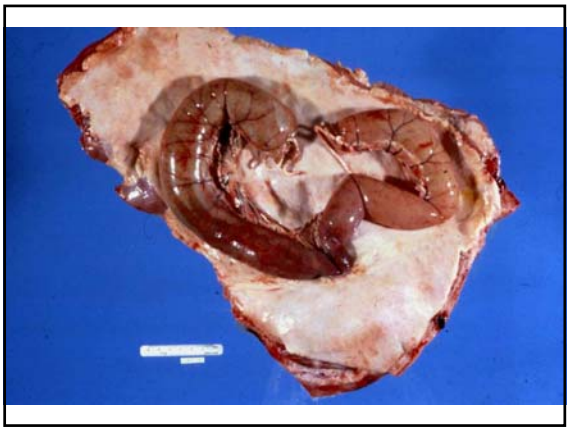
Pig Diseases

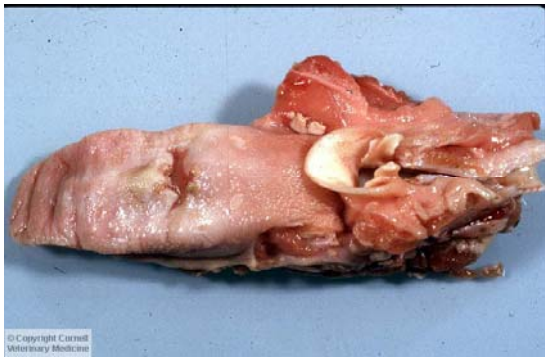
"C. L. Davis Foundation's "Gross Morbid Anatomy of Diseases of Animals"

March 23-27, 2008,
AFIP, Washington, DC.

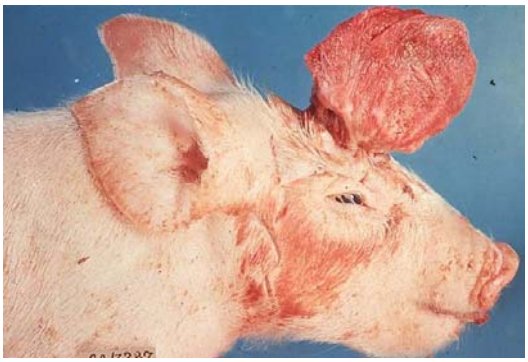
Ana Alcaraz, DVM, PhD
Diplomate ACVP
College of Veterinary Medicine
Western University of Health Sciences

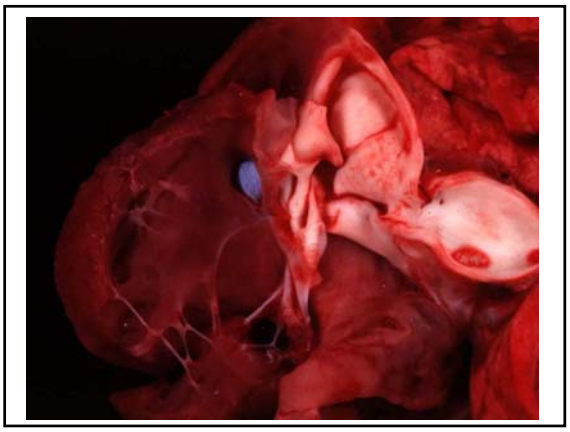
Congenital diseases

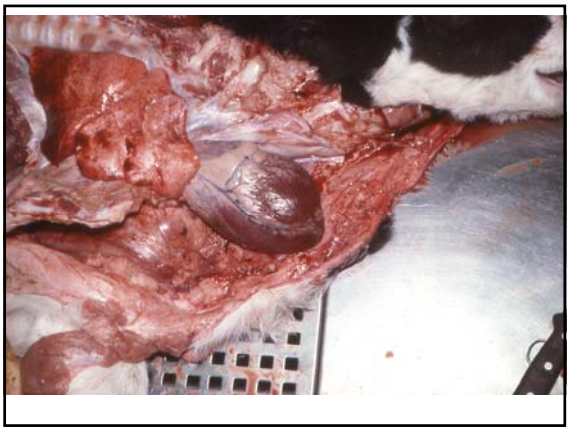


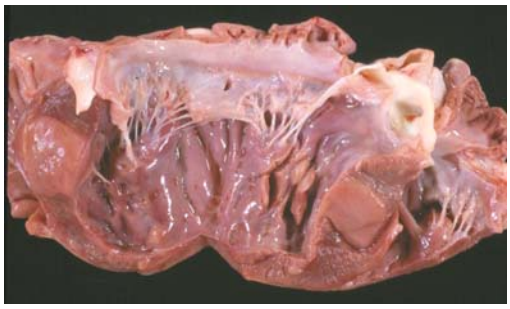

© Copyright Cornell
Veterinary Medicine

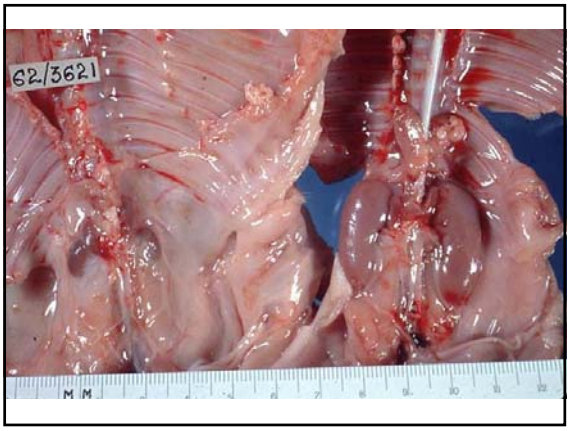

© Copyright Cornell
Veterinary Medicine

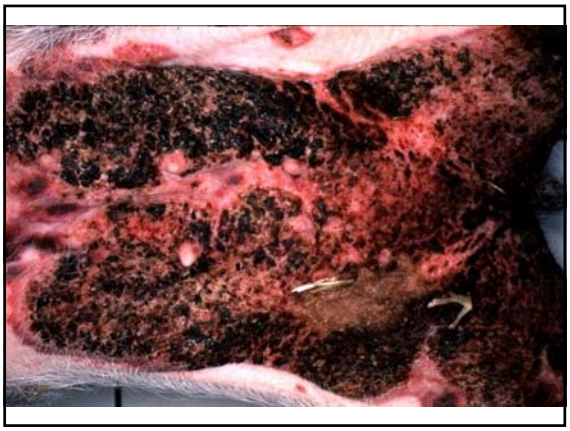


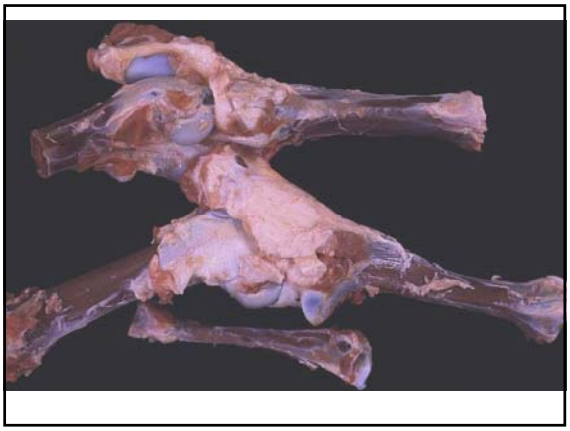


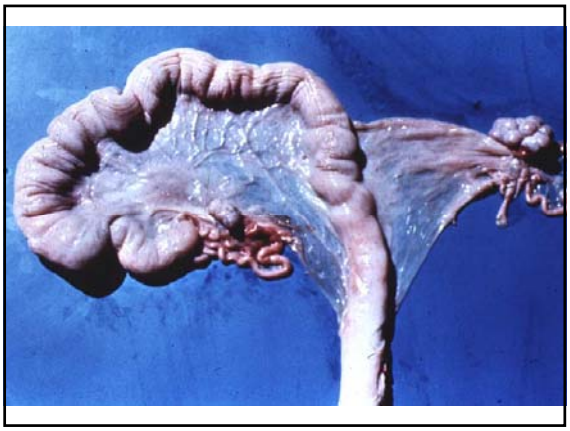


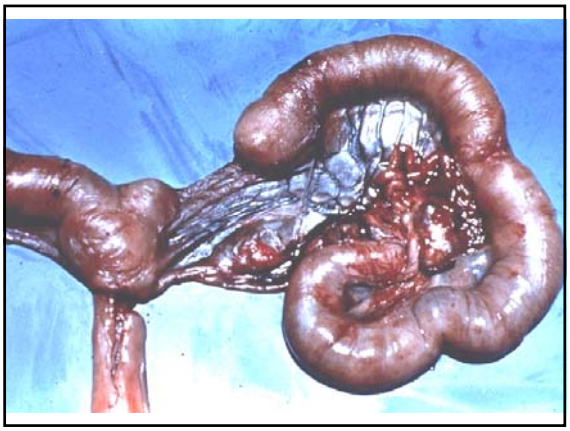


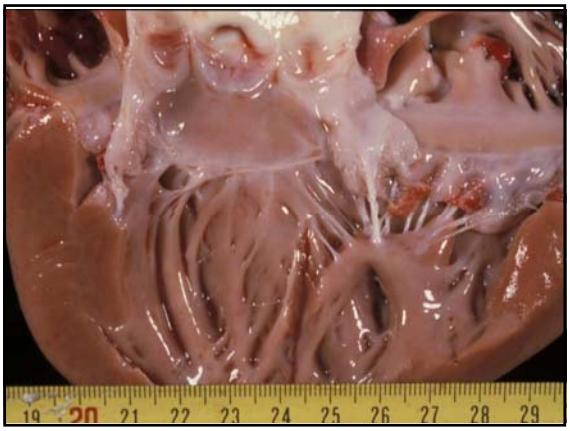

62/3621

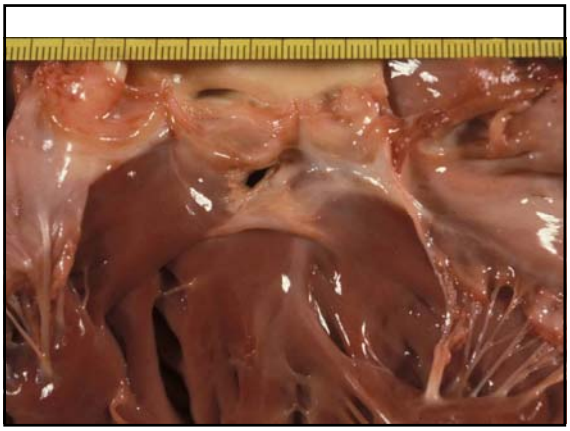


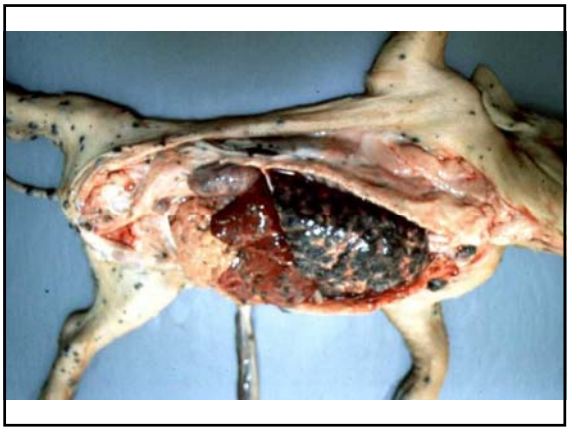










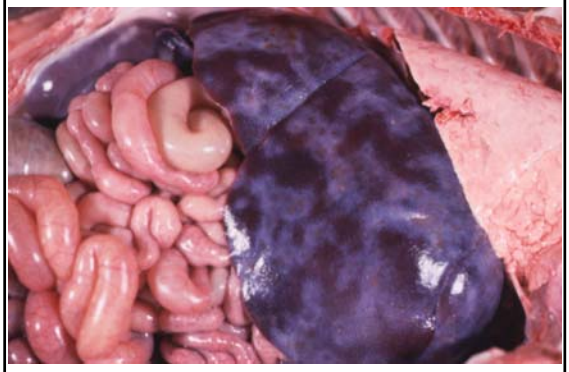


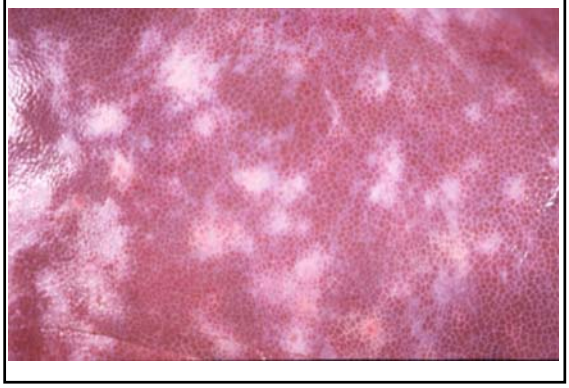
•Francisco Garcia Marin, University of Leon, Spain
•Ana Alcaraz, Western University
•Andrew Miller, Harvard Medical School
•John M. King, Cornell University. http://w3.vet.cornell.edu/nst/
•Edward G (Ted) Clark , Centre Animal Diagnostic Laboratory, Calgary, Canada.
•Noha's Artchives University of Georgia
•Institute of Animal Pathology, Vetsuisse Faculty Bern

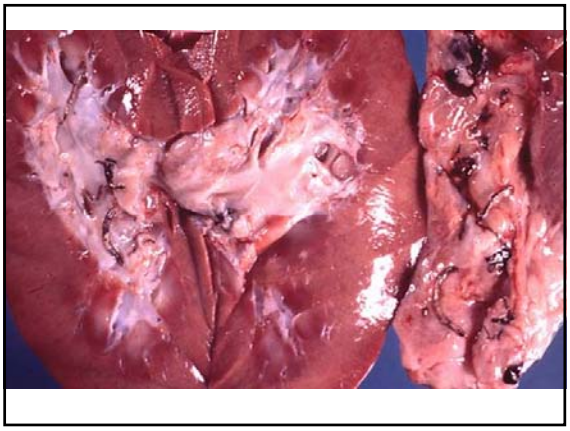
Pig Diseases

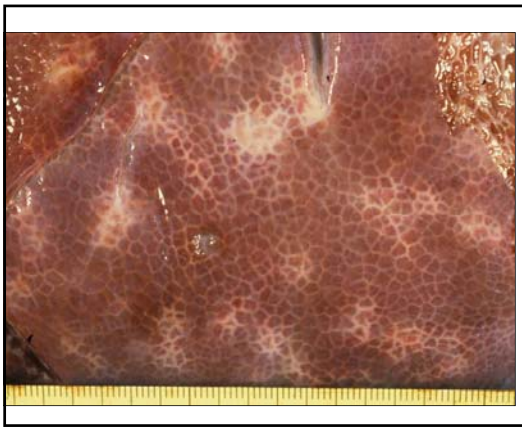
Ana Alcaraz, DVM, PhD
Diplomate ACVP
College of Veterinary Medicine
Western University of Health Sciences

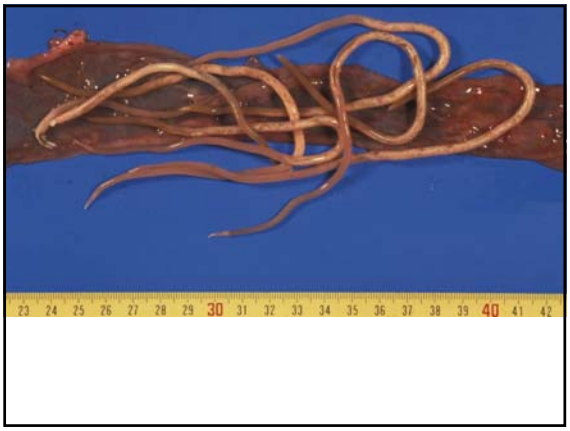
Parasite diseases

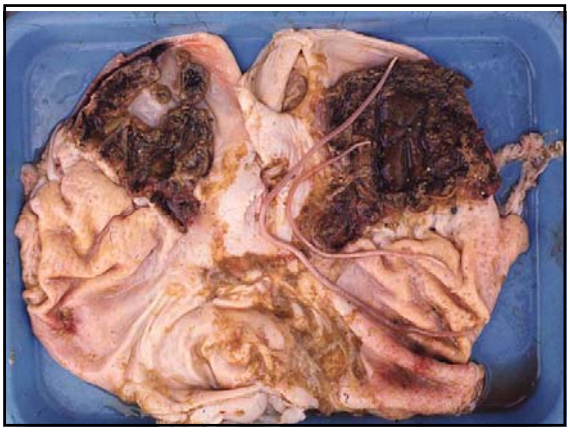


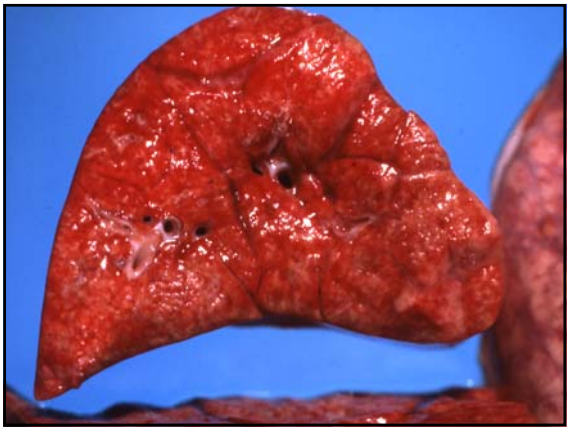


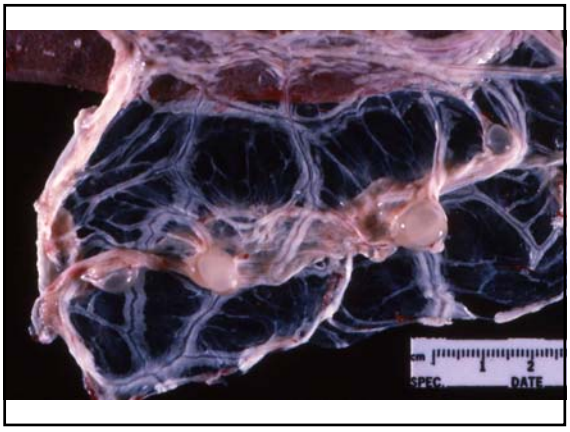


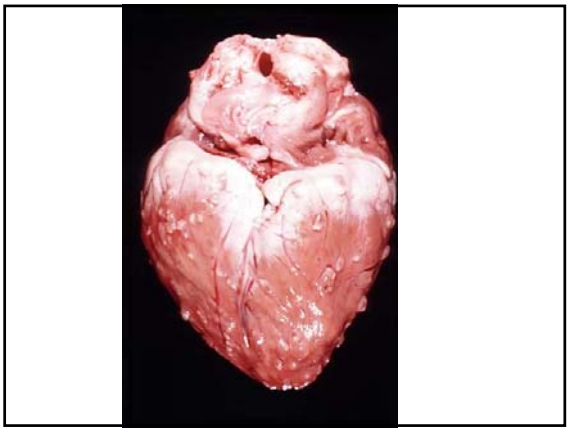


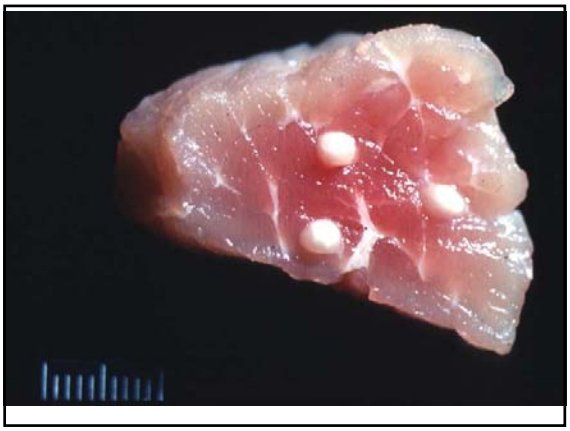


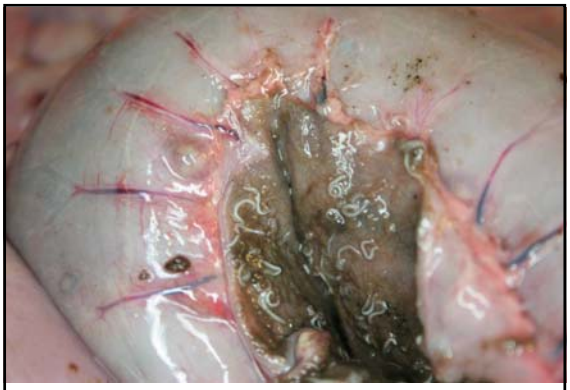


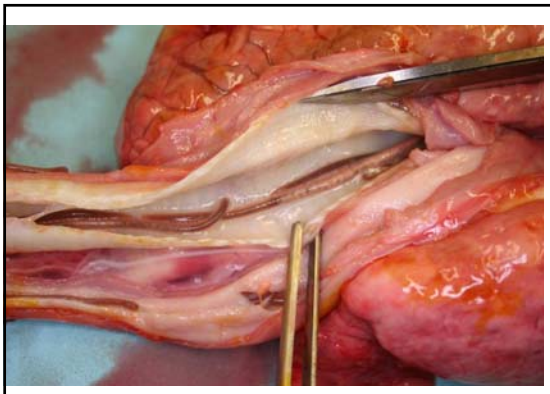


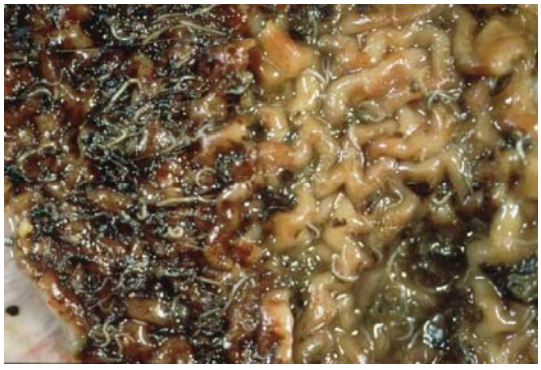

SPEC.
DATE

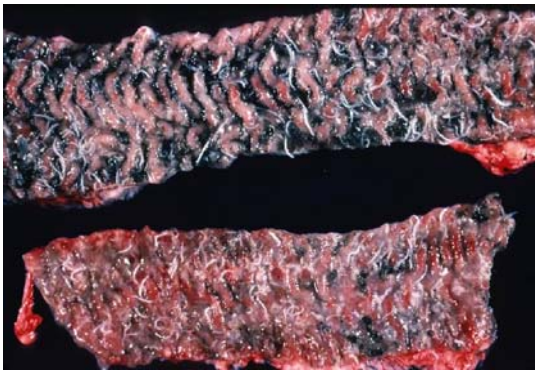




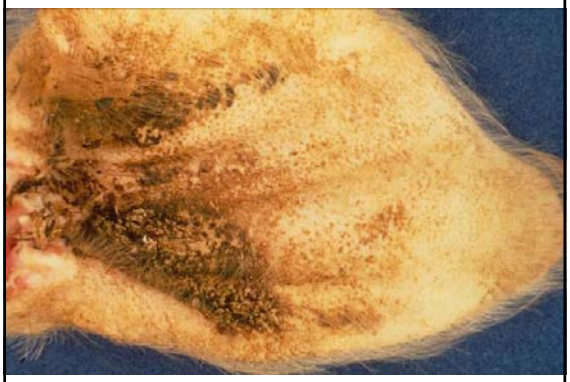


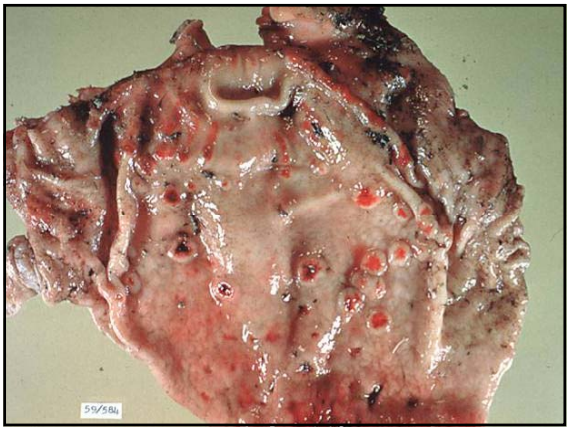


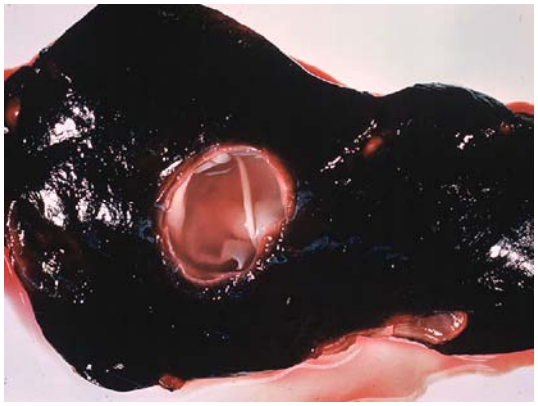




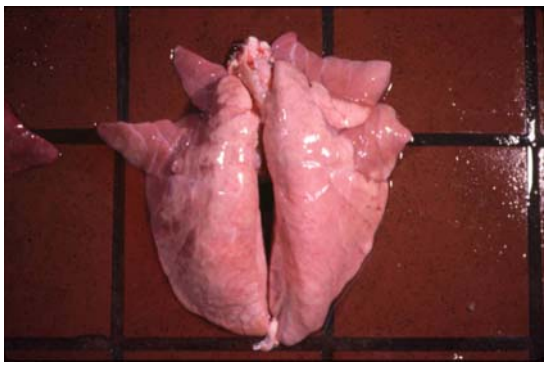

cm
1
2
3

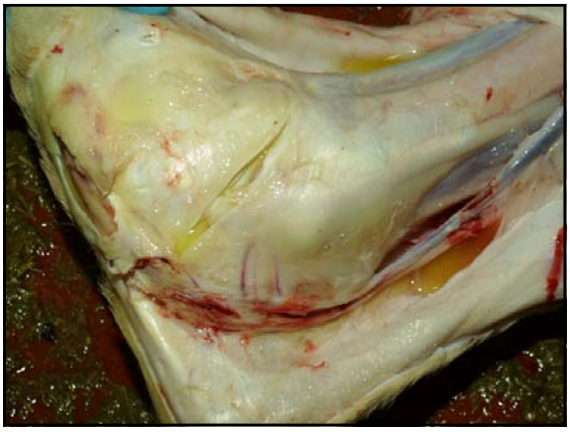


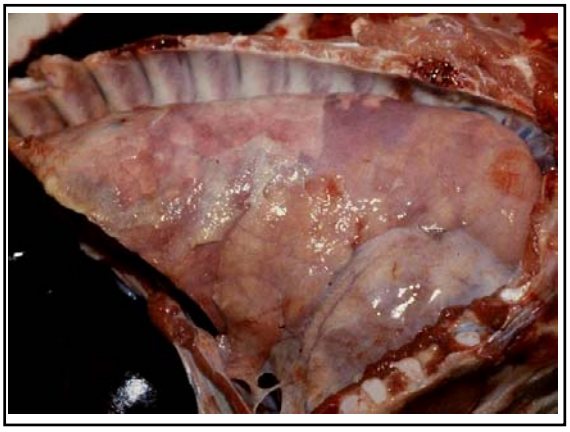


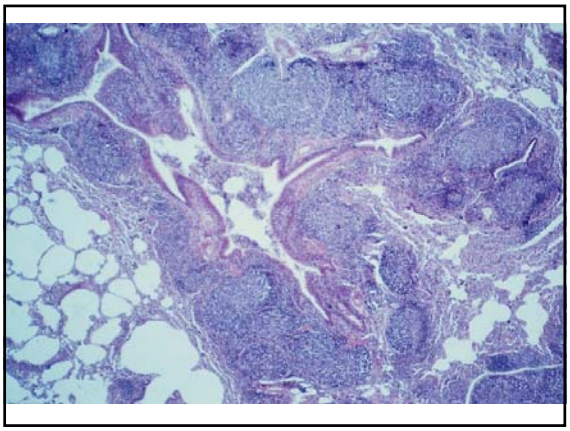


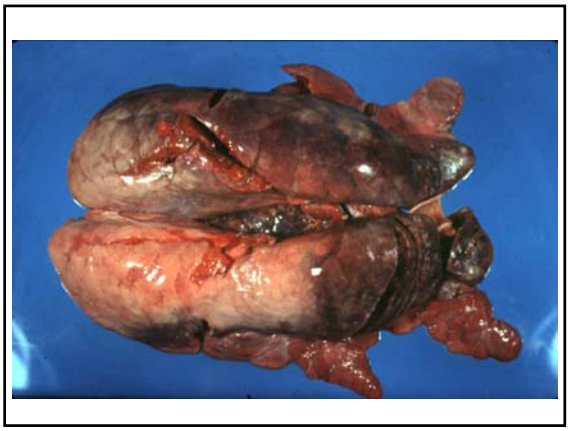
BACTERIAL DISEASES

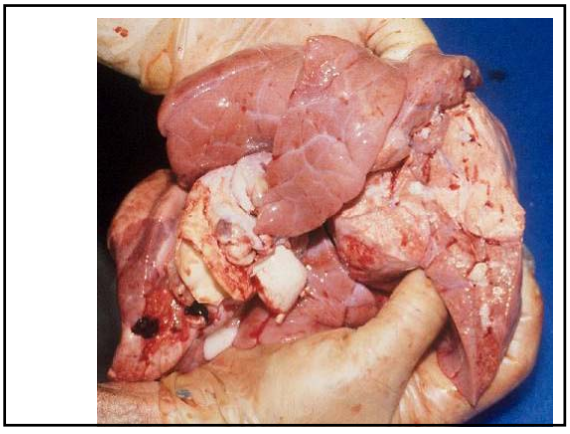


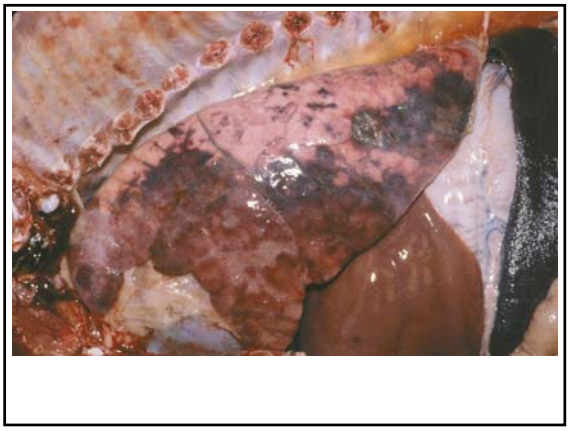


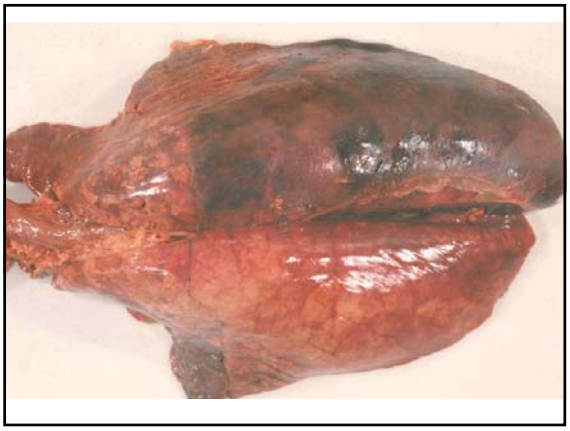


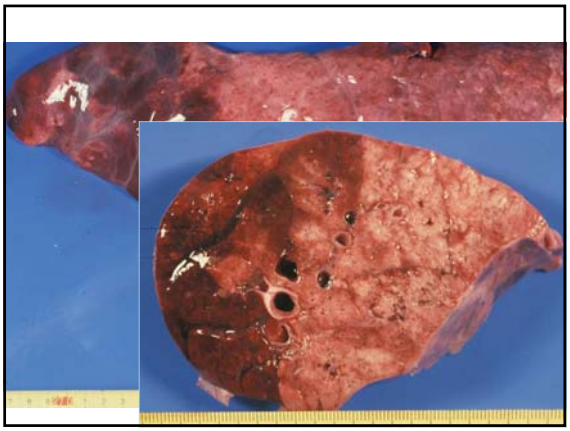


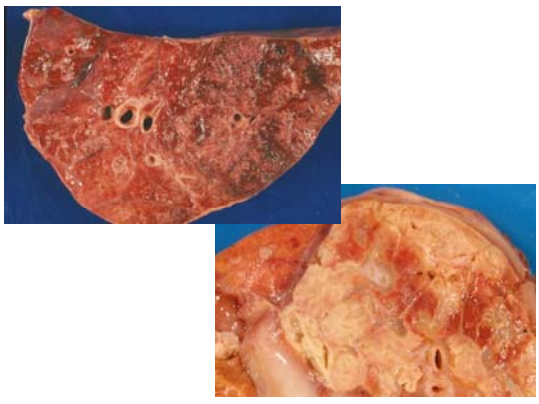












J. Comp. Path. 2008, Vol. 139, 61–66

Available online at www.sciencedirect.com

ScienceDirect

ELSEVIER

Multifocal Granulomatous Hepatitis Caused by *Actinobacillus pleuropneumoniae* Serotype 2 in Slaughter Pigs

T. Ohba*, T. Shibahara†, H. Kobayashi†, A. Takashima*, M. Nagoshi*, R. Osanai† and M. Kubo†

* Toyama Prefectural Meat Inspection Centre, 20-4 Shinbori, Imizu 934-0035 and † Epidemiological Research Team, National Institute of Animal Health, 2-1-5 Kannondai, Tsukuba 305-0856, Japan

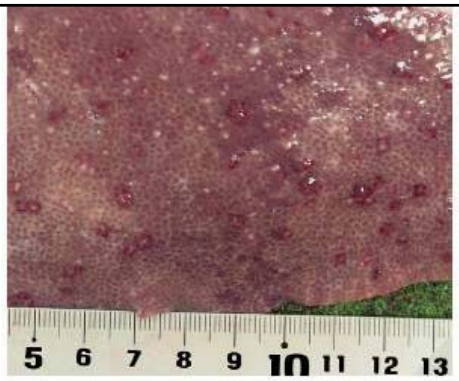


Fig. 1. Liver of pig 4. Diffuse multifocal white–yellow foci are seen. Scale, cm.

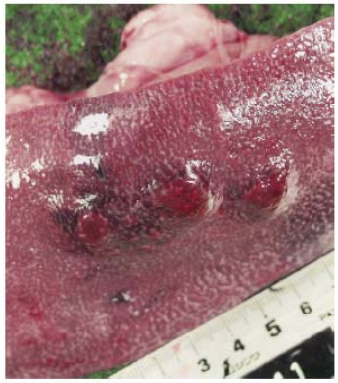
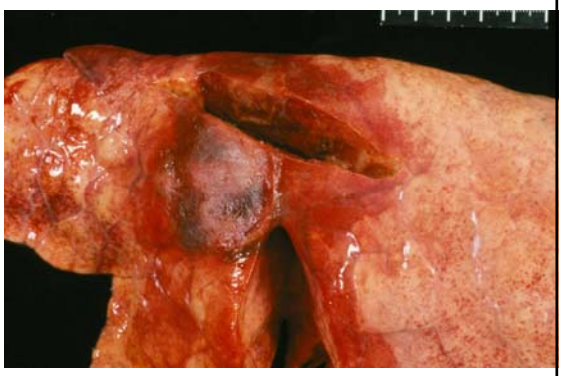
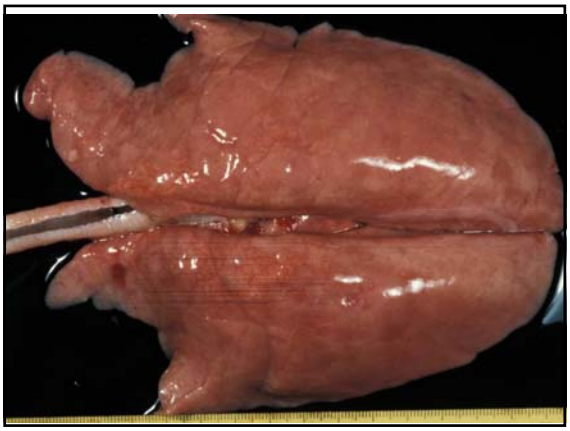
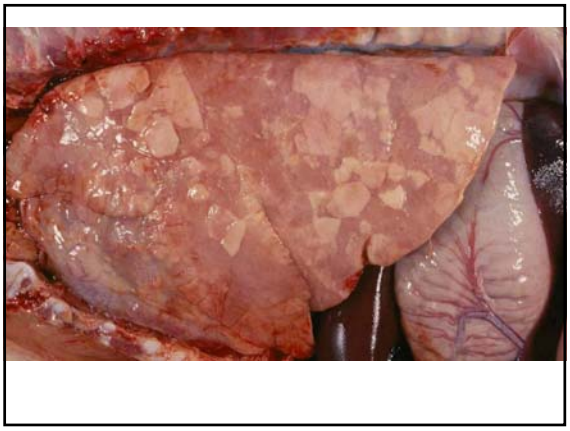


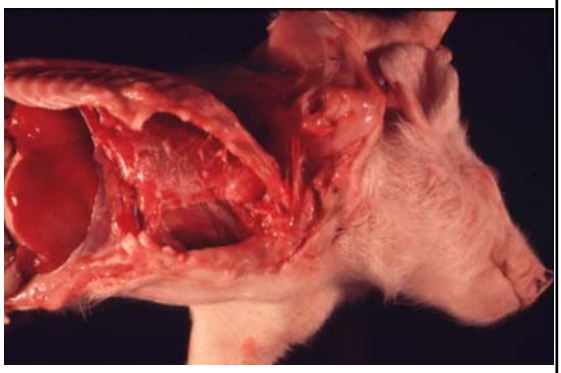
Fig. 2. Spleen of pig 10. Several haemorrhagic foci are seen in the enlarged spleen. Scale, cm.

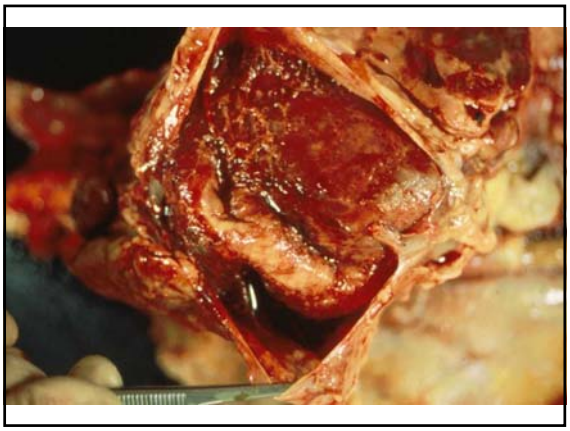


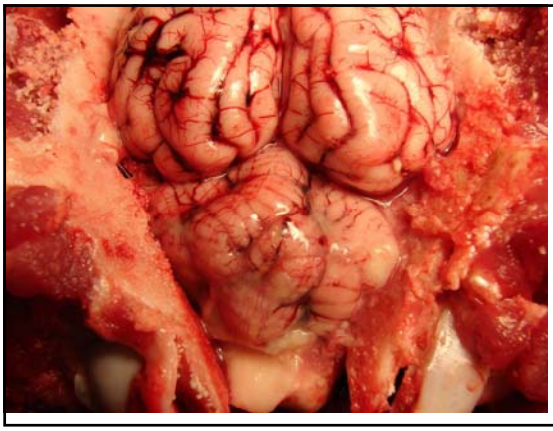

cm 1 2 3 4 5

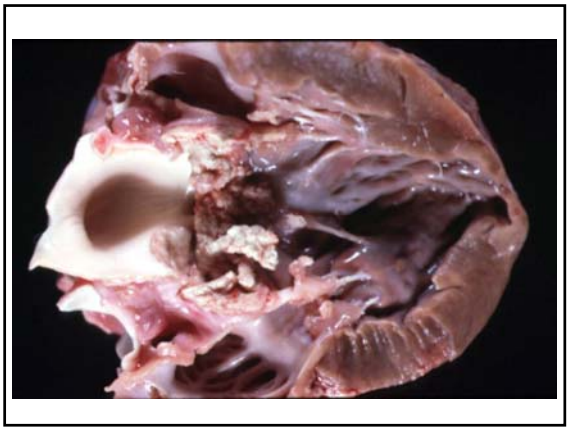


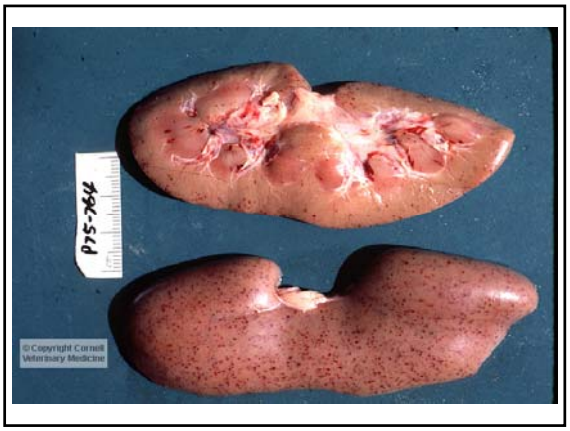




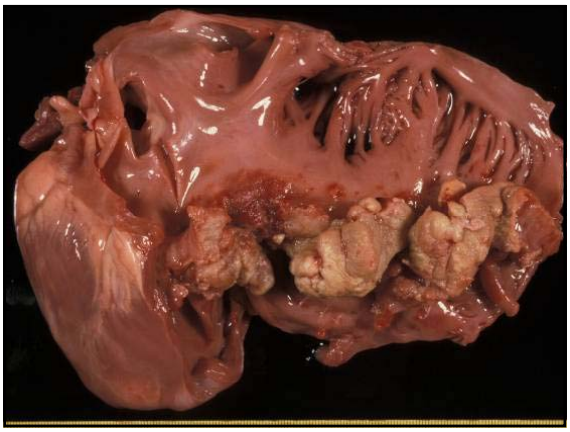


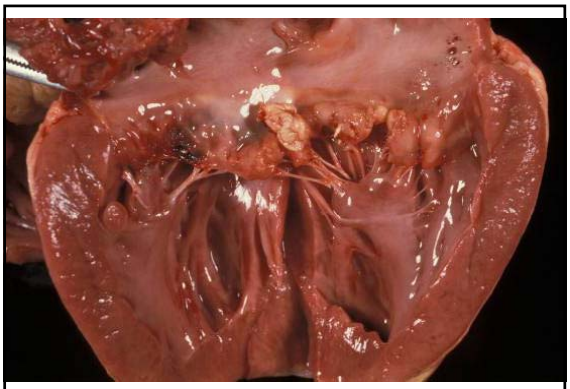


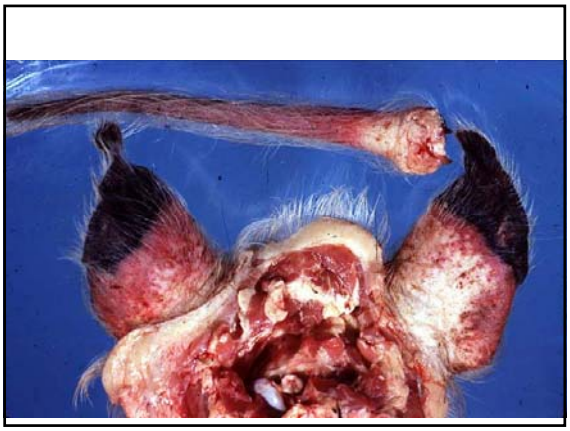


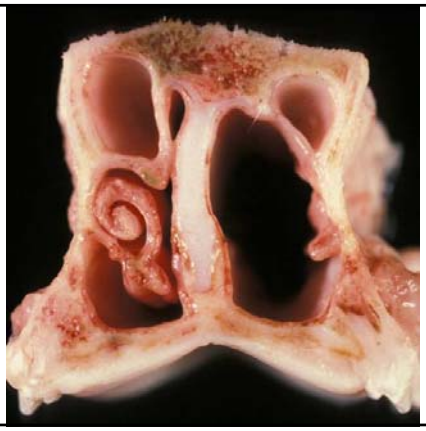


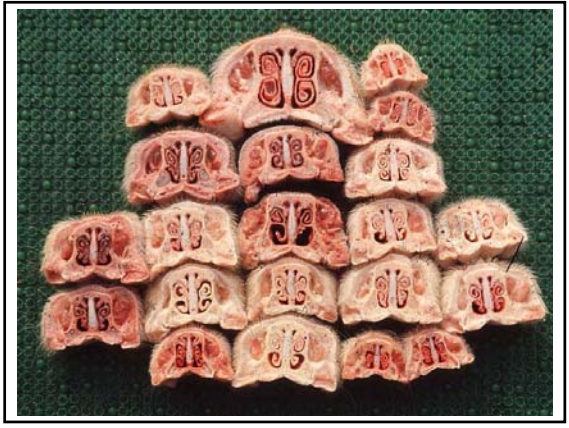
-extensive acute necrosis of ears and head and neck skin

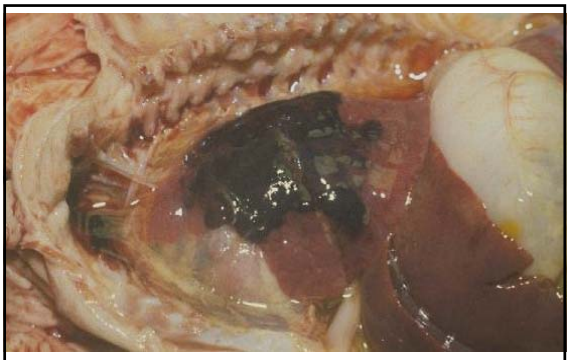


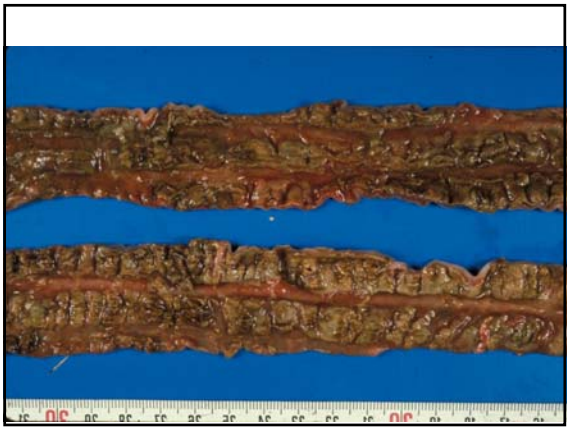


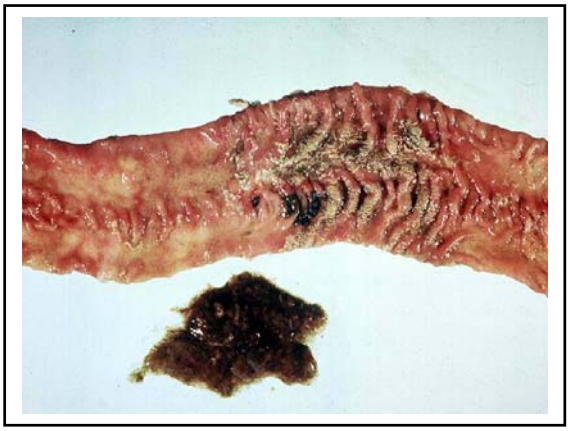




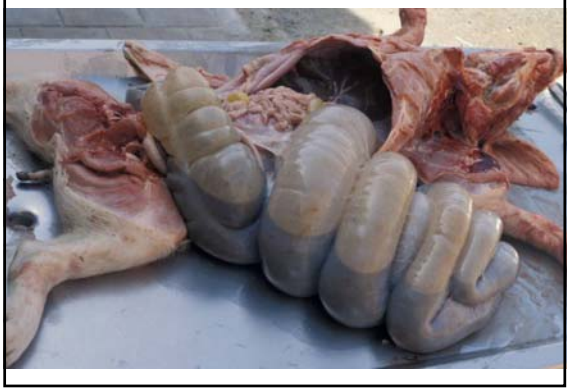


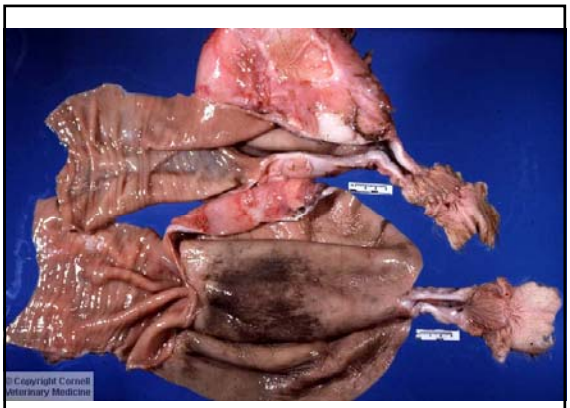


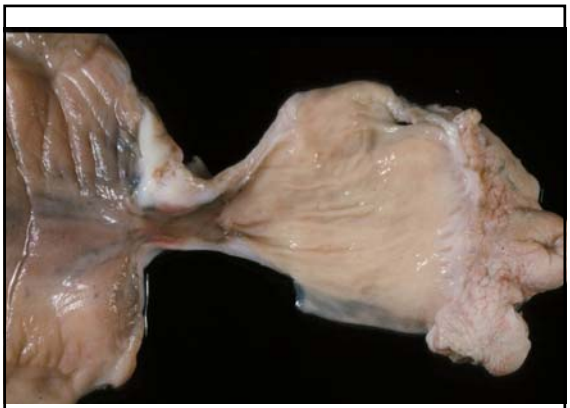


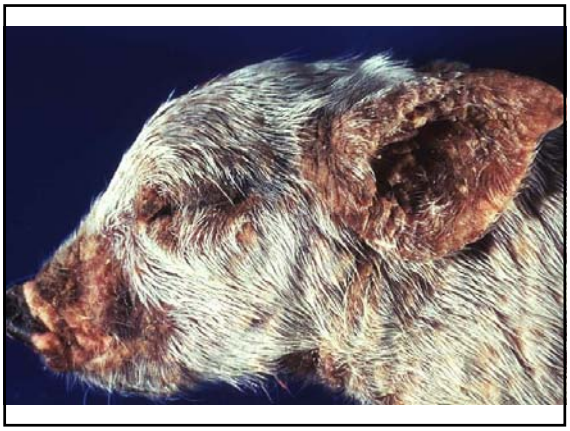


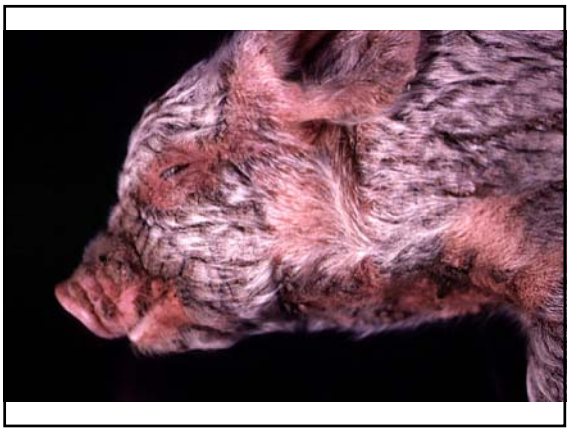

cm 1 2 3
IOWA STATE UNIVERSITY
85P1270

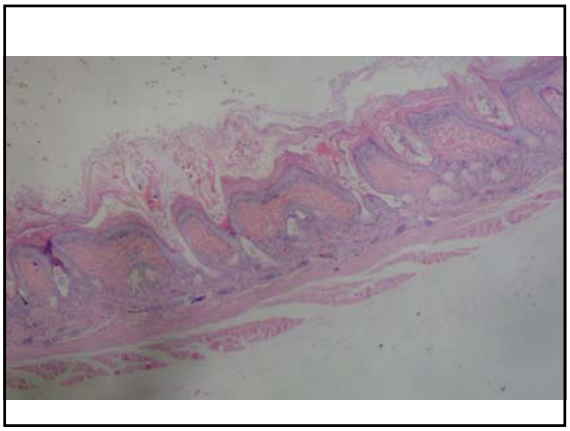


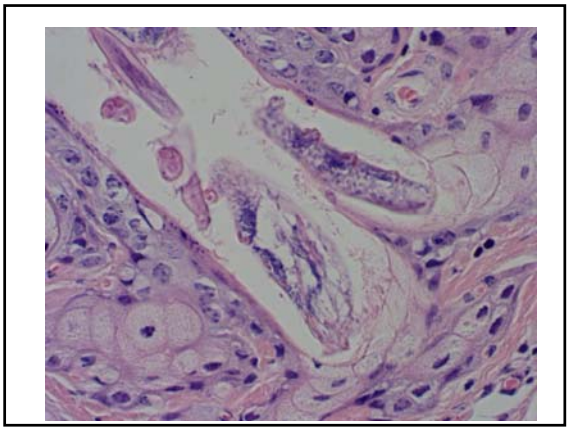

© Copyright Cornell
Veterinary Medicine

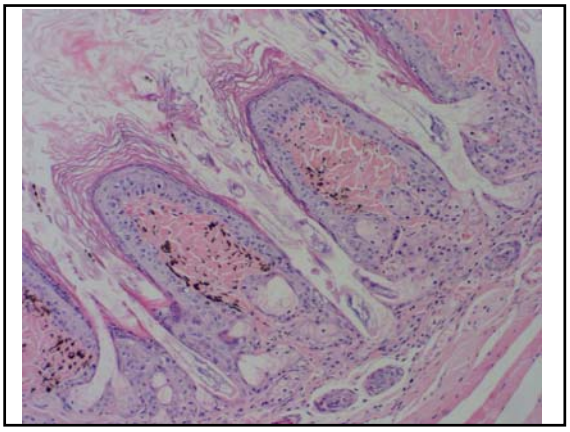


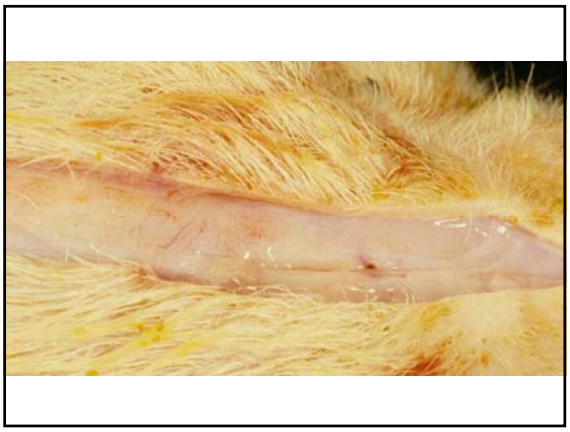


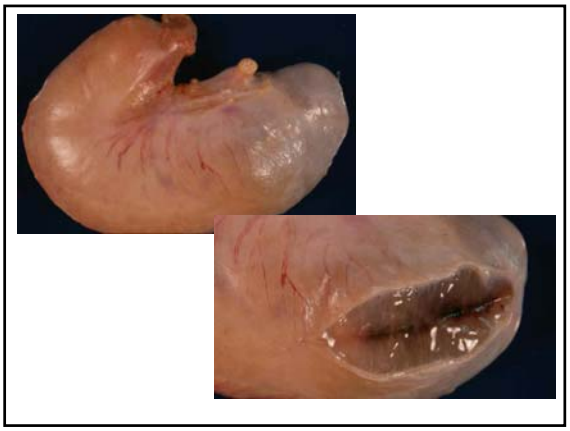


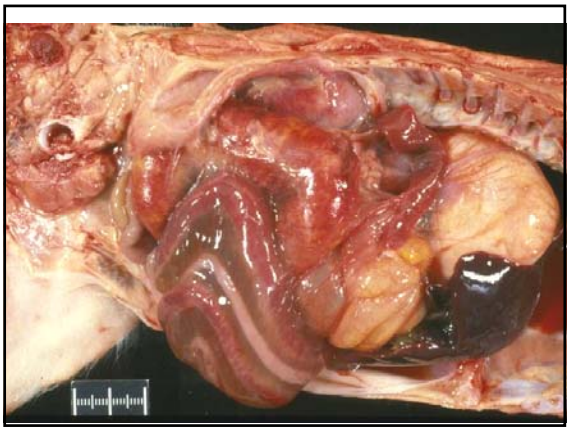


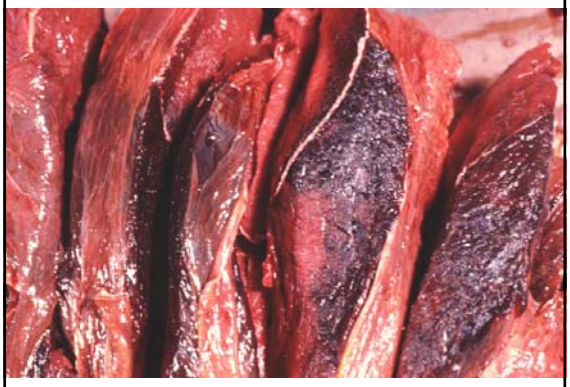


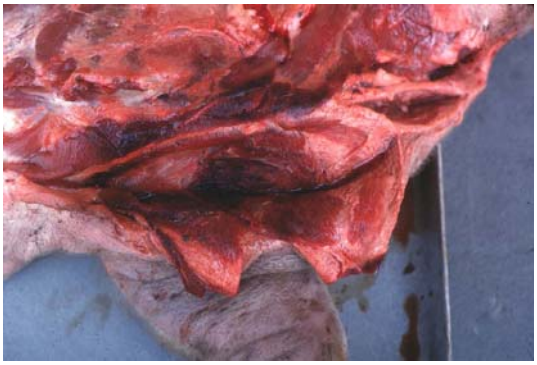




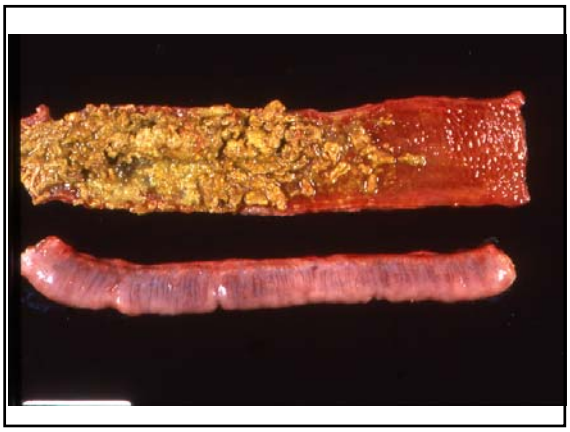








Picture from AFIP collection



•Francisco Garcia Marin, University of Leon, Spain
•Ana Alcaraz, Western University
•Andrew Miller, Harvard Medical School
•John M. King, Cornell University. http://w3.vet.cornell.edu/nst/
•Edward G (Ted) Clark , Centre Animal Diagnostic Laboratory, Calgary, Canada.
•Noha's Artchives University of Georgia
•Institute of Animal Pathology, Vetsuisse Faculty Bern

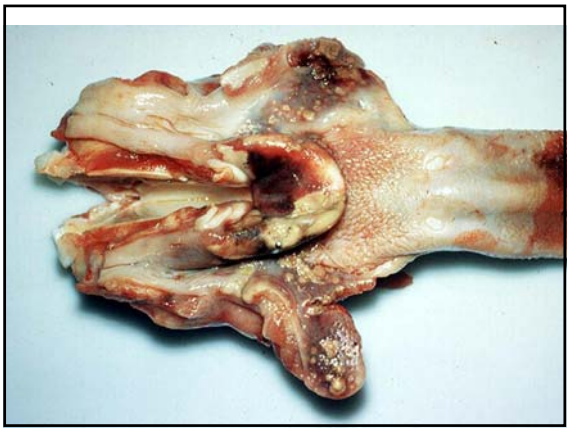
Pig Diseases

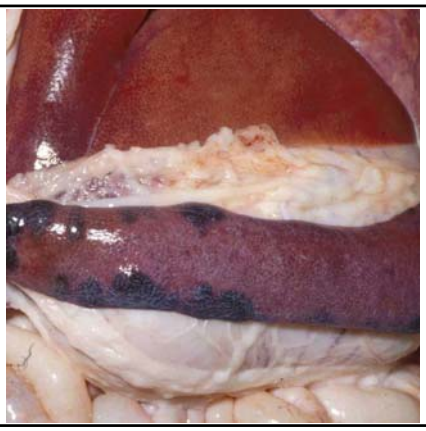
"C. L. Davis Foundation's "Gross Morbid Anatomy of Diseases of Animals"

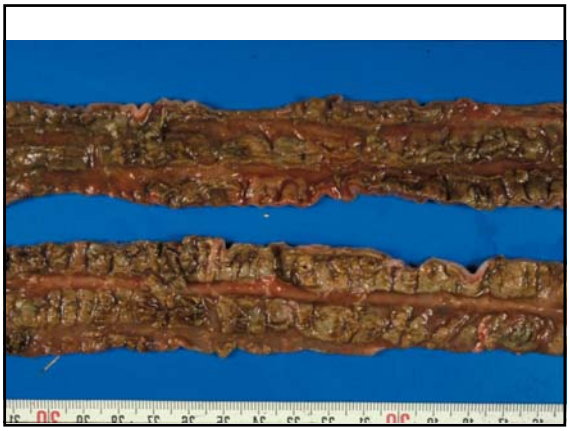
March 23-27, 2008,
AFIP, Washington, DC.

Ana Alcaraz, DVM, PhD
Diplomate ACVP
College of Veterinary Medicine
Western University of Health Sciences

Viral diseases







Available online at www.sciencedirect.com
ScienceDirect
Virus Research 129 (2007) 26–34
Virus Research
www.elsevier.com/locate/virusres

Identification of a novel virus in pigs—Bungowannah virus: A possible new species of pestivirus

P.D. Kirkland[a,*], M.J. Frost[a], D.S. Finlaison[a], K.R. King[a], J.F. Ridpath[b], X. Gu[a]

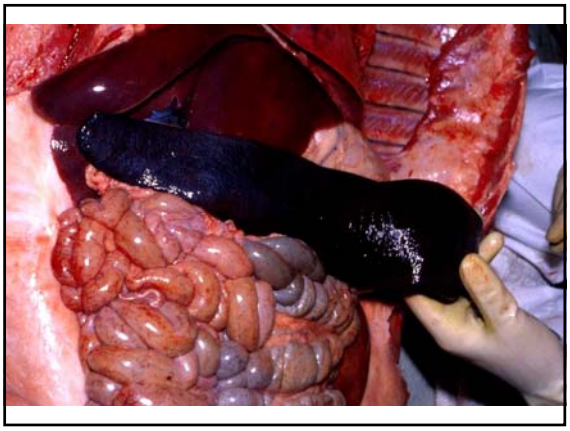
[a] Virology Laboratory, Elizabeth Macarthur Agricultural Institute, PMB 8, Camden, New South Wales 2570, Australia
[b] United States Department of Agriculture, National Animal Disease Center, 2300 Dayton Avenue, Ames, IA, USA

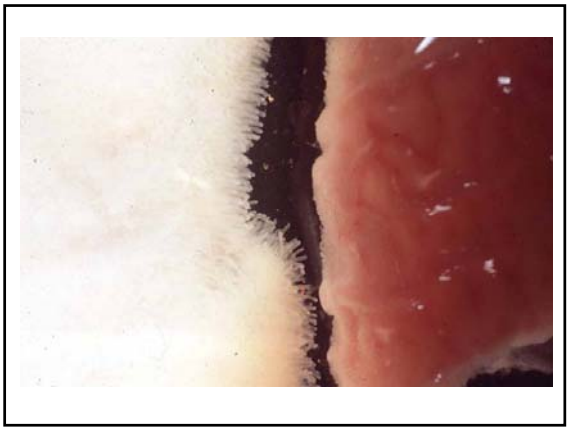
Received 2 February 2007; received in revised form 16 March 2007; accepted 2 May 2007
Available online 11 June 2007

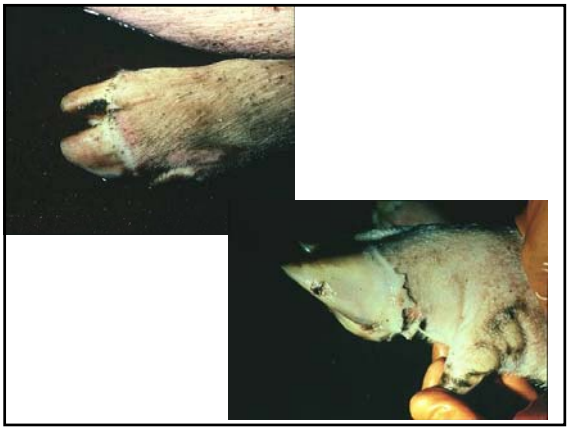
Abstract

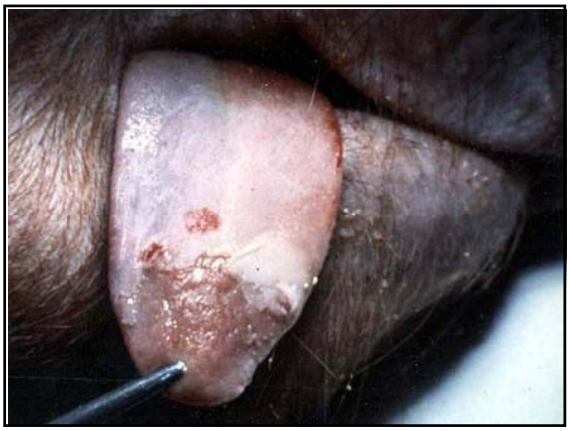
In 2003 an outbreak of sudden deaths occurred in 3–4-week-old piglets on a farm in New South Wales, Australia. There was a marked increase in the birth of stillborn foetuses. Pathological changes consisted of a multifocal non-suppurative myocarditis. A viral infection was suspected but a wide range of known agents were excluded. A modified sequence independent single primer amplification (SISPA) method was used to identify a novel virus associated with this outbreak. Conserved 5′UTR motifs, the presence of a putative N^{pro} coding region and limited antigenic cross-reactivity with other members of the *Pestivirus* genus, support the placement of this virus in the *Pestivirus* genus. Phylogenetic analysis of the 5′UTR, N^{pro} and E2 coding regions showed this virus to be the most divergent pestivirus identified to date.

Keywords: Bungowannah virus; Pestivirus; Porcine myocarditis syndrome

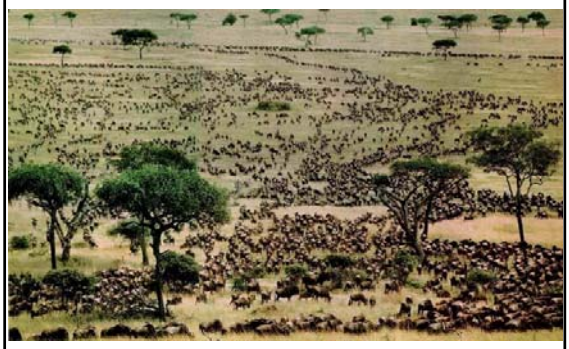


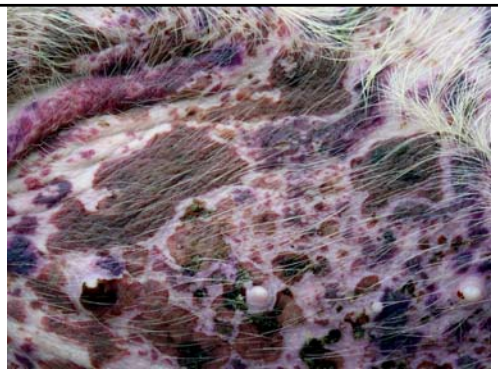


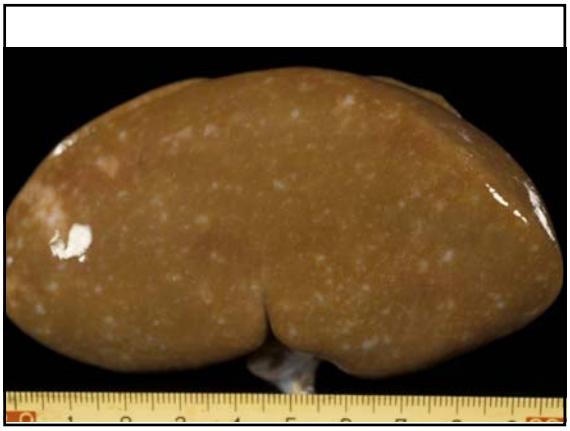


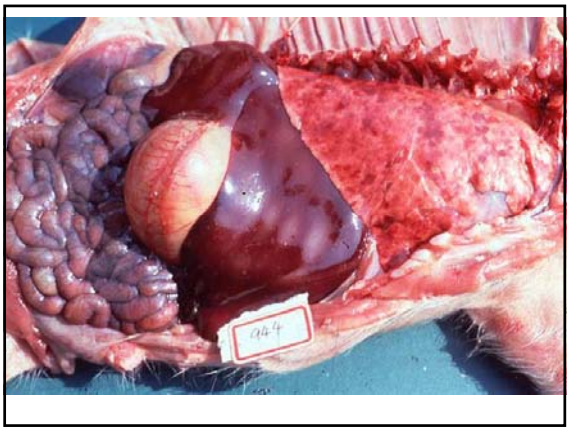


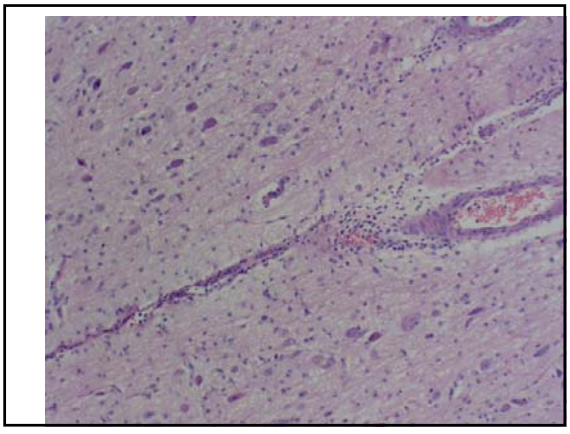

© Copyright Cornell Veterinary Medicine

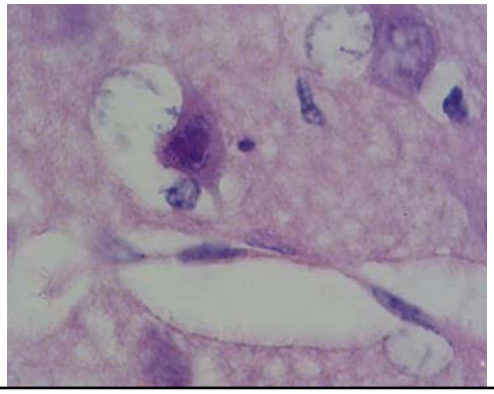


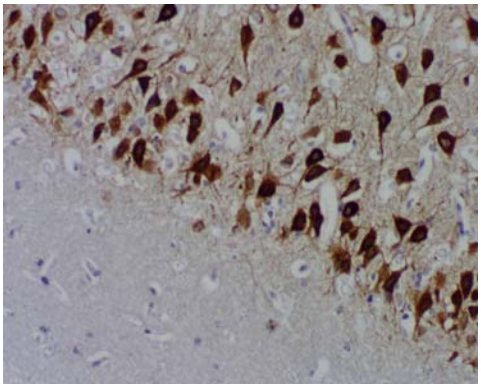


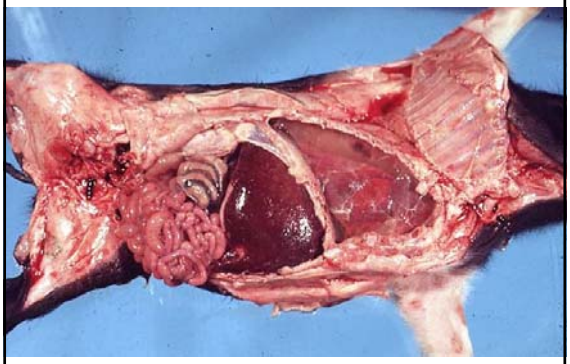




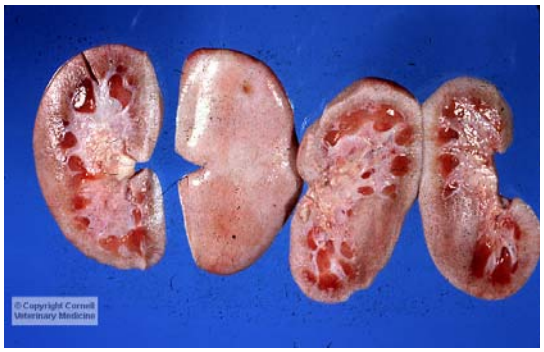


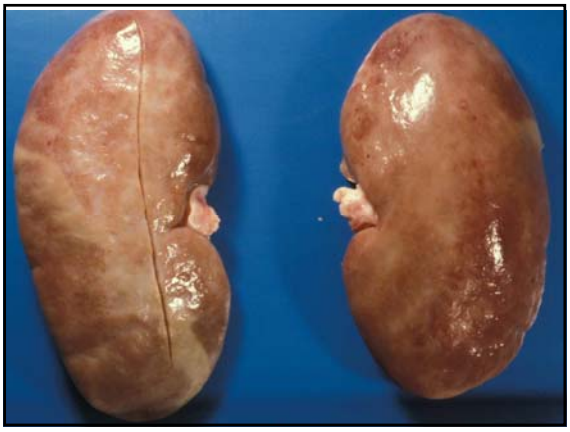


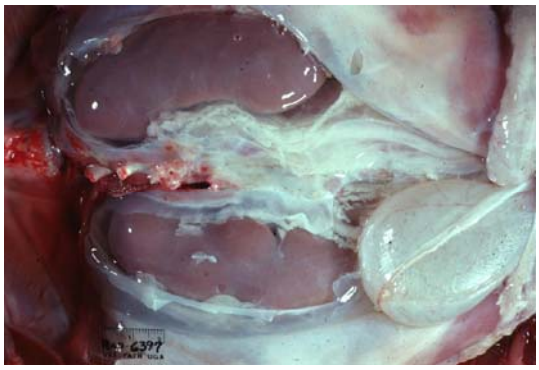


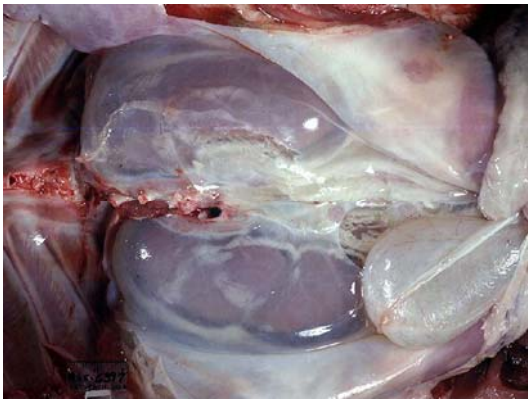


Toxins









•Francisco Garcia Marin, University of Leon, Spain
•Ana Alcaraz, Western University
•Andrew Miller, Harvard Medical School
•John M. King, Cornell University. http://w3.vet.cornell.edu/nst/
•Edward G (Ted) Clark , Centre Animal Diagnostic Laboratory, Calgary, Canada.
•Noha's Artchives University of Georgia
•Institute of Animal Pathology, Vetsuisse Faculty Bern

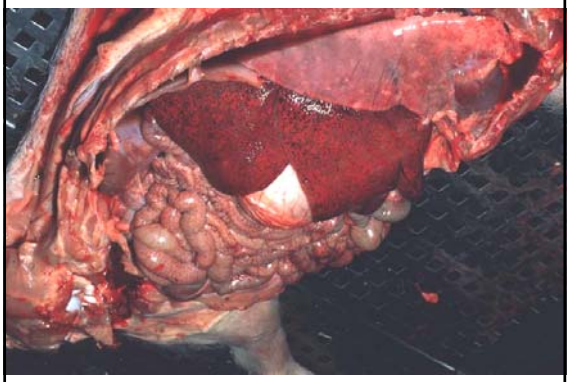
Pig Diseases

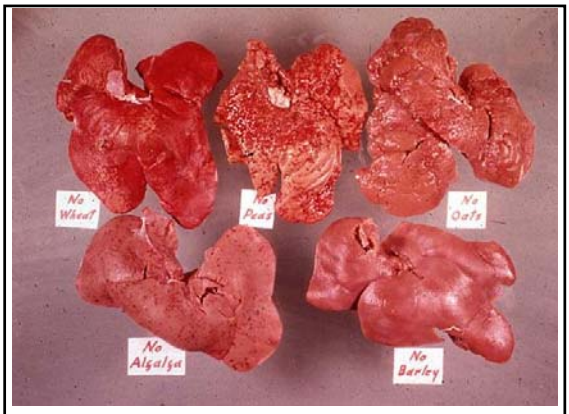
"C. L. Davis Foundation's "Gross Morbid Anatomy of Diseases of Animals"

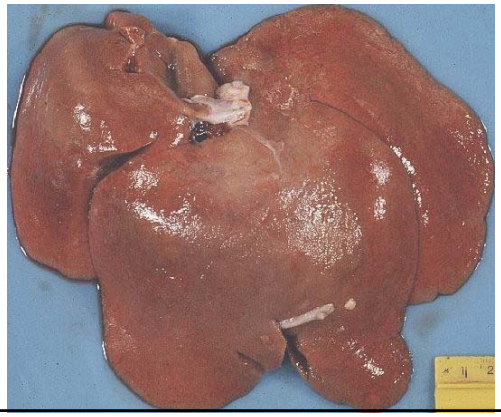
March 23-27, 2008,
AFIP, Washington, DC.

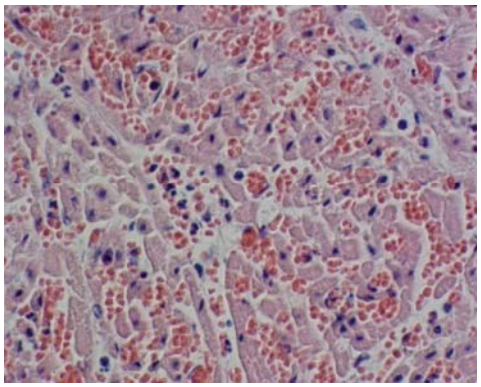
Ana Alcaraz, DVM, PhD
Diplomate ACVP
College of Veterinary Medicine
Western University of Health Sciences

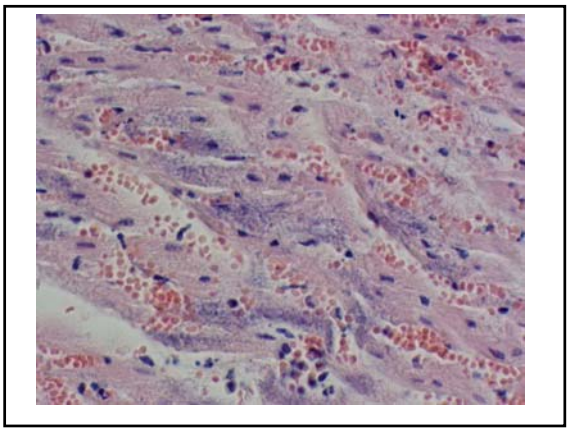
Other pig disease

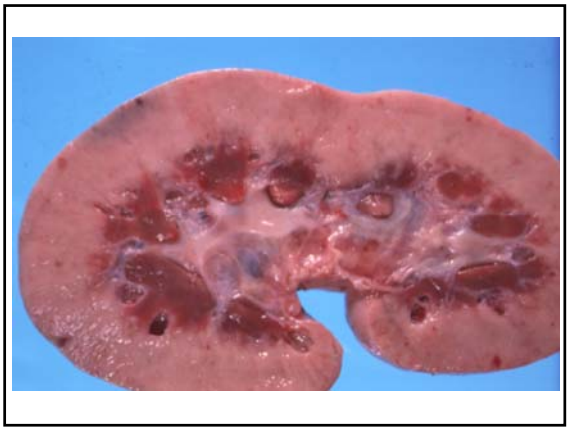


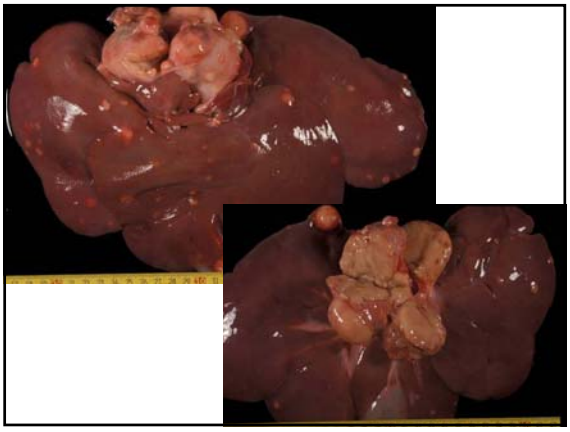


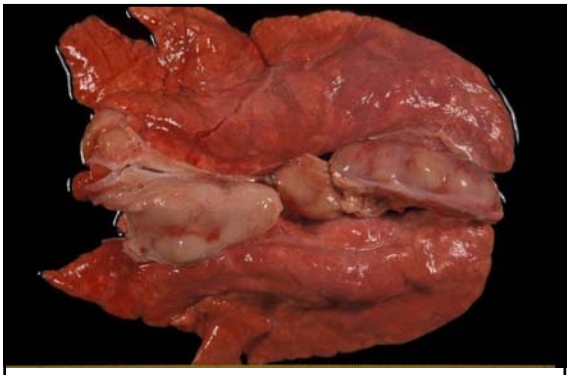










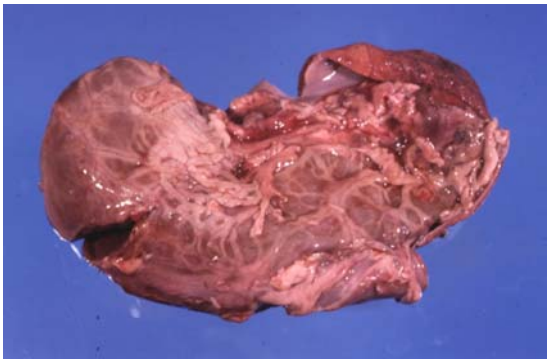


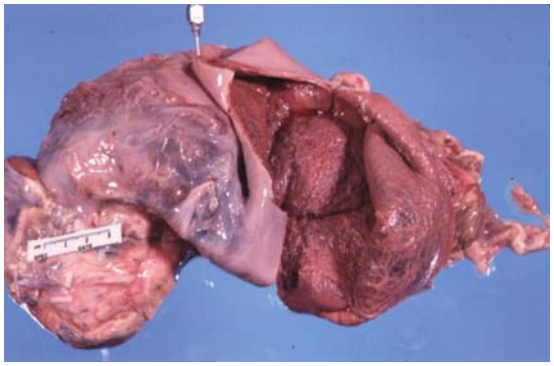

© Copyright Cornell
Veterinary Medicine

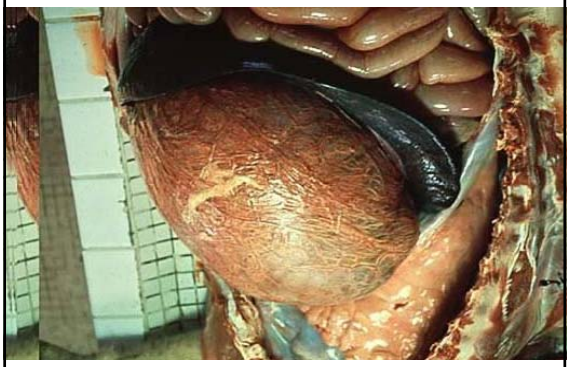

© Copyright Cornell
Veterinary Medicine

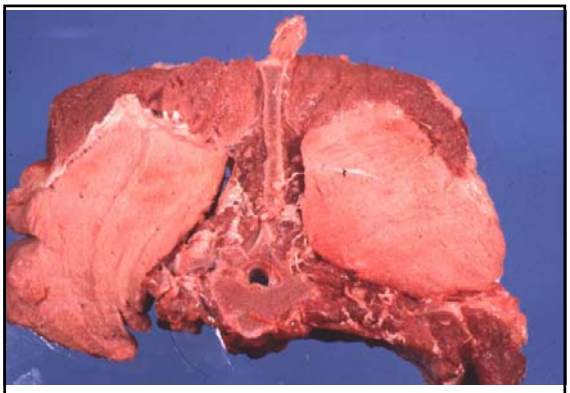

© Copyright Cornell
Veterinary Medicine

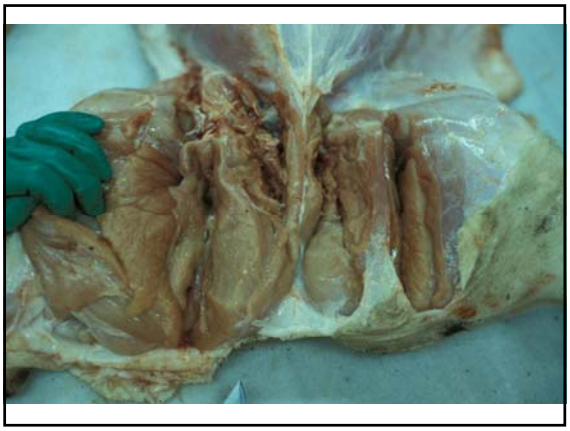

© Copyright Cornell
Veterinary Medicine

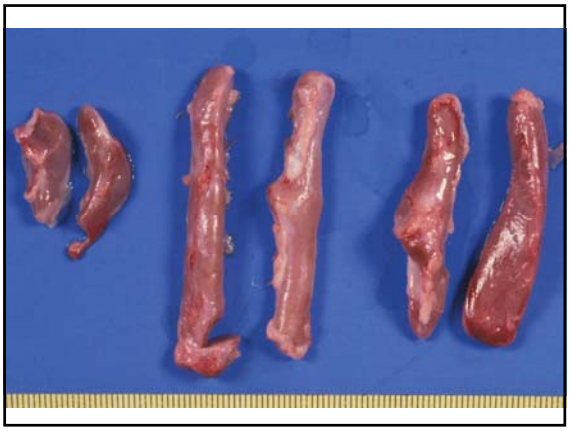


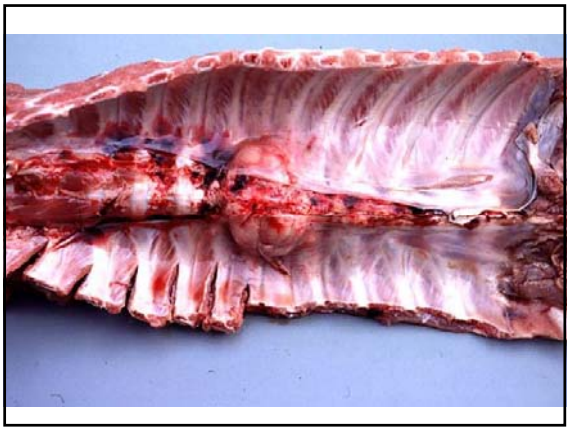


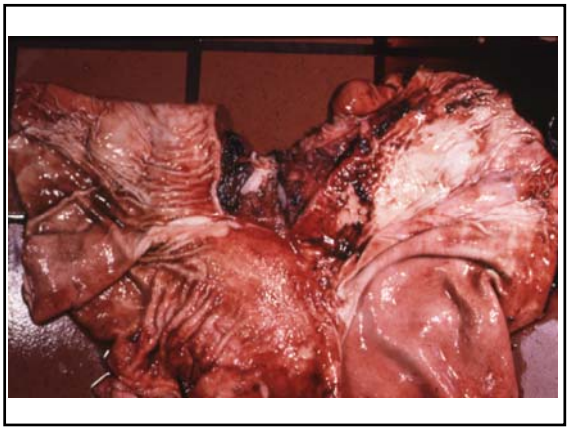


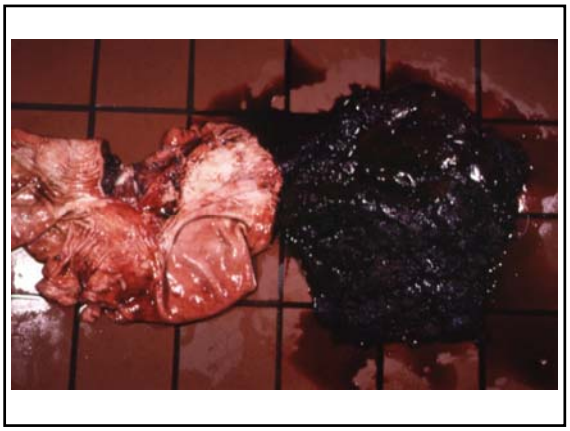


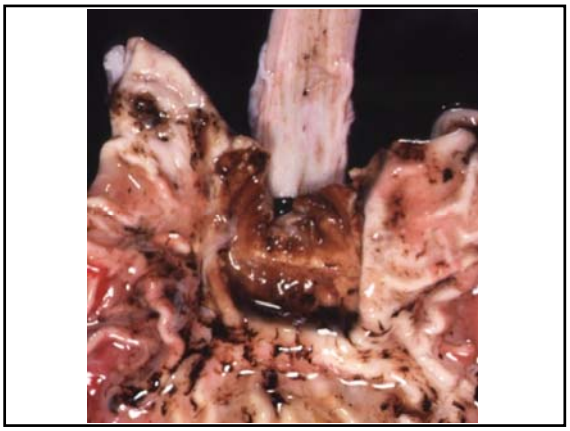


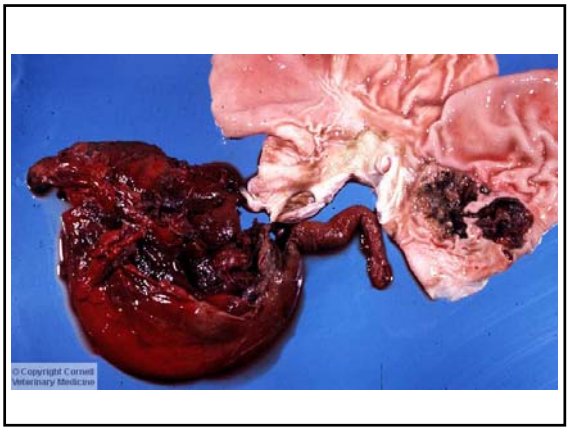


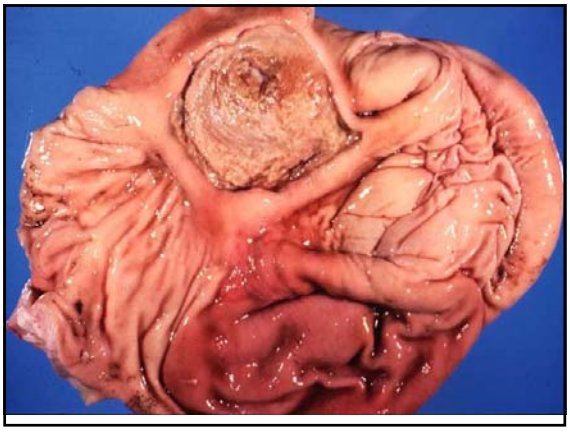


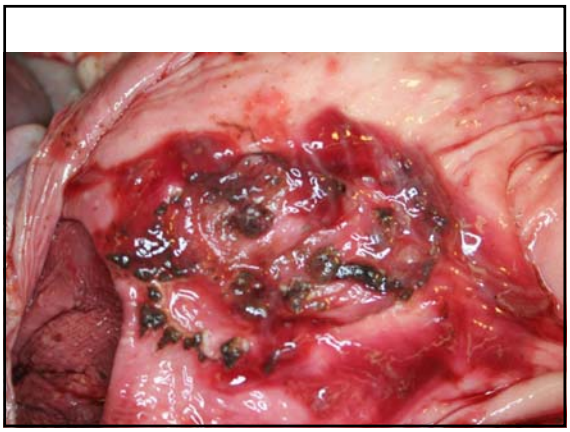


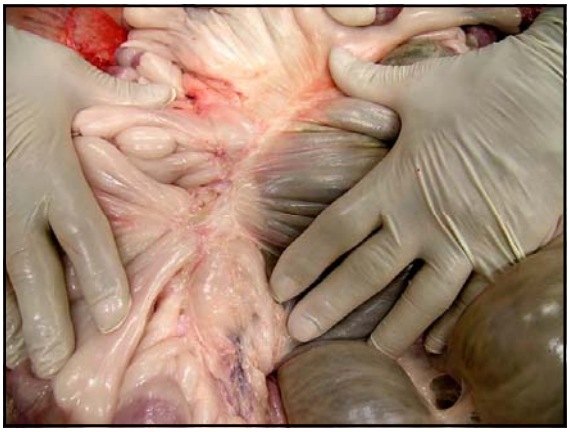


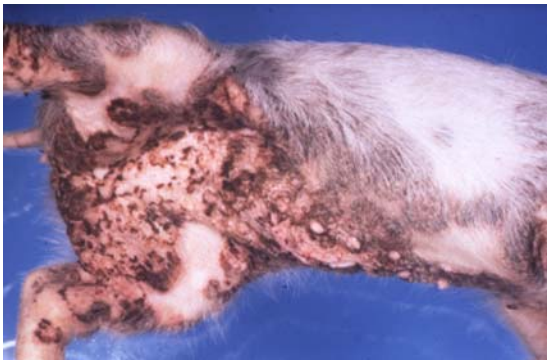


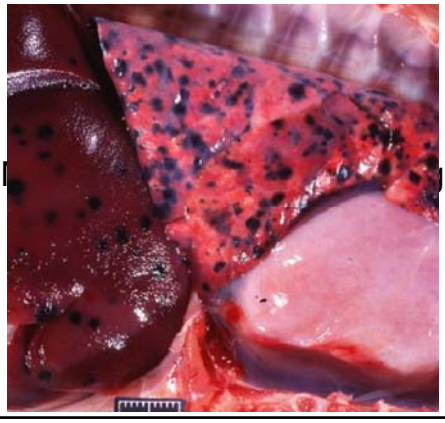

© Copyright Cornell
Veterinary Medicine



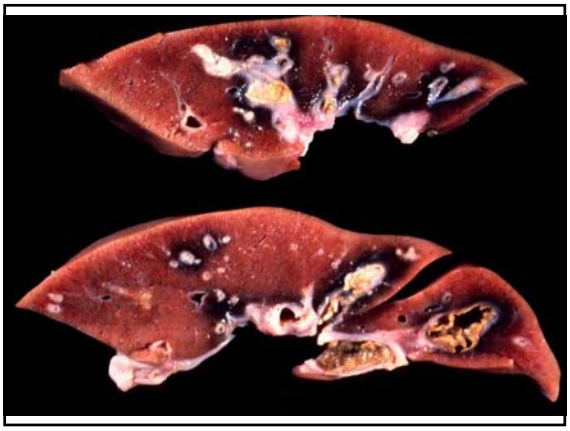


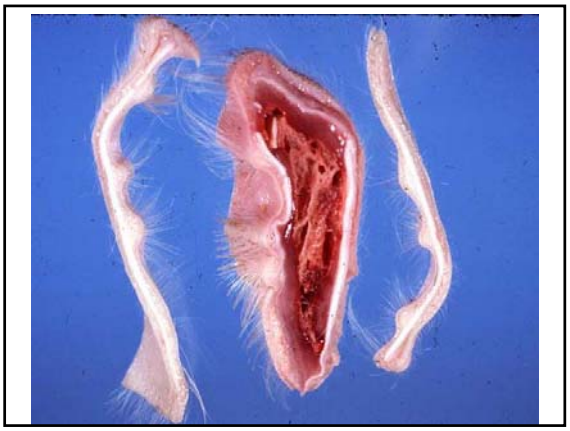


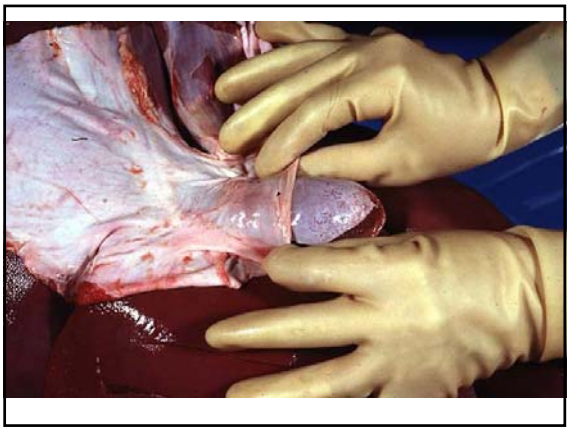


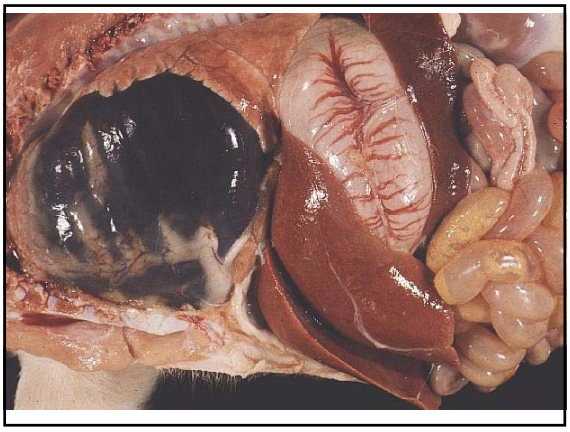


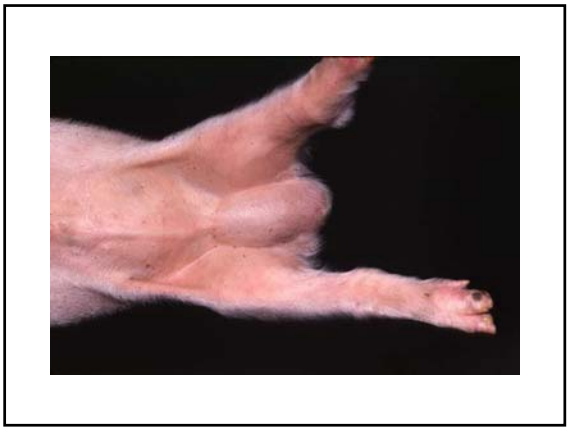
Diagnostic challenges

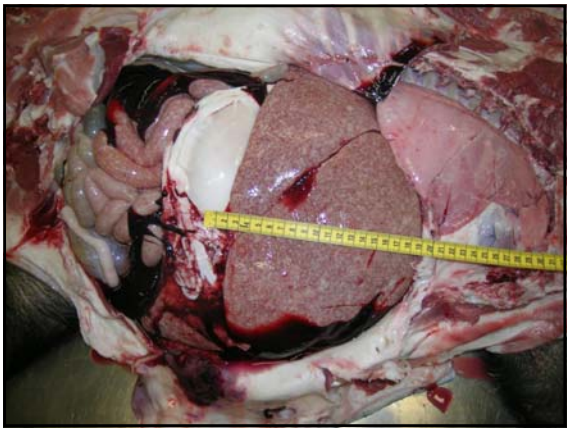












•Francisco Garcia Marin, University of Leon, Spain
•Ana Alcaraz, Western University
•Andrew Miller, Harvard Medical School
•John M. King, Cornell University. http://w3.vet.cornell.edu/nst/
•Edward G (Ted) Clark , Centre Animal Diagnostic Laboratory, Calgary, Canada.
•Noha's Artchives University of Georgia
•Institute of Animal Pathology, Vetsuisse Faculty Bern

Gross Morbid Pathology of Swine

C. L. Davis Foundation's "Gross Morbid Anatomy of Diseases of Animals"
March 23-27, 2008, AFIP, Washington, DC.

Ana Alcaraz DVM, PhD, DACVP, Associate Professor
College of Veterinary Medicine,
Western University of Health Sciences
Pomona Ca, 91766
Tel.: 909-706-3479; E-mail: aalcaraz@westernu.edu

Introduction

CONGENITAL LESIONS

Whole body	Congenital lesion-hereditary	Amelia	
Abdominal muscles	Congenital	Abdominal wall: Umbilical hernia with small intestinal infarction	sequel to omphalitis
Whole body – joints	Genetic autosomal recessive in Yorkshire pigs teratogens	Severe arthrogryposis	DDx- in utero vitamin A or Manganese def, Classical swine fever, wild black cherry (bark) or poison hemlock (Nipha virus?)
Leg -bones	Autosomal recessive	congenital hyperostosis	fatal in first few weeks of life
Tongue:	Genetic autosomal recessive	Epitheliogenesis imperfecta	Concurrent hydroureter and hydronephrosis. Multiplicity of defects.
Whole body		Conjoined twins, thoracopagus	
Body as a whole:	Polygenic inheritance in Landrace, males more susceptible	Diffuse myofibrillar hypoplasia (Splay leg)	Deltoids and semitendinosus most often involved
Head		Cyclops	
Brain:	Congenital	Cranioschisis and meningoencephalocoele	Neural tube defects. Insult: 2 weeks gestation
Heart:		focal ventricular septal defect	Male>females High incidence of foramen ovale observed in large white and landrace breeds

Tissue	Etiology	Gross Diagnosis	Notes
Heart		Ectopia cordis	
heart	Genetic defect probably autosomal recessive	Myocardial rhabdomyomatosis or hamartomas. -	these are hamartomas of myocardial muscle, not true tumors - Incidental findings in adults -pigs are of normal size and health status
Whole bodies		Atresia Ani	
Kidneys		Bilateral renal agenesis	
	Hereditary (autosomal recessive) disease of Landrace pigs.	Dermatosis Vegetans Characterized by crusting lichenified cutaneous lesions which coalesce to cover much of the body, Foot deformities, and a Giant Cell Pneumonitis	congenital or develop at 2-3 weeks of age.
	Autosomal dominant,		over-production of porphyrin pigments from hemoglobin formation
Uterus	Congenital defects	Horn duplication Atresia Hypoplasia	
Heart	Congenital defect	Incomplete subaortic ring	Most common defect in dogs, unknown in pigs
Hear	Congenital defect	Patent ductus arteriosus	
Kidney	Congenital	Common developmental Polycystic anomaly. May be observed in up to 27% of kidneys at slaughter.	Polycystic Kidney. Incidental finding in pigs and other species s.a. bovines
Scrotum	Congenital	Inguinal / Scrotal Hernia/ umbilical hernia	More common in males
Skin, liver, lung		Skin, liver, lung: multifocal metastatic melanoma	High incidence in Sinclair strain of miniature swine. Duroc- benig cutaneous melanomas

Tissue	Etiology	Gross Diagnosis	Notes

PARASITIC DISEASES

Liver	*Ascaris suum* and *Stephanurus dentatus* larval migration	Chronic, coalescing hepatic fibrosis (fibrosis hepatitis)	(Milk Spots Liver) Associated lesion: eosinophilic pneumonia
Heart omentum	Metacestodes of *Taenia solium*	Myocardial cysticersosis Etdx: Skeletal muscular cestodiasis (metacestodiasis) or cestodal myositis	*Cysticercosis*
Intestine	*Isospora suis*	Necrotizing enteritis	DDX salmonellosis
Tongue	*Gongylonema spp*	No significant lesion Incidental finding	Nematode is in the superficial epithelium, similar to the bovine parasite found in esophagus
Intestine	*Macracanthorhynchus hyrudinaceous*	Multifocal intestinal granulomas associated with *Macracanthorhynchus hyrudinaceousl* (The Thorny-Headed Worm)	
Intestine	Oesophagostomum spp	*nodular lesion large inteistine*	
Lung	*Metastrongylus spp*	Round worm	What are the lung worms in other species.?
Intestinal Parasite	Roundworms *(Ascaris suum)* Whipworm *(Trichuris suis)* *Oesophagostonum spp-* Thorny-Headed Worm: *Macracanthorhynchus hyrudinaceous*	Intestinal Parasite *Oesophagostonum spp-nodular lesion large inteistine* *MDx: Colon or cecum: Diffuse catarrhal typhlocolitis with many trichuris suis* *Cause: Trichuris suis*	Roundworms *(Ascaris suum)* Whipworm *(Trichuris suis)* Thorny-Headed Worm: *Macracanthorhynchus hyrudinaceous*
Stomach	Hyostrongylus rubidus	MDx: Stomach: Multifocal hyperplastic and ulcerative gastritis	DDx for stomach ulcers in pigs): Idiopathic ulceration of pars esophagea; Salmonellosis; Aspergillosis This parasite is usually not pathogenic, but can induce hyperplasia and ulceration
Skin (ear)	Sarcoptic mange-*S. scabei var suis*		-occasional cause of skin disease in some

Tissue	Etiology	Gross Diagnosis	Notes
			herds and the ears of sows
		BACTERIAL AND VIRAL DISEASES	
Lung	*Mycoplasma hyopneumoniae*	Enzootic pneumonia (combination of M. hyo and an opportunistic bacteria). Mild, multifocal, anteroventral consolidation	IHC is good test to make a definitive DX.
Lung	*Mycoplasma hyopneumoniae*	HISTO: an extremely chronic case with BALT hyperplasia severe	Well-demarcated, tan-colored anteroventral consolidation. PCV-2 and Mycoplasma Vet Path 41: 599-711 2004 If it is not firm, it is not pneumonia
Lung	*Pasteurella multocida*	Purulent exudate is present in airways on the cut surfaces. IHC used in the diagnosis. Similar to pastuerellosis in rabbits	common cause of suppurative bronchopneumonia and is part of the PRDC -it is usually secondary to *M. hyopneumoniae*, PCV2 or PRRS virus infection -type D also causes atrophic rhinitis- See below
Lung	*Actinobacillus pleuropneumoniae* – "pleuropneumonia"	acute fibrinous and necrotizing pleuropneumonia	very similar to *Mannheimia haemolytica* in cattle -the distribution can be extremely variable from case to case with involvement of one lung only not uncommon
Lungs	*Actinobacillus pleuropneumoniae*	Bilateral FIBRINOHEMORRHAGIC pleuropneumonia and bronchopneumonia DDx for fibrinonecrotic pleuropneumonia in pigs: Actinobacillus pleuropneumoniae Actinobacillus suis Streptococcus suis Salmonella choleraesuis case report pleuropneumonia in a piglet DDx *Morganella morganii* [Ono, Vet Path 38: 336-339, 2001]	

Tissue	Etiology	Gross Diagnosis	Notes
Lung	*Actinobacillus pleuropneumoniae* – "pleuropneumonia	Subacuteto chronic necrotizing pneumonia	necrotic tissue becomes pale -eventually the necrotic areas become walled off if the animal survives
Liver	*Actinobacillus pleuropneumoniae* – "pleuropneumonia	Multifocal granulomatous hepatitis (J. Comp Path 2008 139: 61-66)	
	Mycobacterium avium	Multifocal hepatic granulomas	
Lung and skin	*Actinobacillus suis*	septicemia/bacteremia -It is part of the normal upper respiratory tract flora and it can result in a bacteremia or septicemia after stress is a common sequel or after another disease process. -Cutaneous pustules or foci of necrosis are not uncommon	
Lung	*Actinobacillus suis*	acute septicemic case with multifocal white foci visible, representing bacterial colonies, necrosis and neutrophils -these foci may be visible in multiple tissues, especially liver, skin, spleen and lung	
Lung	Swine influenza virus (SIV; orthomyxovirus)	MDx: Lung: Diffuse interstitial pneumonia with multifocal lobular atelectasis	M. hyopneumoniae does not potentiate disease [Thacker, J Clin Microbiol 39: 7, 2525-2530, 2001]
	Swine Influenza (SIV)	Mild, multifocal, anteroventral, lobular bronchopneumonia (or lobular atalectasis)	Signalment and Clinical Signs (Sudden onset, High morbidity, Barking cough). May exhibit a "checkerboard" appearance
		- Two subtypes of SIV: H1N1 more common in USA, and H3N2 [REF: Choi et al, 2002, Arch Virol 147: 1209-1220]. Korea gets H1N2 [REF: Jung JVDI 17: 176-178, 2005] -Hallmark lesion of SIV is NECROTIZING BRONCHIOLITIS causing CHECKERBOARD PATTERN [Jung et al, Vet path 39: 10-16, 2002; Gramer, 2005, J Swine Health Prod 13: 157-160] Whereas SIV can be potentiated by concurrent infection with PRRSV and possibly PCV2, Mycoplasma	
	Porcine Respiratory Coronavirus (PRCV)	Mild, multifocal, anteroventral lobular	Gross and microscopic lesions similar to SIV

Tissue	Etiology	Gross Diagnosis	Notes
		bronchopneumonia (or lobular atalectasis)	
Lung	Porcine Respiratory Disease Complex (PRDC)	Severe, bronchointerstitial pnuemonia	Multi-agent pneumonia
	PRDC	DDx: Anteroventral Consolidation: M. hyo, SIV, PRCV, Bacterial Bronchopneuimonia DDx: Interstitial Pneumonia: PRRSV, PCV2, Bacterial speticemia, Larval migration DDx: Bronchointerstitial pnuemonia (all of the above) DDx: For anteroventral consolidation (M. hyo, SIV, PRCV, Bacterial Bronchopneuimonia)	
Lung	Porcine Reproductive and Respiratory Syndrome (PRRSV)	Severe, diffuse interstitial Pneumonia	
Lymph nodes	PRRSV	Diffuse Lymph Node Enlargement (Moderate, lymph node hyperplasia)	PRRSV infection typically cases an interstitial pneumonia and diffuse lymph node enlargement.
	PRRSV	Mild diffuse, interstitial pneumonia (low virulent strain) Severe diffuse, interstitial pneumonia (high virulent strain)	Single stranded RNA virus with marked strain differences.
	Porcine Circovirus 2 (PCV2)	Signalment (8-20 weeks) Clinical Signs: Weight loss, Dyspnea, Pallor, Diarrhea, Jaundice	
Lung , lymph node	PCV2 Porcine Circovirus-associated disease	Gross Lesions: Diffuse interstitial Pnuemonia, Diffuse lymph node enlargement.	DDX: Gross Lesions are typically indistinguishable from PRRSV. *Samonella cholerasuis*
	Haemophilus parasuis	-acute fibrinous polyserositis	Lesion associated with *H. parasuis* is known as Glasser's disease
	Haemophilus parasuis (Glasser's Disease)	Severe, acute, diffuse fibrinopurulent pleuritis and pericarditis (Polyserositis)	DDx: *Strep suis, Mycoplasma hyorhinis, Actinobacillus suis*
	Differential diagnosis	-*Mycoplasma hyorhinis* can also produce polyserositis in larger feeder pigs but uncommon -*H. parasuis* very difficult to impossible to isolate if antibiotics were given these pigs often have fibrinous arthritis and meningitis as well -*E. coli* septicemia and *Strep suis* can produce identical lesions in young suckling or feeder pigs, meningitis is common.	

Tissue	Etiology	Gross Diagnosis	Notes
	H. parasuis		isolated in complicated bronchopneumonia cases Other etiologies that may contribute to cases of pneumonia include: *Mycoplasma hyopneumoniae* , PCV2 or PRRS virus and swine influenza virus
Systemic disease	*Streptococcus suis* – nursery*; Haemophilus parasuis* – nursery*; Actinobacillus suis* – any age (grow/finish most commonly)*; Salmonella choleraesuis* – grow/finish*; Erysipelothrix rhusiopathiae* – grow-finish, adults		
	Streptococcus suis	Acute deaths due to septicemia, Polyserositis, Arthritis, Meningitis bacterial opportunist in bronchopneumonias	Nursery pigs:
	Erysipelas rhusiopathiae septicemia	Gross Lesions: Rhomboid urticarial lesions (diamond skin lesions) Erythema / Cyanosis of extremities and ventral abdomen. Arthritis	Occasional Gross Lesions Gastric Infarction Enlarged Spleen Turkey-egg kidney
	Erysipelas rhusiopathiae septicemia	1. Multifocal rhomboid, to coalescing, cutaneous infarction (diamond skin lesions); 2. Multifocal rhomboid, cutaneous erythema (diamond skin lesions);	DDX: Porcine Dermatitis and Nephropathy Syndrome (PDNS) (see below and *A. suis*
	Erysipelas rhusiopathiae septicemia	Heart: Severe, Vegetative Valvular endocarditis Joint: Severe, Chronic, Diffuse Proliferative Arthritis	Chronic manifestations of Erysipelas
	Erysipelas rhusiopathiae septicemia	Multifocal renal cortical petechia (Turkey-egg kidney)	DDx: 1. Bacterial Septicemia (Erysipelas, *Salmonella choleraesuis*) 2. Viral Infections (CSF, ASF, MCF) 3. PDNS
	Erysipelothrix rhusiopathiae - Erysipelas diamond skin disease is due to cutaneous vasculitis and thrombosis -occurs mainly in large feeder and finisher pigs -simmetric lesion in the ears. Think about **core temperature gangrene**		

Tissue	Etiology	Gross Diagnosis	Notes
	-these are subacute and antibiotic therapy will often allow them to recover		
Nasal turbinates	Toxigenic *Pasteurella multocida* type D +/- Bordetella	Atrophic Rhinitis Absorbed → inhibits osteoblasts, inhibits chondrocyte proliferation, stimulates (indirectly) osteoclast → bony atrophy in nasal turbinates and physes of long bones	Progressive AR is caused by Bordetella + toxigenic *Pasteurella multocida* type D Progressive AR causes stunted growth and turbinate atrophy. Gross Lesions: a. Distortion of the snout (shortening, lateral deviation), b. Turbinate atrophy, c. Oculonasal discharge
Head Lung		Atrophic rhinitis Shortened snout (Progressive Atrophic Rhinitis) *Bordetella spp* results in a hemorrhagic, necrotizing pneumonia is suckling piglets (not on the same pigs with severe atrophic rhinitis, so there may be strain differences)	
	Porcine Cytomegalovirus Inclusion Body Rhinitis	Clinical signs: a. Generally observed in suckling pigs, b. Sneezing, c. Nasal discharge, d. Coughing, e. Decreased growth rate	Inclusion Body Rhinitis
	Inclusion Body Rhinitis (Porcine Cytomegalovirus)	Mucopurulent Rhinitis	Inclusion Body Rhinitis (Porcine Cytomegalovirus)
	Major Causes of diarrhea in Swine	Suckling Pigs: *C. perf type A, C. difficile, E. coli, C. perf type C,* TGE, Rota, Coccidia Nursery Pigs: Hemolytic E. coli, Salmonella, Coccidia, TGE, Rotavirus Grow/Finish pigs: Lawsonia, Salmonella, Brachyspira, Whipworms, (TGE)	
	Salmonella choleraesuis septicemia	Common Gross Lesions: a. Erythema / Cyanosis of extremities and ventral abdomen, b. Splenomegaly, c. Enlarged, hemorrhagic LN's, d. Interstitial to bronchointerstitial pneumonia, e. severe multifocal to diffuse necrotic enterocolitis	
	Salmonella cholerasuis- or S. Typhimurium enterocolitis	MDx: Severe necrotic enterocolitis MDx: Rectum: Locally extensive circumferential ischemic necrosis with rectal stricture or segmental atresia	Associated lesion: atresia coli. Becareful because Salmonella is not always isolated from these cases. MEGACOLON!

Tissue	Etiology	Gross Diagnosis	Notes
Intestine	S. typhi-suis, S. choleraesuis, S. typhimurium	Colon: Multifocal to coalescing fibrinonecrotizing and ulcerative colitis (caused by Salmonella typhi-suis in this case) DDx for button ulcers in colon are: S. typhi suis, S. choleraesuis, S. typhimurium Classical swine fever (hog cholera)	
	Brachyspira hyodysenteriae 5 species of (Serpulina) Brachysphyra	Distal Small Intestine: *Lawsonia, Salmonella typhimurium* Colon: *Brachyspira hyodysenteriae* (Swine dysentery), *Brachyspira pilosicoli* (intestinal Spirochetosis), *Salmonella typhimurium*, *Salmonella choleraesuis* (uncommon), Lawsonia (uncommon)	Enteric Diseases of Grow/finish pigs. *S. pilosicoli*= Intestinal spirochetosis
	MDx: Colon: Catarrhal, hemorrhagic, and fibrinonecrotic colitis *Cause: Brachyspira hyodysenteriae* *Name the disease: Swine dysentery* *ALWAYS large intestine, but otherwise looks like Lawsonia or Salmonella.* *Balantidium often secondary invader* *Salmonella typhimurium often secondary invader causing vascular lesions, which don't see with swine dysentery*		
Skin	*Staphilococcus hyicus*	Name the disease: Greasy Pig Disease MDx: Severe Exudative Epidermitis	Focal to generalized, crusting and exudative skin lesions typically observed in suckling and nursery pigs
Skin	Mange: *Sarcoptes scabiei* var *suis*	Clinical signs: a. Pruritis with scratching/rubbing, b. Crusting skin lesions, c. Cutaneous erythema.	Mange *Sarcoptes scabiei* var *suis* DDX for Severe Exudative Epidermitis
Periocular subcutanous	*E. coli* Edema Disease	Eyelid edema	Marked edema of the gastric mucosa
Stomach	*E. coli* Edema Disease	Edema Disease. The gross lesion is not always present. Histopathology lesion is microangiopathy.	Pathogenesis of Edema Disease: *E. coli* (usually hemolytic) attaches to enterocytes by pili (K88, F18) → elaborates shiga-like toxin (Stx2e) → toxin causes systemic increased capillary permeability.
Gastrointestinal	*E. coli* Edema Disease	Gastric edema Mesocolinic edema	The typical gastric lesion is found in less than 10% of the cases

Tissue	Etiology	Gross Diagnosis	Notes
Skeletal muscle	Clostridial Myositis *Clostridium perfringes or Clostridium septicum*	Severe, acute, locally extensive, necrohemorrhagic myositis	Wound infectious with Clostridia acting alone or in combination
	Clostridium perfringens type C	Small intestine: Segmental necrohemorrhagic enteritis with mild subserosal emphysema	
		Clinical sign: Bloody diarrhea May be transmural Causes subacute disease in 1-2 wk old piglets; partial protection from lactogenic immunity	
	Lawsonia intracellularis	Porcine Proliferative Enteropathy	Forms: Acute hemorrhagic PE (Most often observed in pigs > 200 lbs) Porcine intestinal adenomatosis (PIA is the "proliferative" form) Necrotic enteritis (Rarely progresses to Regional Ileitis ("hose pipe gut"), DDx enteric Salmonellosis
	Lawsonia	Proliferative and fibrinonecrotic enteritis	DDX: Salmonella typhimurium
	Lawsonia	Proliferative and Proliferative and necrotizing colitis due to Lawsonia	Proliferative Ileitis does not just effect the ileum.
Intestine	PCV2 enterits		Gross Lesions: 1. Ileum thickened, edematous (can be confused with Ileitis (Lawsonia) on gross examination), 2. Diffuse Lymph Node Enlargement Histopath: 1. Granulomatous enteritis, 2. Lymphoid depletion, 3. Abundant PCV2 antigen by IHC
Intestine and lymph nodes	PCV2 enteritis		Granulomatous enteritis; moderate, mesenteric lymphadenopathy.
	Porcine Circovirus 2 (PCV2)	Preferred Terminology: Porcine Circovirus-Associated Disease (PCVAD)	Co-Infection with porcine parvovirus (PPV), PRRSV, *M. hyo.,* or the administration of certain, oil based vaccines, typically

Tissue	Etiology	Gross Diagnosis	Notes
			result in higher levels of viremia, of longer duration, and can lead to the development of clinical PCVAD
	PCVAD	Wasting Pig	
	PCVAD	Moderate, Diffuse Interstitial Pnuemonia	
	PCVAD	Diffuse Lymphadenopathy (Lymph Node Enlargement)	
	PCVAD	Jaundiced pigs with a Yellow-orange Liver	Jaundice is an uncommon manifestation of PCVAD
	African Swine Fever (ASF) Asfarvirus	Gross Lesions: a. Splenomegaly ± splenic infarction, b. Enlarged hemorrhagic lymph nodes, c. Gallbladder edema, d. Pulmonary Edema, e. Serosal petechia, f. Multifocal renal cortical petechia (Turkey egg kidney)	Lesions can be indistinguishable from other systemic diseases of swine, such as: a. CSF (Hog Cholera), b. Bacterial septicemia (*Salmonella choleraesuis*, *Erysipelas*), c. PDNS (Porcine Dermatitis Nephropathy Syndrome)
	African Swine Fever (Asfarvirus)	Spleen: Diffuse splenomegaly, hemorrhage and necrosis	DDx- Mycoplasma haemosuis (Eperythrozoon suis with extramedullary hemolysis) J comp Path 2006 133:294-297)
	Classic Swine Fever (CSF) Flavivirus, pestivirus Same family as BVDv	Gross Lesions: a. Purple discoloration of abdominal skin, or necrosis of the tips of extremities, b. Lymph node hemorrhage, c. Splenic Infarction, d. Tonsil Necrosis, e. Turkey Egg Kidney	Can produce mummified, stillborn and weakborn pigs.
	Classic Swine Fever (CSF)	Multifocal tonsil necrosis Multifocal renal cortical petechia (Turkey egg kidney)	Not currently in the United States Pigs are cyanotic , sshow conjunctivitis with diarrhea.
	Porcine pestivirus Buguwannah virus	Multifocal Myocarditis Histological: Non-suppurative myocarditis	Stillirths, abortions Virus Research 2007. 129: 34-36

Tissue	Etiology	Gross Diagnosis	Notes
	Transmissible Gastroenteritis (TGE) Porcine coronavirus	Thin walled, fluid-filled intestine lacking chyle in the lacteals. (Moderate, diffuse, atrophic enteritis)	Severe villous atrophy, lack of chyle absorption, thin wall, maldigestion DDx: E. coli
	Foot & Mouth Disease (FMD) Picornavirus	Causes vesicles on the mouth, teats and soft tissues of the feet.	DDx: a. vesicular stomatitis, b. vesicular exanthema of swine, c. swine vesicular disease.
	Foot & Mouth Disease (FMD)	Multifocal vesicular glossitis and dermatitis) Multifocal vesicles on snout and tongue	
	Foot & Mouth Disease (FMD)	Ruptured vescicles on feet and teats	
	MDX: Tongue: Multifocal vesicular glossitis caused by DDx: **FMD** (Picornaviridae-Aphthovirus) **Vesicular stomatitis** (Rhabdoviridae-Vesiculovirus): Primarily infects horses, cattle, mules, and swine **Vesicular exanthema** (Calicivirus): Occurs in swine and San Miguel sea lions. Associated with feeding raw garbage **Swine vesicular disease** (Picornaviridae, Enterovirus): Occurs only in swine, and is also associated with the feeding of raw garbage.		
	Maliganat Catarrhal Fever (MCF) Herpes virus	Corneal edema and conjunctivits	Systemic disease with vasculitis. Mutifocal hemorrahges in different organs.
	Porcine Dermatitis / Nephropathy Syndrome (PDNS)	Multifocal cutaneous macules (Irregular to coalescing foci of cutaneous erythema, typically surrounding a central black focus of necrosis)	Immune complex vasculitis linked to PCV2 infection
	Pseudorabies (PRV) Herpesvirus (Alpha subfamily) Porcine herpes virus 1	Multifocal, random hepatic necrosis, intranuclear inclusion bodies	Observed in aborted fetuses and neonates. In scukling pigs mortality is very high with CNS disease
	Pseudorabies (PRV) Herpesvirus (Alpha subfamily)		Encephalitis. Aujeszky's disease is a zonnosis

Tissue	Etiology	Gross Diagnosis	Notes
	Porcine Parvovirus (PPV)	Fetal mummification	Follows fetal infection from day 30-70 (mummies are 1-6 inches in crown rump length)
	PCV2 – abortion	Fetal mummification Autolyzed, fetuses with fluid distended abdomens	Heart is the target organ for PCV2 in the fetus. Infection leads to gross lesions of fetal heart failure
	SwinePox	Congenital infection – piglets born with disseminated cutaneous and oral pox lesions. In older animals Lice (Haematopinus suis) may facilitate transmission.	Characteristic intracytoplasmic inclusion bodies
	SwinePox	Multifocal, random erythematous and papular dermatitis	Lice may mechanically transmit the virus and cause cutaneous trauma which facilitates infection. Pig lice = *Haematopinus suis*
Whole body	SwinePox	Multifocal, random erythematous and papular dermatitis	
Kidney	Ochratoxin or Citrinin toxicity	Severe diffuse renal fibrosis	Ochratoxin – Aspergillus ochraceus**, (Stoev et al., Exp Tox Path, 52: 287-296, 2000)** Citrinin – Penicillium citrinin
Kidney	Pigweed toxicity- (Amaranthus retroflexus)	Severe perirenal edema	Severe perirenal edema Pigweed (Amaranthus retroflexus) à severe perirenal edema. Pathogenesis: Ingestion à acute tubular necrosis (the nephrotoxic principle is unknown) tubular epithelium is leaking lymphatic drainage and leakage of fluid into perirenal connective tissues à perirenal edema (- - -> death due to hyperkalemic heart failure)

Tissue	Etiology	Gross Diagnosis	Notes
Liver		Nutritional: Hepatosis dietetica,	Multifocal lobular necrotic hepatitis Occasional Jaundice
Liver	Nutritional Vit E deficiency	Submassive hepatic necrosis and hemorrhage Name the disease: Hepatosis Dietetica	Deficiency of Vit E, selenium and sulfur containing amino acids DDx: PCV2, hepatotoxins
Heart	Mulberry Heart Disease Cause: Vitamin E responsive disease (a deficiency is only identified in 25% of the cases	Gross Lesions: a. Clear to straw-colored fluid in thorax and abdomen which clots on exposure to air, b. Pulmonary Edema, c. Increased Pericardial fluid, d. Hepatic Congestion, e. Myocardial Hemorrhage	Age Affected: Nursery Pigs Clinical Signs: Good doing pigs found dead Name the disease: Mulberry Heart Disease
	Mulberry Heart Disease (MHD)	Severe, acute, focally extensive & coalescing epicardial hemorrhage. Severe, diffuse interlobular edema	
	Juvenile Pustular Psoriasiform Dermatitis. Porcine juvenile pustular psoriasiform dermatitis Pityriasis Rosea	Self limiting inhereted condition observed in 3-14 week old pigs Skin Lesions: Raised red periphery with central scaling crater on the ventral abdomen and inner thighs	Pityriasis Rosea (Juvenile Pustular Psoriaform Dermatitis)
	Lymphoma	Renal lymphoma, Liver lymphoma	Diffuselly in the organs or multifocal neoplastic foci with lymphadenomegaly. DDx: severe lymphadenitits *Rhodococcus equi*
	Preputial mycotic plaques	Multifocal hyperkeratinized raised areas with intralesional fungal hyphi probable *Aspergilus spp*	Common lesin in pig. Not significant
	Spleen	Splenic torsion with infarction	Common finding in pigs due to the loosley attachment to the stomach.
	Porcine stress syndrome. Homozygous	Histologic appearance – Zenkers necrosis in	Pathogenesis: halothane genotype (HalNN) -->

Tissue	Etiology	Gross Diagnosis	Notes
	recessive gene.	skeletal myofibers	exposure to halothane --> hyperthermia --> myocyte necrosis --> acute death
	Vertebral Osteomyelitis (spinal abscess)	Abcesses are most of the time located at the level of the heart and kidneys.	Spinal abscesses are the most common cause of hindlimb paralysis
	Gastric Ulceration	Gross Findings: Pig found dead, extremely pale, Mild to moderate pneumonia	Contributing Factors: a. Feed: (Small feed particle size, pelleting feeds, diets with high levels of unsaturated fats, low fiber, high energy diets), b. Issues that lead to irregular feeding patterns, c. Pneumonia: Pigs with severe gastric ulceration are 9 to 12 times more likely to have lung disease (Pneumonia may lead to irregular feeding patterns, Stress of intercurrent disease, In response to infection, the body releases histamine), d. Stress (transportation, overstocking)
	Gastric Ulceration	Severe, Gastric ulceration with hemorrhage and melena. The gastric hemorrhage smells like apple cider.	
	Mesenteric bone metaplasia	Hard irregular bony proliferation on the mesentery	Common finding in adult animals. No sihnificant lesion.
GOOD LUCK!			