the observed lesions
Before the Department of Agriculture Veterinarian arrives (unless otherwise authorised)	
	Stop movement of all animals from and to the farm
	Stop all movement of vehicles from the farm
	Divert all movement of all vehicles that are to arrive at the farm ï such as feed trucks, milk tanker etc.
	Ensure farm perimeter entry points prohibit vehicle movements ï for example place tractor across entrance, ensure signs are in place, if necessary place stockpeople at entrance
	Proceed with a detailed clinical examination of all the other stock on the farm ï all species
Leaving the farm	
	Follow all advice given by the Department of Agriculture Veterinarian
	Leave disposable overalls
	Leave farm boots
	Leave rectal thermometer
	Do not remove any items contaminated with faeces or blood
	If necessary rewrite notes on clean paper
	Provide counseling and support to the client with regard to possibility that the suspect disease is confirmed
	Implement suitable additional biosecurity measures
	Spray car wheels and wheel hubs with disinfectant
	On the way home wash car in hot steam car wash
	Double wash all clothing with detergent
	Shower thoroughly ï minimum 3 minutes ï note watch and glasses
	Thoroughly clean and disinfect all equipment removed from the farm
During routine visit the veterinarian suspects an exotic or unusual animal disease	
	Proceed from vet responsibility point 3
	Do not take personal boots and overalls from the farm
	Ensure you have a small supply of disinfectant in the car at all times

Reducing health risks for farm staff

	**Cover all wounds promptly** Report all accidents to the farm manager
	**Wash hands** Regularly wash your hands, particularly after treating any sick pigs. Wash your hands before eating, drinking or going to the toilet
	**Injury** To avoid injury always move animals appropriately, for example using a pig board. Always use extreme caution when moving adult boars or a sow and her litter
	**Flying objects** When pressure washing wear suitable protective clothing ï protect your eyes, face and hands in particular.
	**Dust** When handling dust environments ensure that you wear face masks to protect your respiratory system.
	**Noise** Wear ear protection when working with pigs. Especially during noisy times, such as feeding, handling and blood collection.

	**Infection and spread of pathogens** Wear gloves when handling sick pigs ï especially when the condition is contagious to other pigs or is zoonotic. If you participate in a post-mortem or handle blood wear gloves
	**Needles, medicines and syringes** Ensure that all needles are covered. Store medicines and syringes appropriately. Dispose of all used needles, syringes and medicine bottles in a sharpôs container
	**Human food storages and facilities** If staff are going to eat at the farm, provide suitable facilities where food can be stored and eaten cleanly. Do not allow pig food products onto the farm.
	**Light** Ensure that there is sufficient light to work safely among the pigs ï minimum of 50 lux
	**Electricity** Ensure that the farmôs electrics are well maintained to avoid electrocution and fir risks
	**Manure** Pay particular care when moving or mixing the slurry and manure. There can be extremely toxic gases in manure which can kill people and pigs. Hydrogen sulphide (H_2S) in particular needs watching. This has no smell when toxic!
	**Fire Risk** Ensure that the farm has a written policy regarding what to do if there is a farm fire. Note pigs will run back into the fire when realized. Do not put yourself at risk to save the pigs.