國立中興大學
National Chung Hsing University

病理剖檢及採樣送檢訓練班- 進階課程

淺談豬隻呼吸道及消化道疾病診斷

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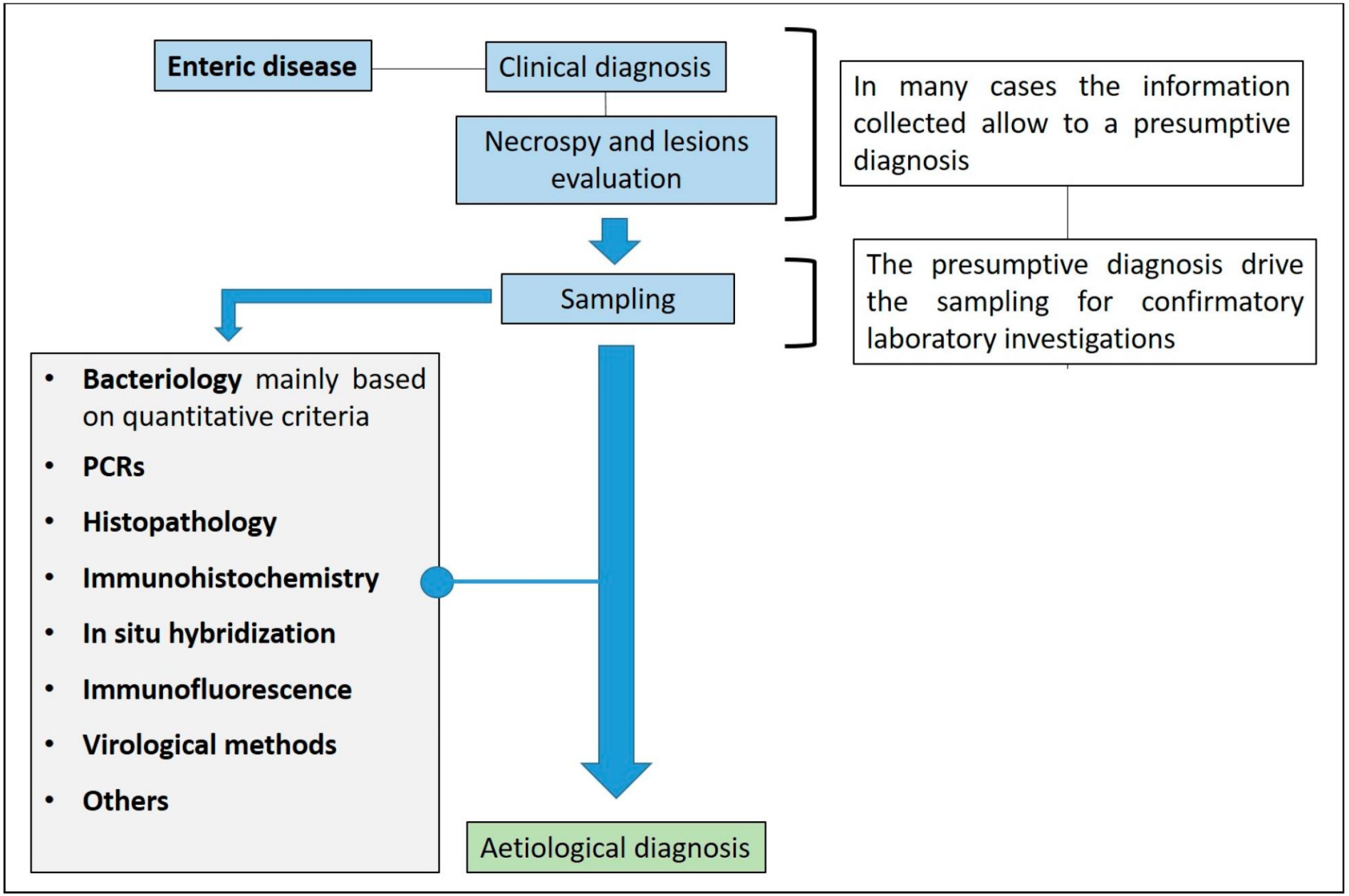
淺談豬隻呼吸道及消化道疾病診斷
I.不同階段豬隻腸道疾病

大綱

1. 哺乳豬消化道疾病與診斷- 初生仔豬下痢
2. 保育豬消化道疾病與診斷- 離乳後下痢
3. 肥育 (生長) 豬消化道疾病與診斷- 生長豬下痢



腸道疾病診斷流程

Luppi *et al*., 2023

Particularly hazardous periods in the pigs life

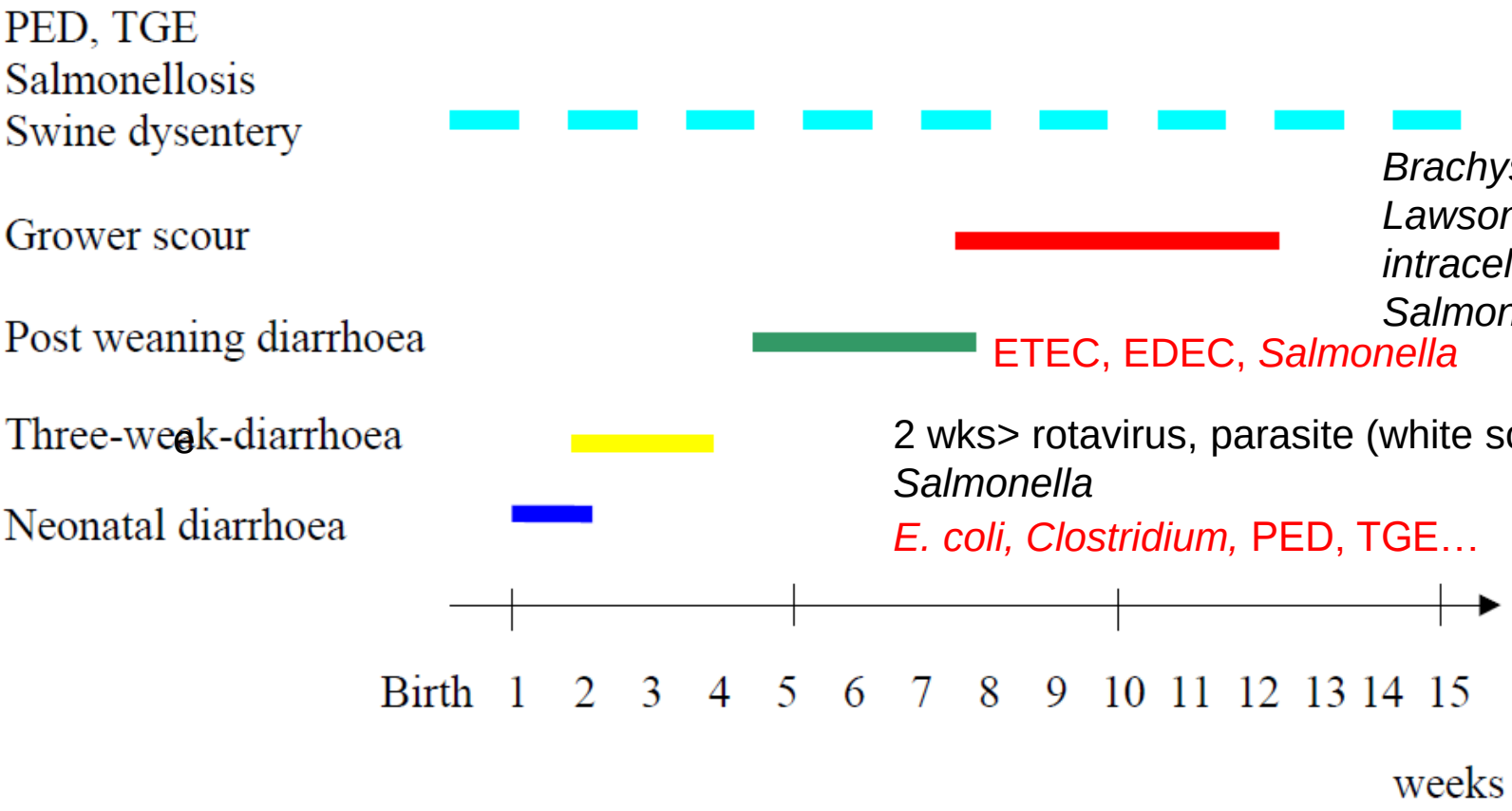


Fig. 2. Diarrhoea in pig is often related to certain ages or certain periods during rearing.

Jacobson M. 2003

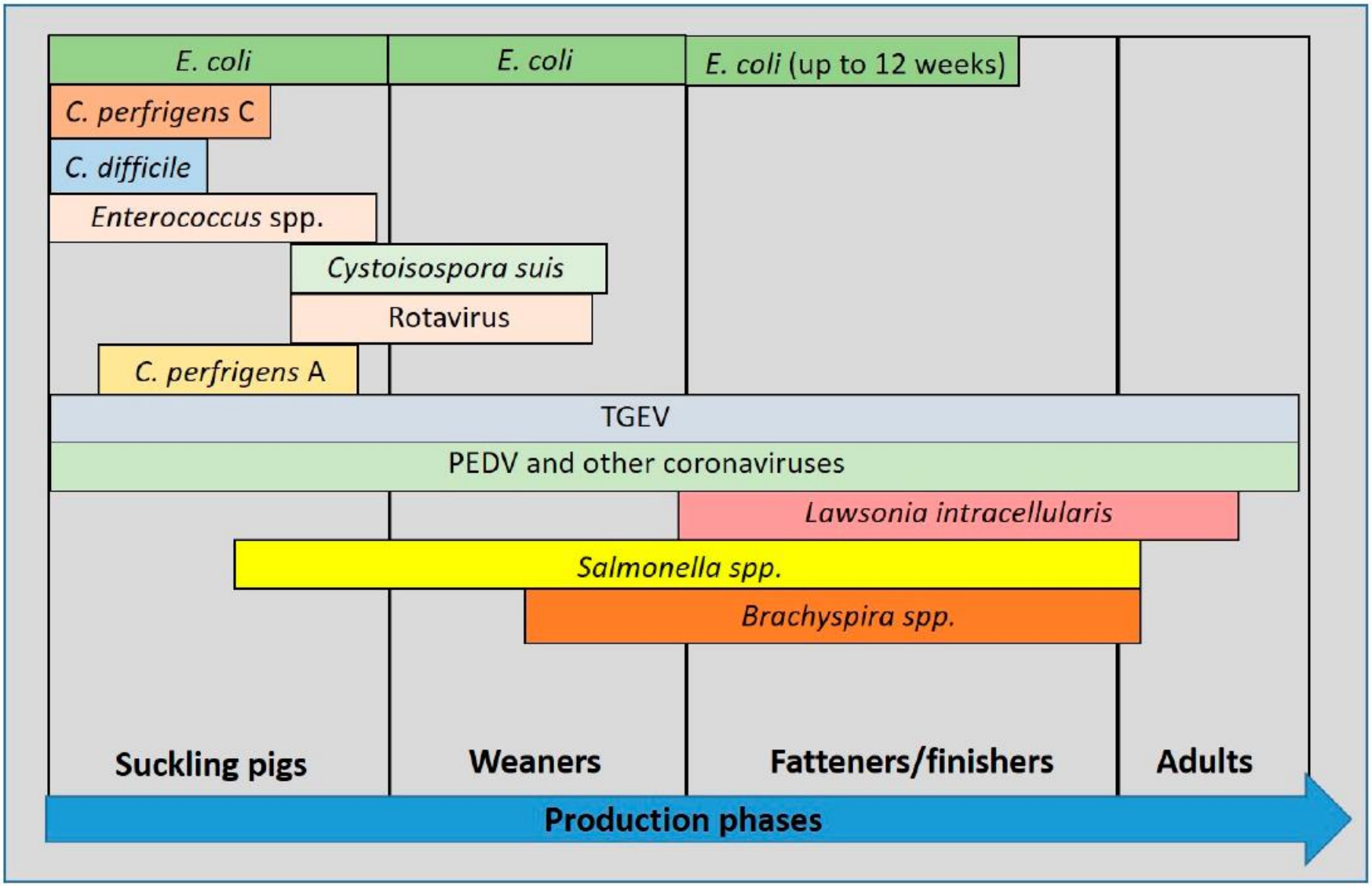
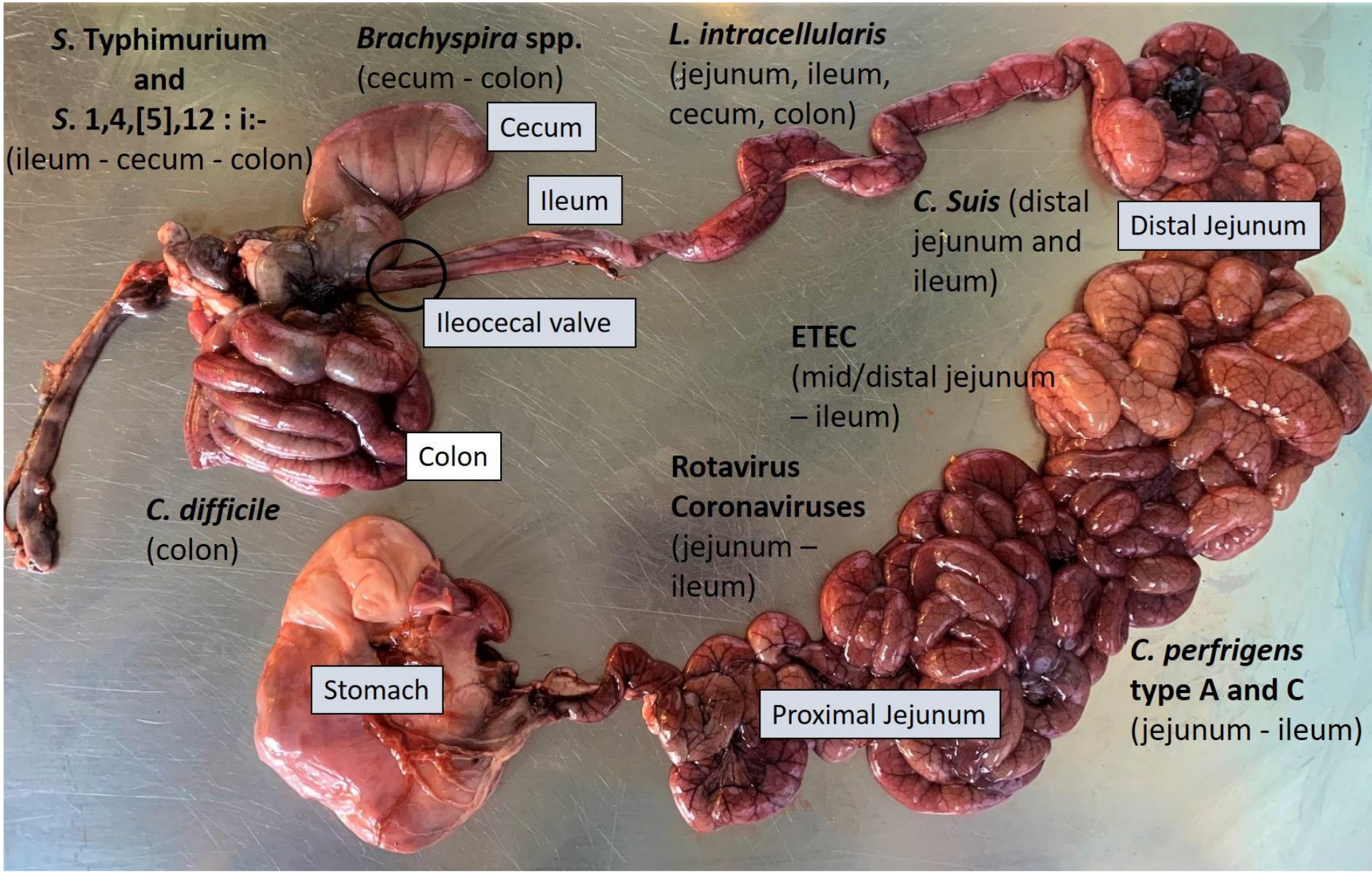


Figure 2. Incidence of pathogens in enteric disease in pigs related to age (modified from Ségales et al., 2013) [6].



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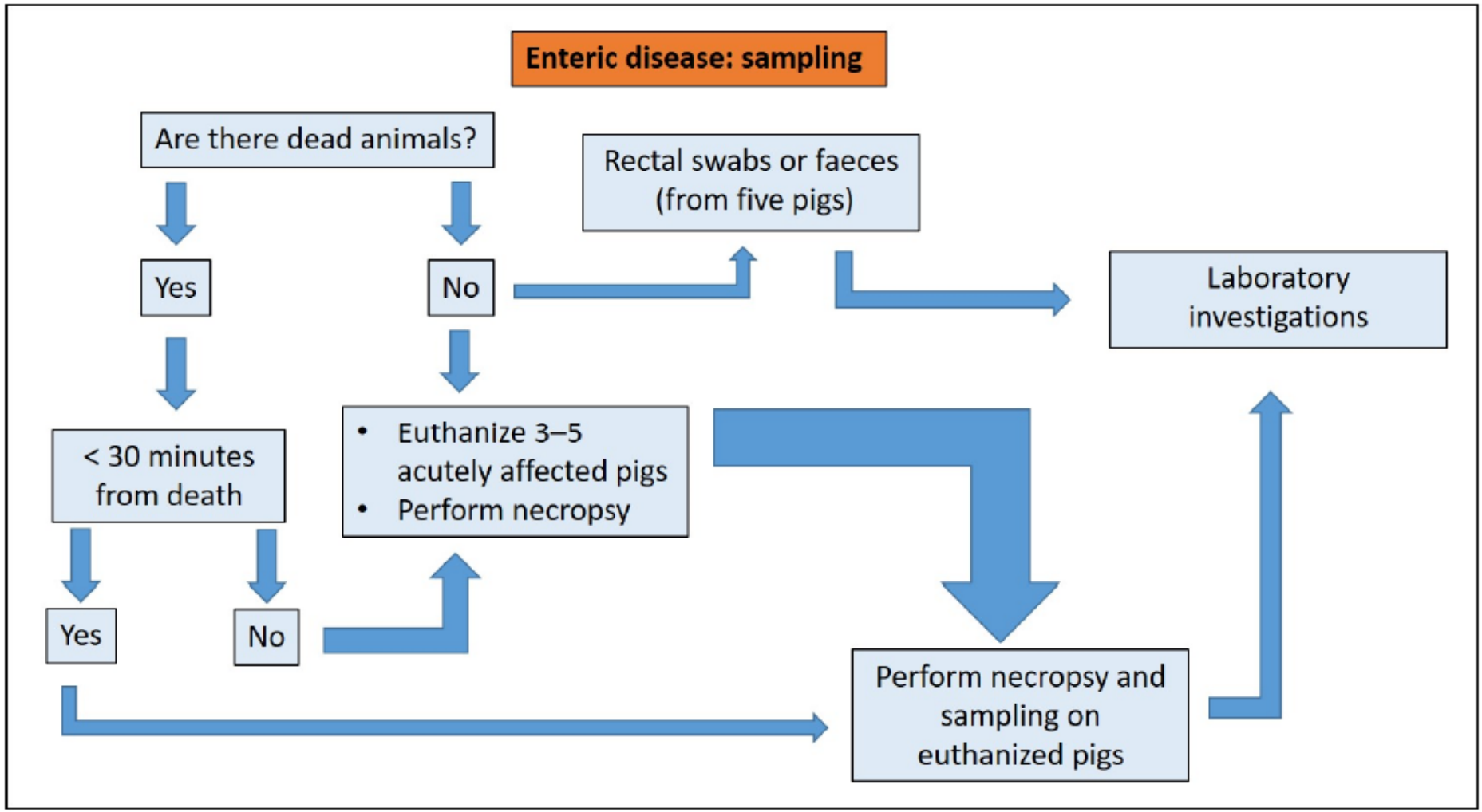

Figure 4. Enteric disease: sampling criteria in the diagnostic pathway.

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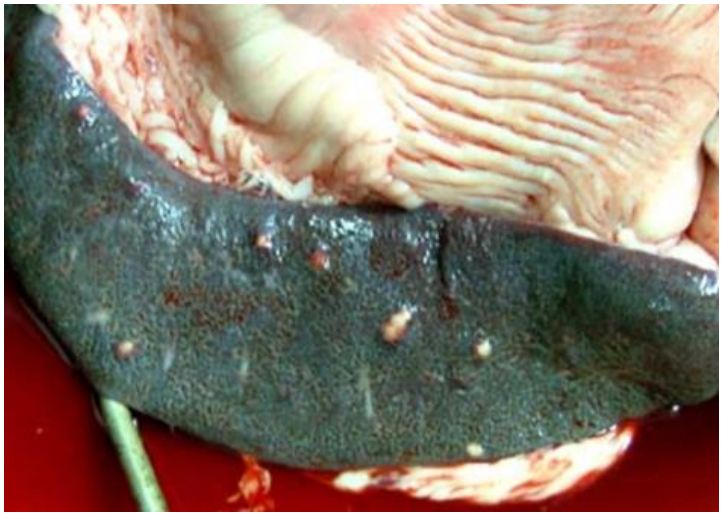
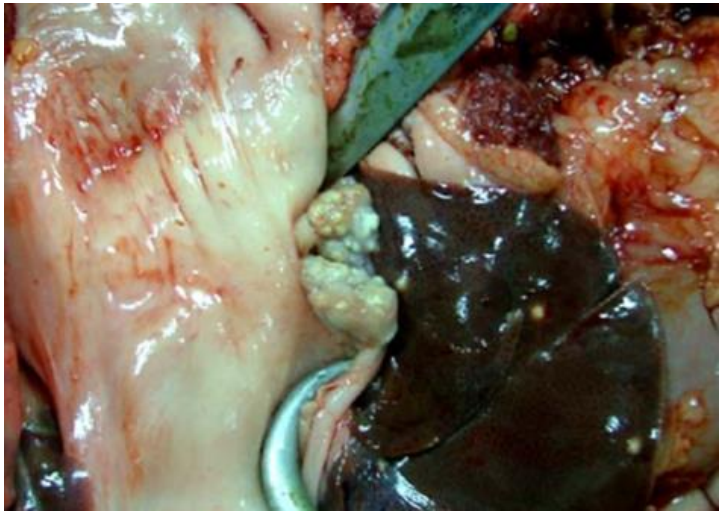
僅適用於採樣後直接福馬林固定檢體

Table 1. Enteric disease: specimen collection for histopathology (Modified from Arruda and Gauger, 2019) [4].

Tissue/Sample	Specimen Collection
Lymph node	Mesenteric—1 cm thickness
Tonsils	Half of a tonsil
Spleen	1 cm thickness
Liver	1 sample 2 × 2 × 0.5 cm
Kidney	Half of a kidney, 0.5 cm slice through the centre
Stomach	3 × 3 × 3 cm piece 1 cm thickness
Jejunum	Three sections, 2 cm long
Ileum	Three sections, 2 cm long
Spiral colon	Three sections, 2 cm long

豬 結核病





台灣常見豬腸道疾病

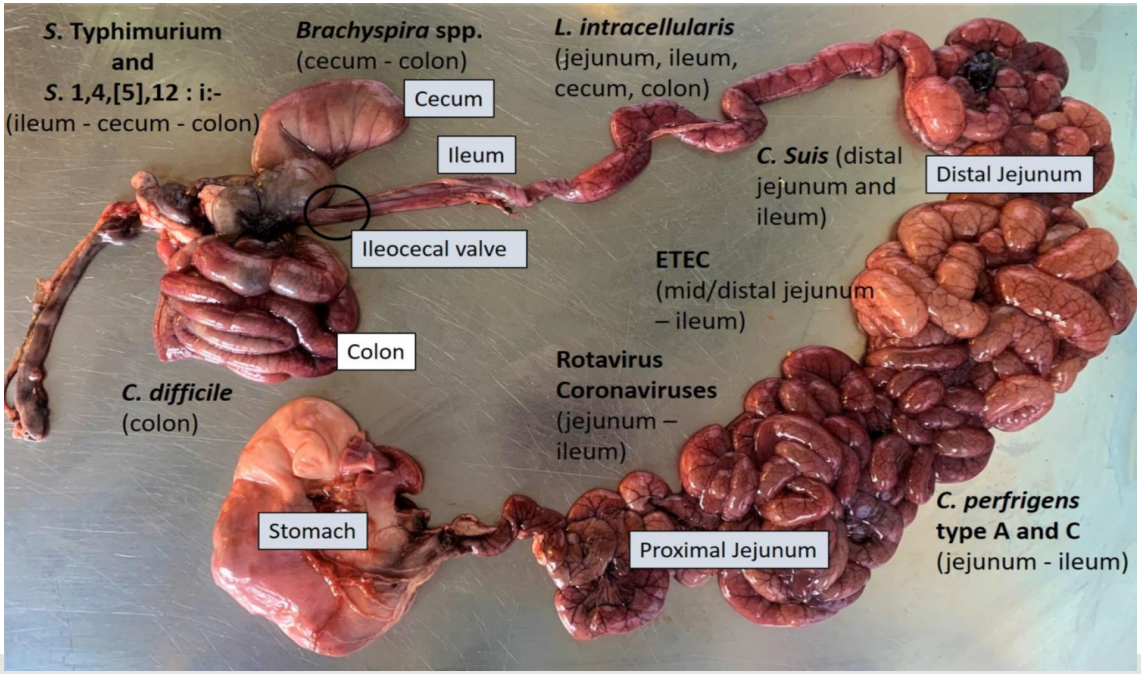
發病年齡	病名	糞便情形
哺乳期	大腸桿菌症	白痢
	梭狀桿菌	鮮紅色血痢
	流行性下痢	水樣下痢
	傳染性胃腸炎	嚴重水樣下痢
	輪狀病毒	輕度水樣下痢
	球蟲症	黏液狀下痢
保育期	沙門氏桿菌	黃色黏液便
肥育前後期及種豬	鞭蟲症	綠色軟泥便
	豬赤痢	暗紅色血痢
	增殖性腸病	黑色血痢

大腸桿菌症

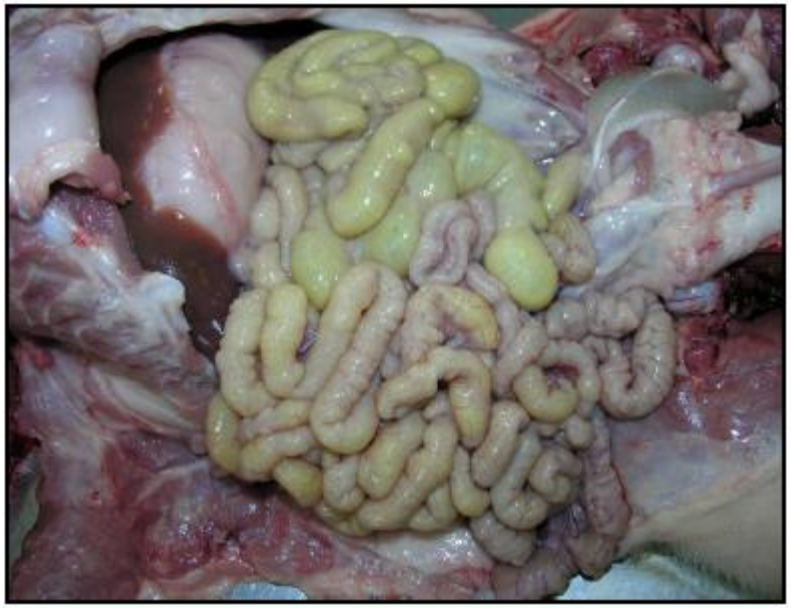
- 新母豬所生一週內小豬發生為早發型;二週到離乳期間發生為遲發型大腸桿菌症（緊迫）

- 全年會發生（尤其是四、七、十一月季節交替）

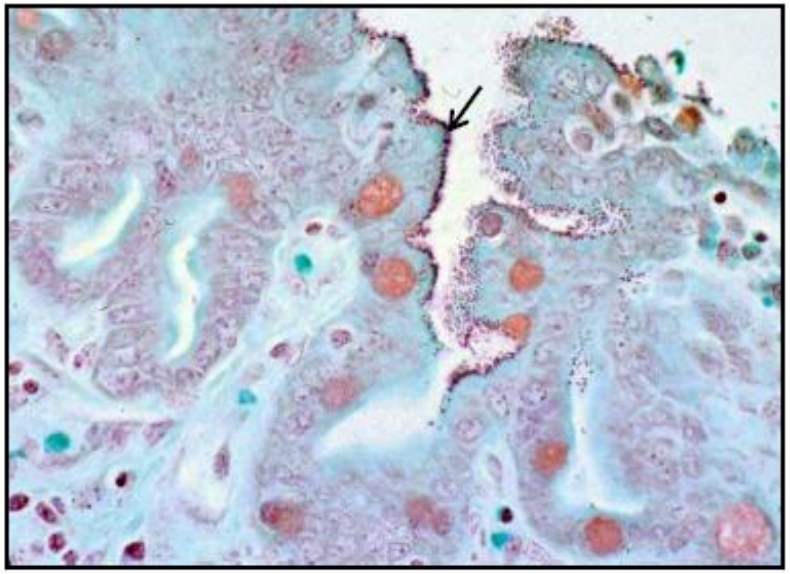
- 症狀：乳白至黃白色水樣白痢，脫水及酸血症而死

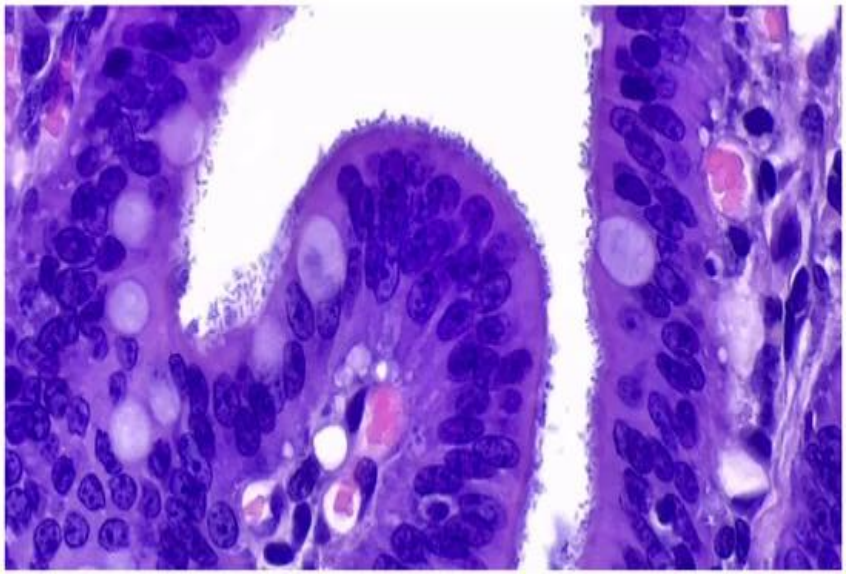


好發新生仔豬
為腸道常在菌，因緊迫或污染增殖而感染發病



Neonatal diarrhea; colibacillosis. *Noah's arkive*





45 d/o

Colibacillosis due to F4, STa, STb ETEC strain.

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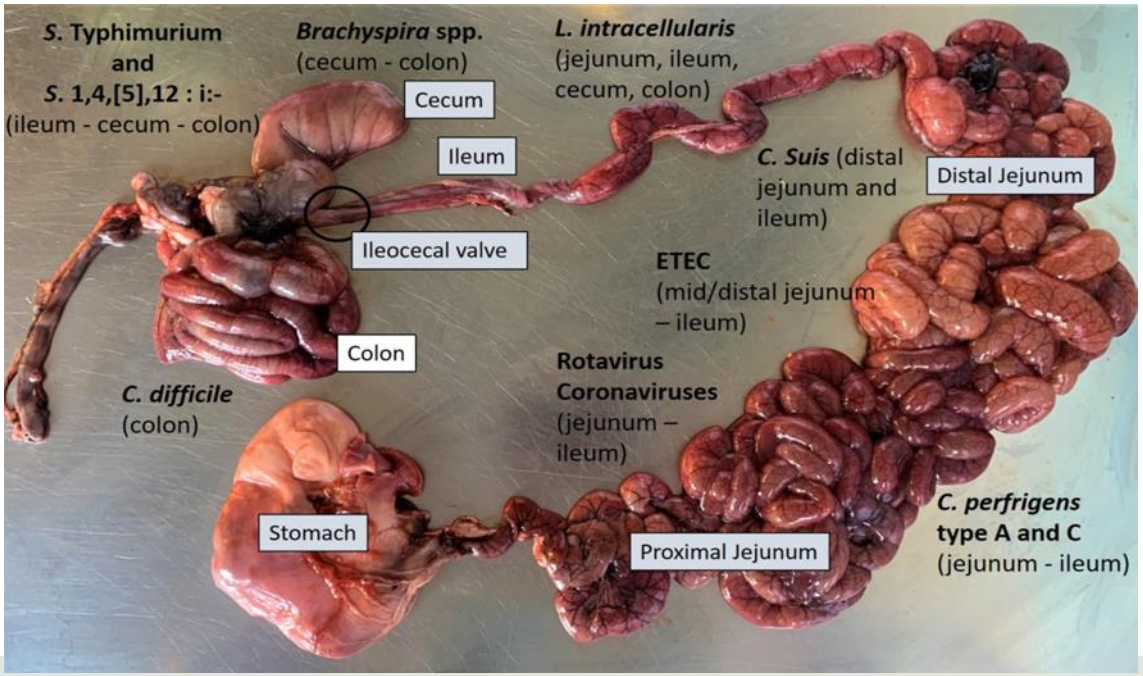
豬水腫病
溶血性大腸桿菌

- 保育豬或剛移入肥育欄之強壯小豬
- 夏天中午好發
- 症狀：體溫升高突然死亡、眼瞼水腫、胃壁水腫、大腸漿膜面水腫



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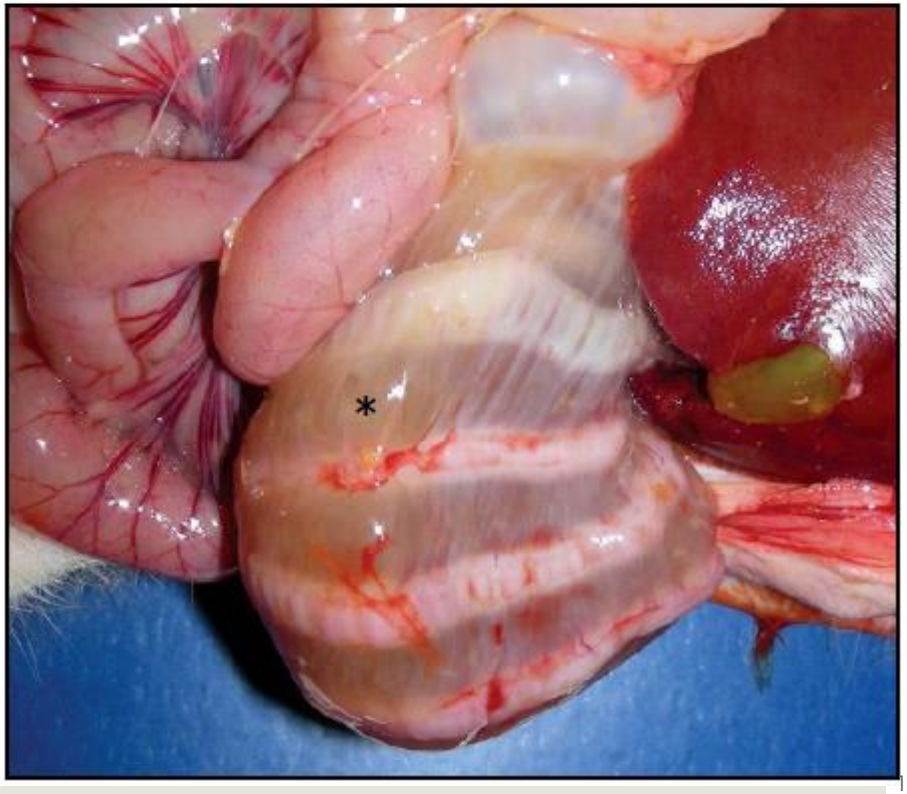
大腸桿菌造成全身水腫病

Edema disease, pig. Note edema of the eyelids, snout (top right), stomach mucosa (bottom left) and mesentery of spiral colon (* bottom right).



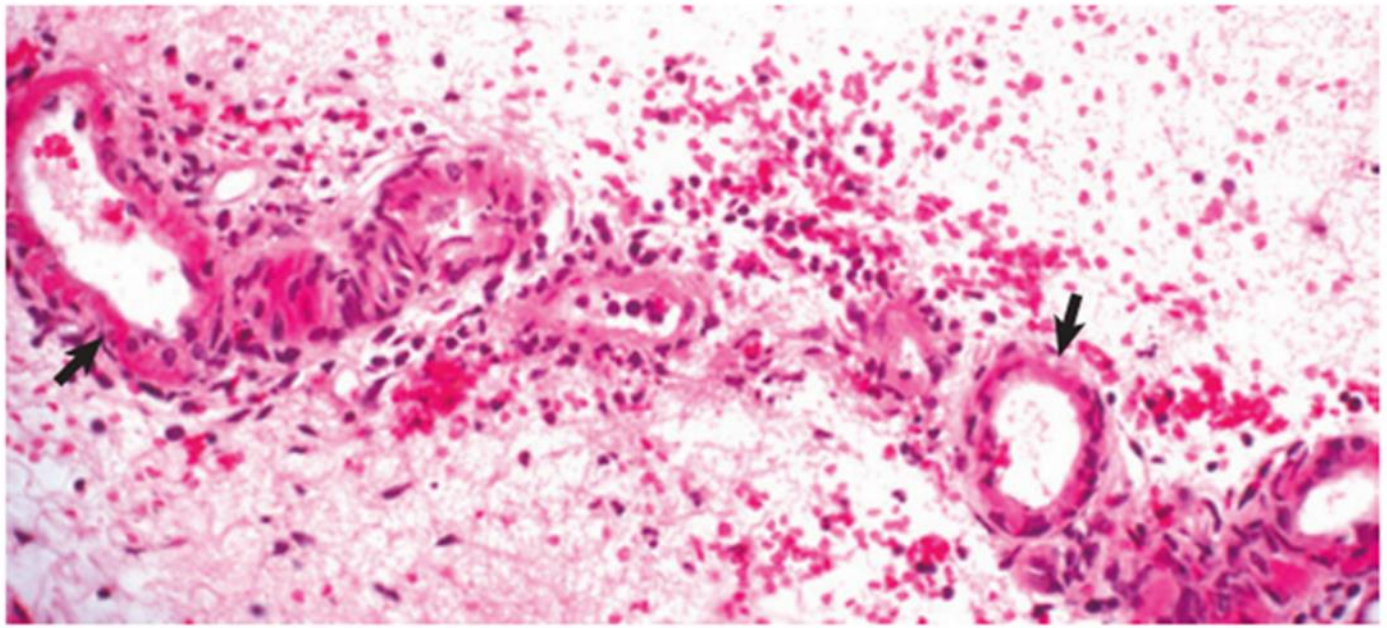


Figure 10-69 Fibrinoid Necrosis of Small Arteries, Edema Disease, Stomach, Submucosa, Pig. Note the circumferential eosinophilic *(arrows)* material in the walls of the arterioles and the extensive edema and mild hemorrhage in surrounding submucosa. H&E stain. (Courtesy School of Veterinary Medicine, Purdue University.)

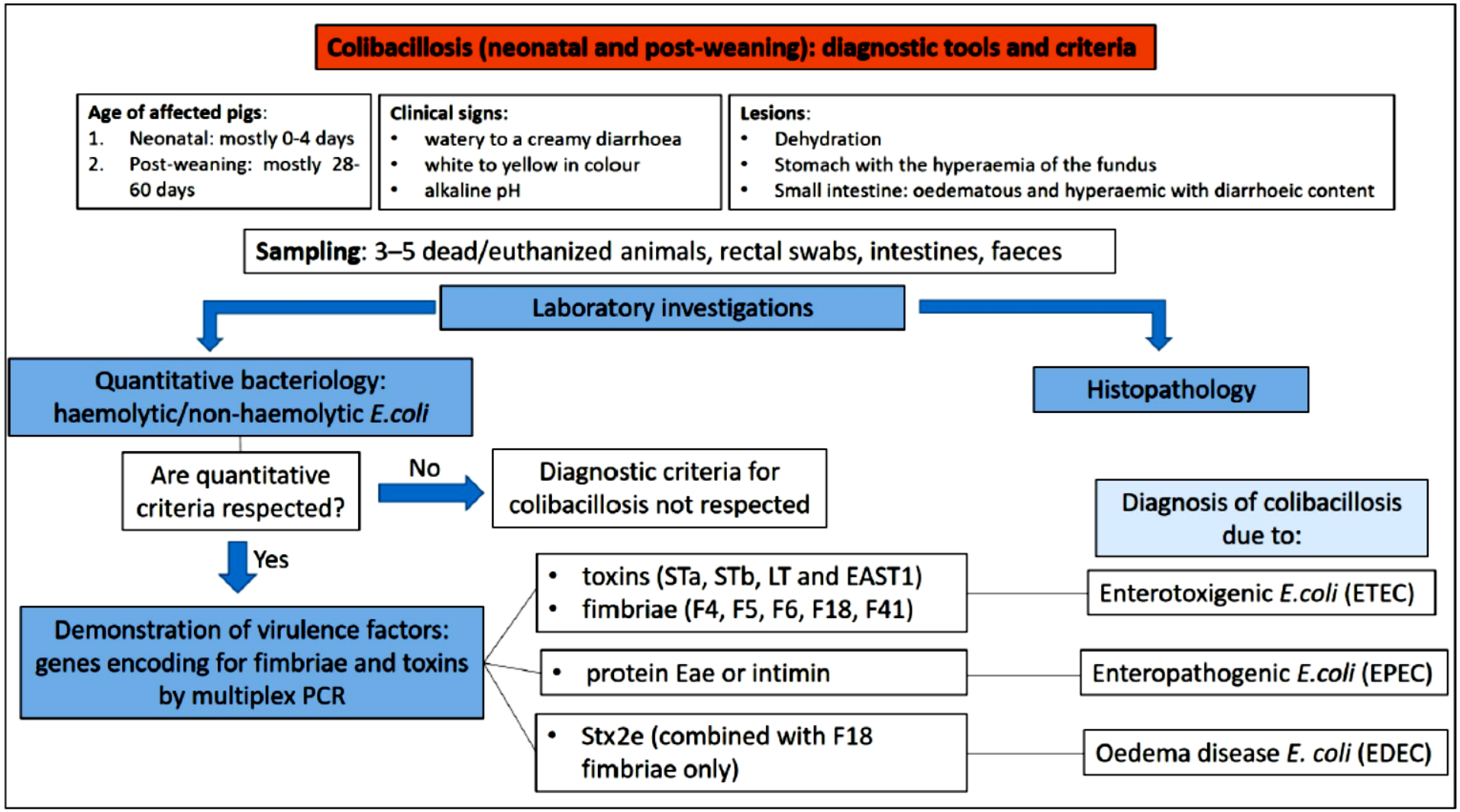


Figure 10. Diagnostic algorithm for the diagnosis of colibacillosis.

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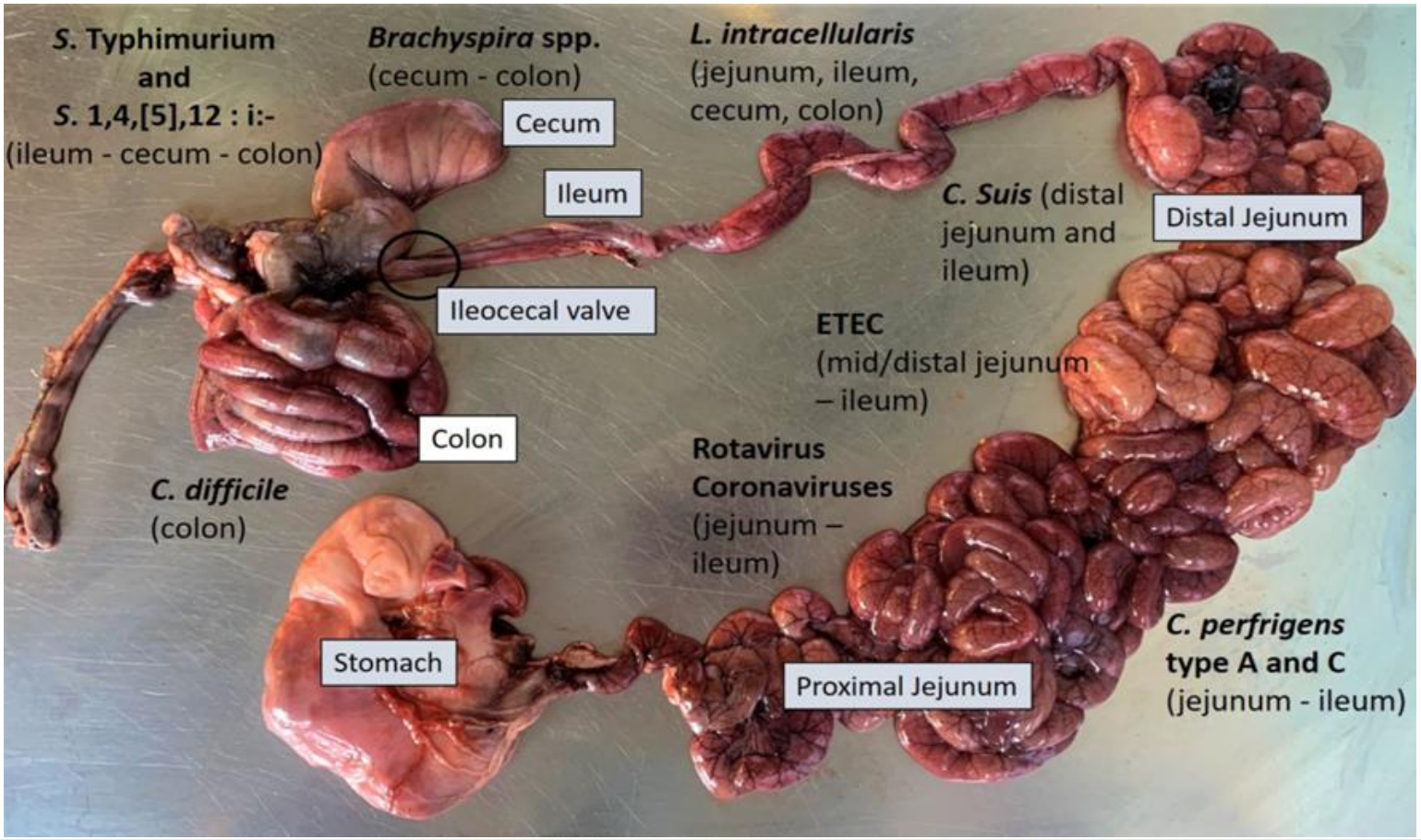
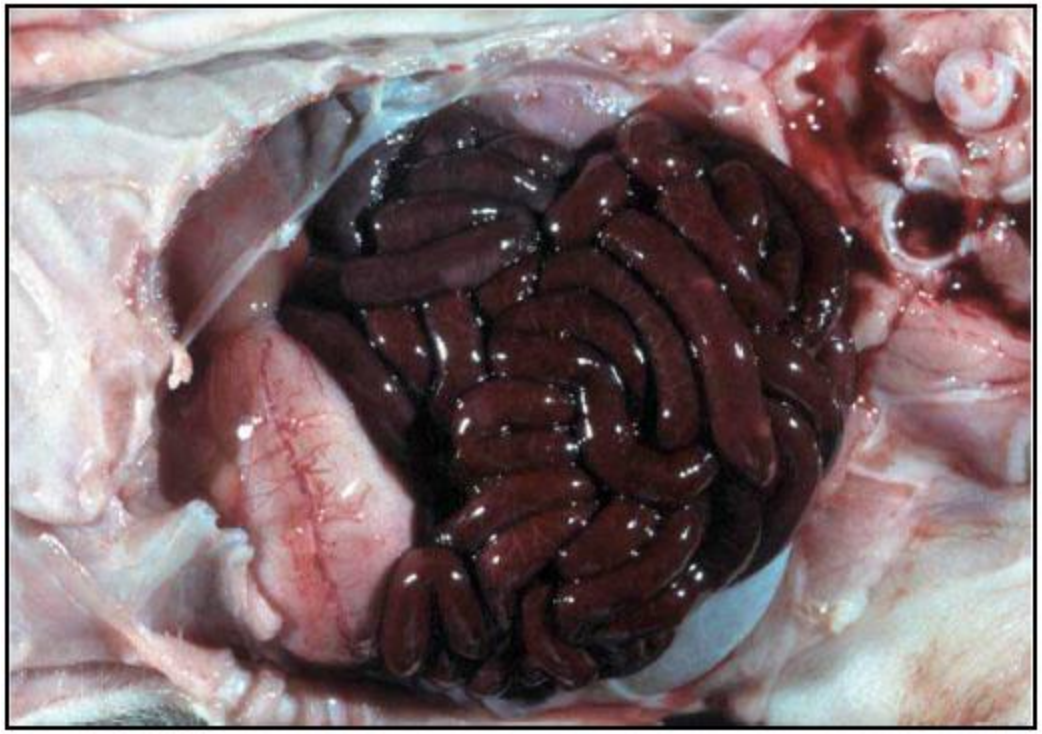
梭菌症

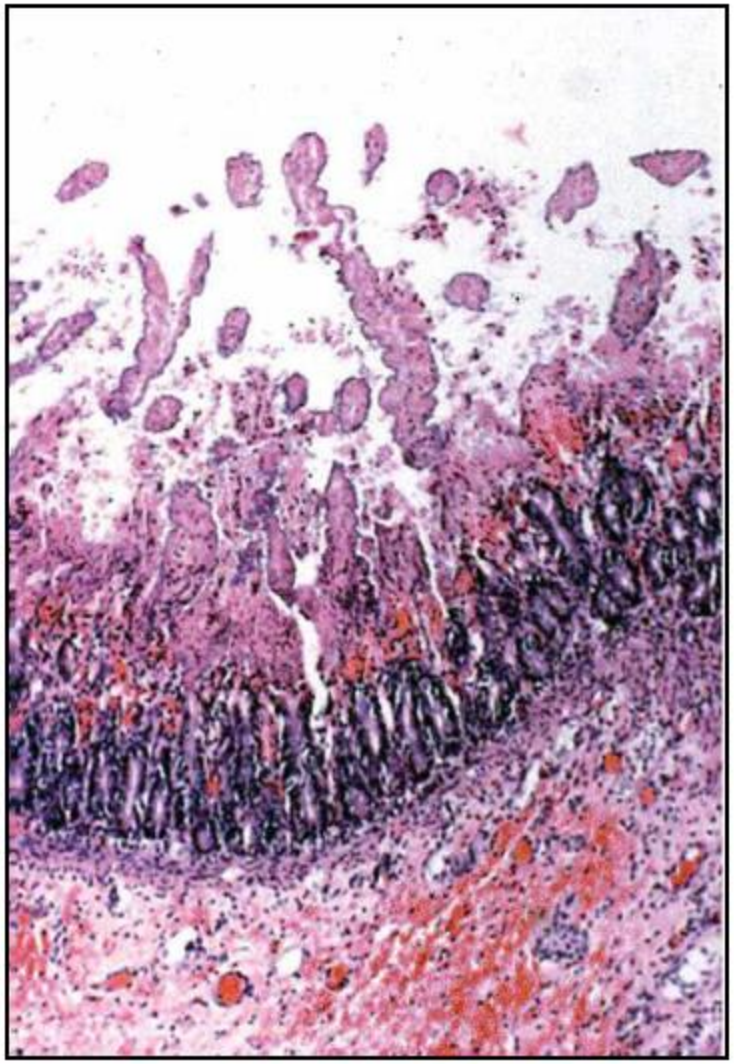
•出生一週內急性出血下痢，一到兩天死亡

症狀：急性出血下痢，一到兩天死亡;耐過則生長遲緩





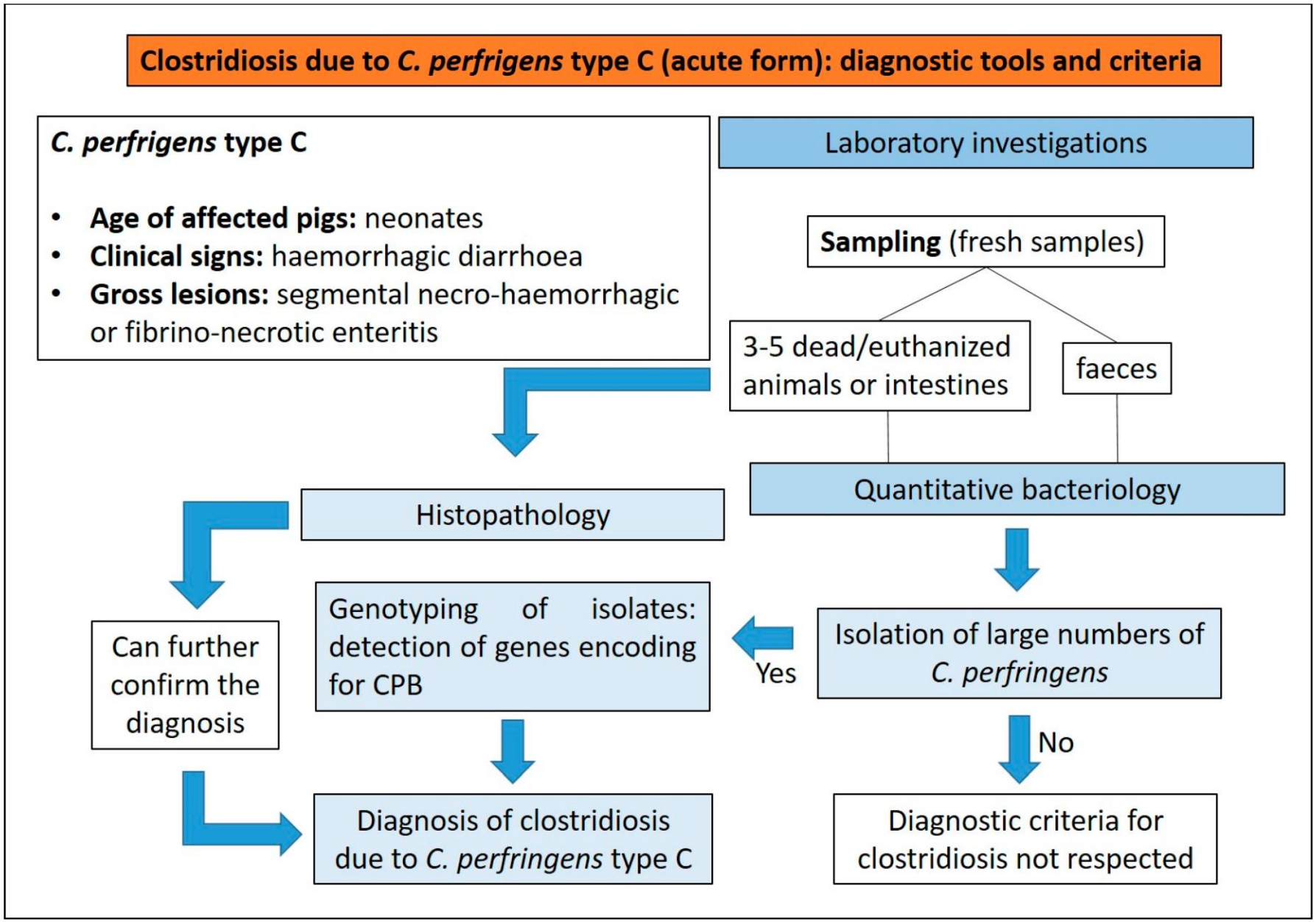
Enterotoxemia, small intestine, pig. The entire small intestinal mucosa is hemorrhagic. Necrosis can extend through the muscularis mucosa and is caused by toxins of the *Clostridium perfringens* type C.



Necrohemorrhagic enteritis, small intestine (histo), cow . Note the horizontal linear "band" of acute coagulative necrosis affecting the superficial half of the mucosa *(light pink zone)* of the intestine caused by clostridial toxins.

Dark red intestine, gas bubbles visible beneath the serosa. Lumen will be filled with bloody necrotic content. *C. perfringens* Type C

Mesocolonic edema - *C. difficile*



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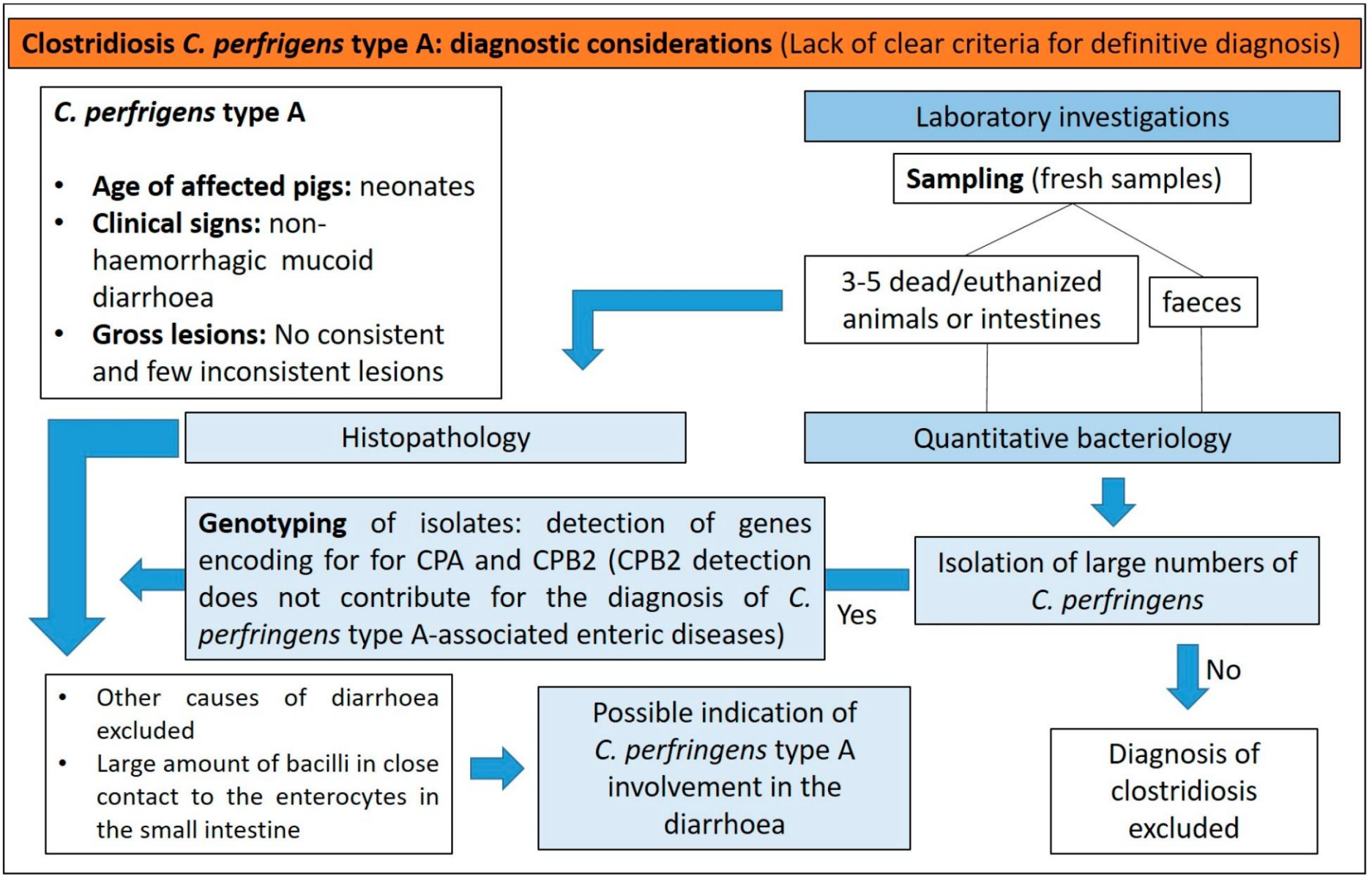

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困難梭菌/ *Clostridium difficile*

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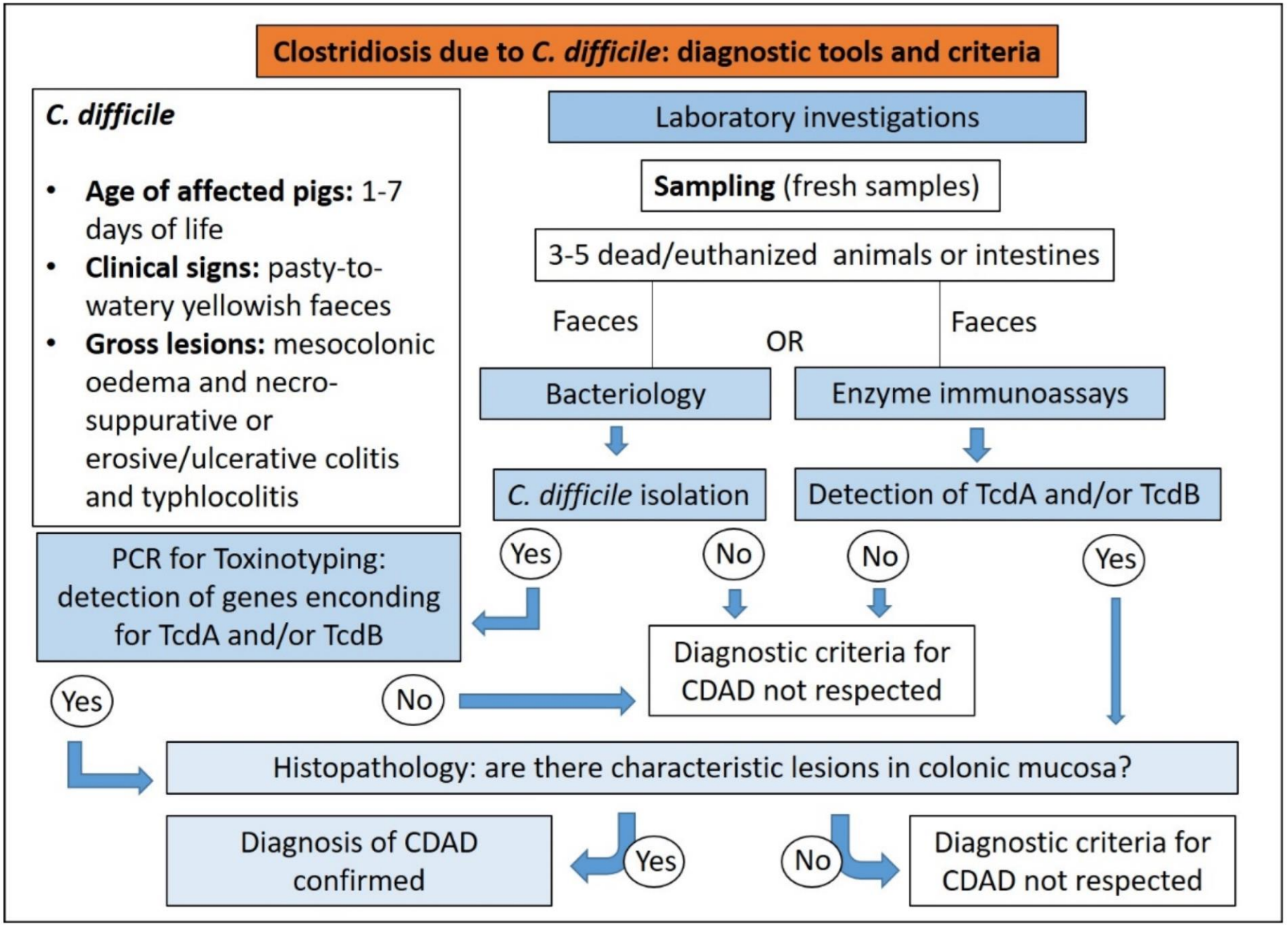

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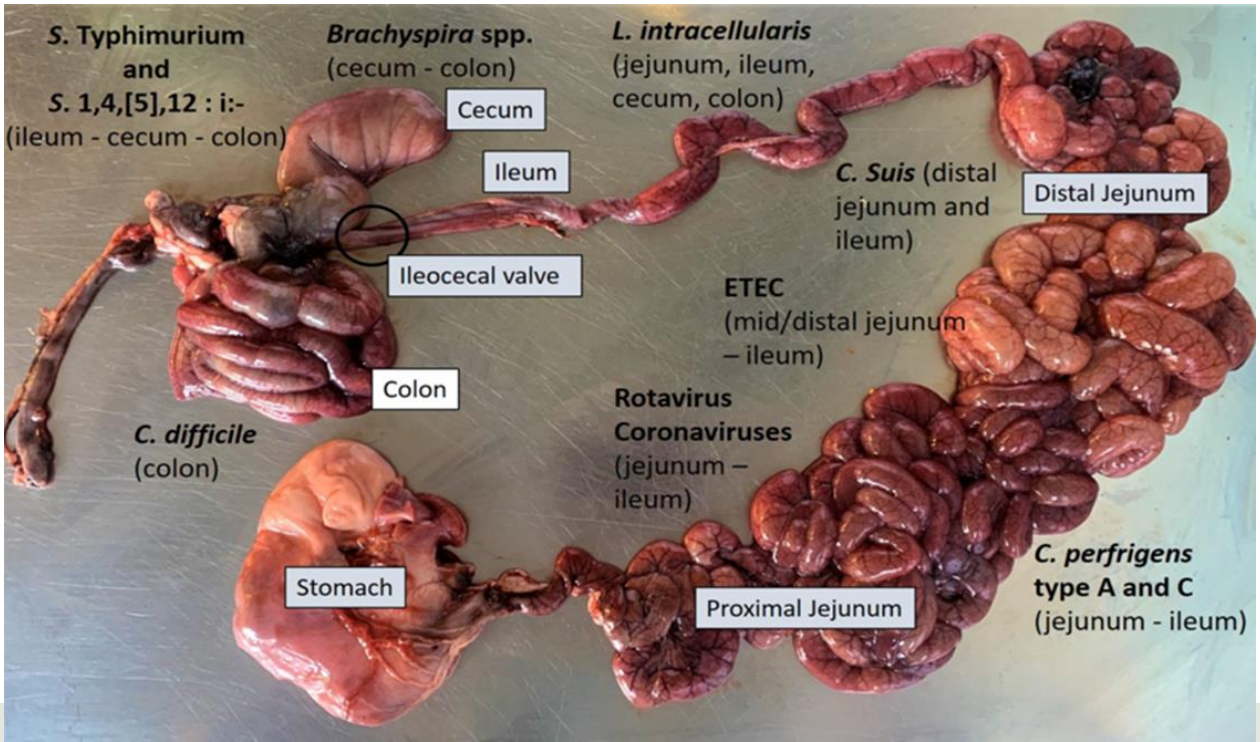
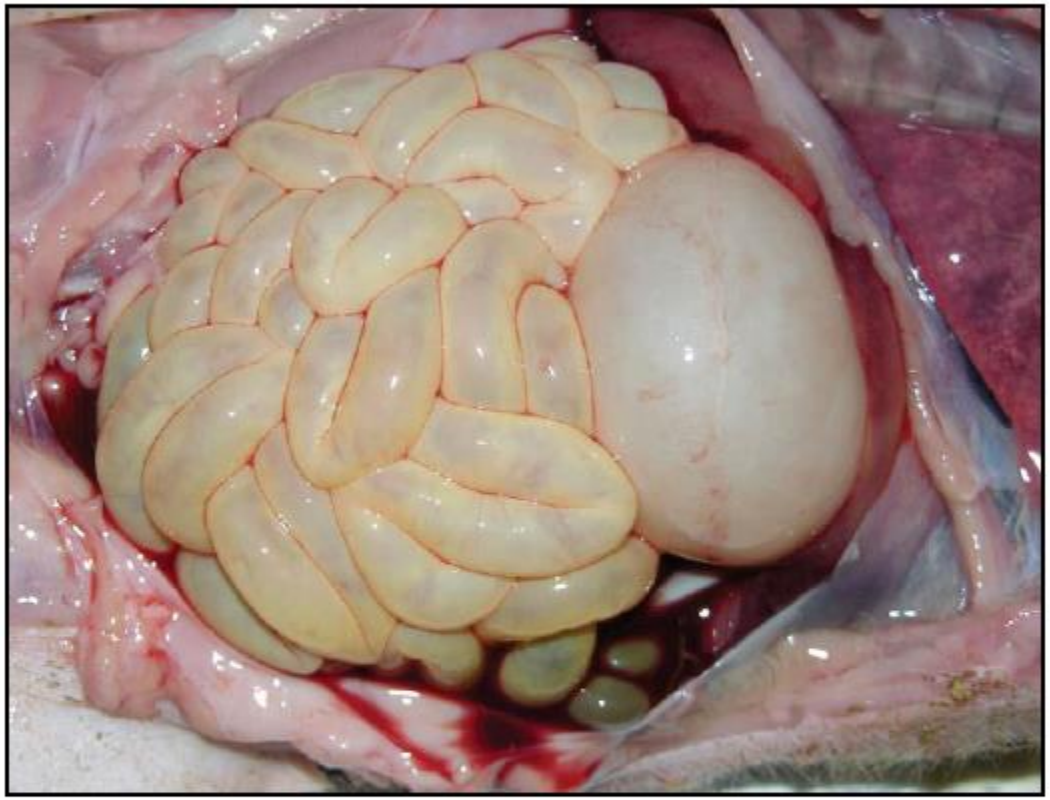
冠狀病毒病毒性下痢

- transmissible gastroenteritis virus (TGEV) 豬傳染性胃腸炎病毒
- porcine epidemic diarrhoea virus (PEDV) 豬流行性下痢病毒
- porcine deltacoronavirus (PDCoV) 豬δ冠狀病毒
- swine acute diarrhoea syndrome coronavirus (SADS-CoV) 豬急性下痢綜合症冠狀病毒



- **Transmissible gastro-enteritis (TGE)**
  - **Coronavirus** infection
  - Highly contagious & high mortality in pigs < 14 days old
  - Severe **villous atrophy**

- **Others**
  - Porcine epidemic diarrhea
  - Porcine **rotavirus**



TGE, small intestine, piglet. The small intestine is dilated by gas, is thin walled, and contains undigested milk.

Pathologic Basis of Veterinary Disease, 5th ed., Mosby-Elsevier

冠狀病毒病毒性下痢：傳染性胃腸炎 (TGE)

- 症狀：嘔吐及下痢、脫水，發病一週齡之內小豬高致死，其他年齡豬隻短暫下痢，不致死
- 好發冬季，但四季皆可發生
- 病變：空迴腸絨毛萎縮

Gaunt dehydrated piglets.

Vomiting sow.

冠狀病毒病毒性下痢：豬流行性下痢(PED)

- 各年齡發生嘔吐下痢

1. 舊型：初春入夏發生，離乳後小豬發生，小豬死亡率低（0-5%）
2. 新型（2013): 全年度發生，新生小豬高死亡率

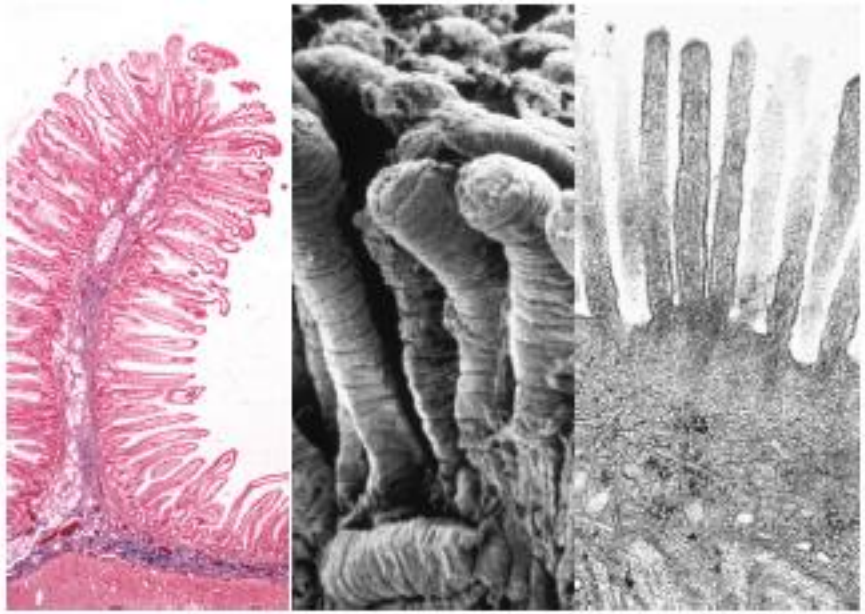
- 症狀：嘔吐及下痢、脫水
- 病變：空迴腸絨毛萎縮

新型ＰＥＤ在台灣之爆發

New variants of PEDV, which emerged in Taiwan in late 2013, have caused a high morbidity and mortality **in neonatal piglets!**

INTESTINE

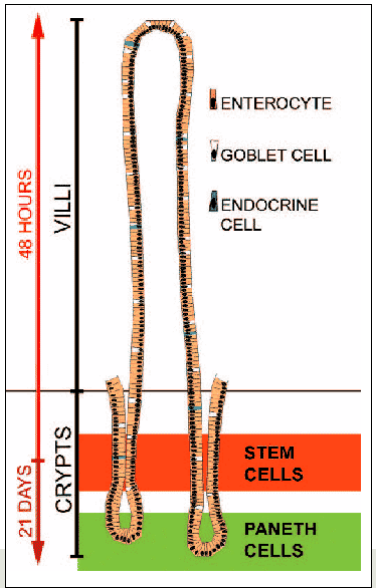
Small & Large Intestines Structure



- Long coiled tube, large surface area
- Folded mucosa
- Villi (7-14 fold increase)
- Microvilli (15-40 fold increase)

Functions

- Digestion, absorption, excretion
- Fermentation vat (cecum)
- Good defense mechanisms



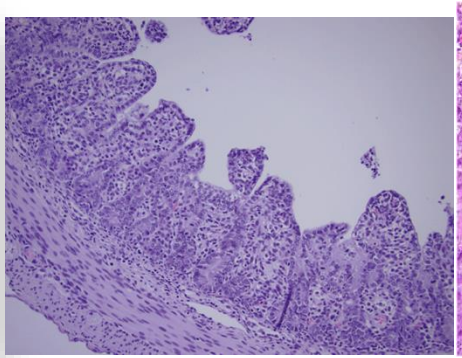
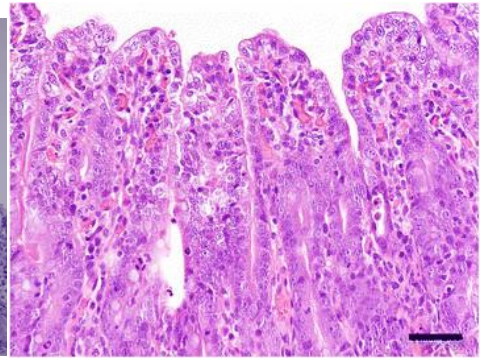
In 3-week-old pigs the turnover rate is 2 to 3 days.

In neonatal pigs, the turnover rate is 7 to 10 days!

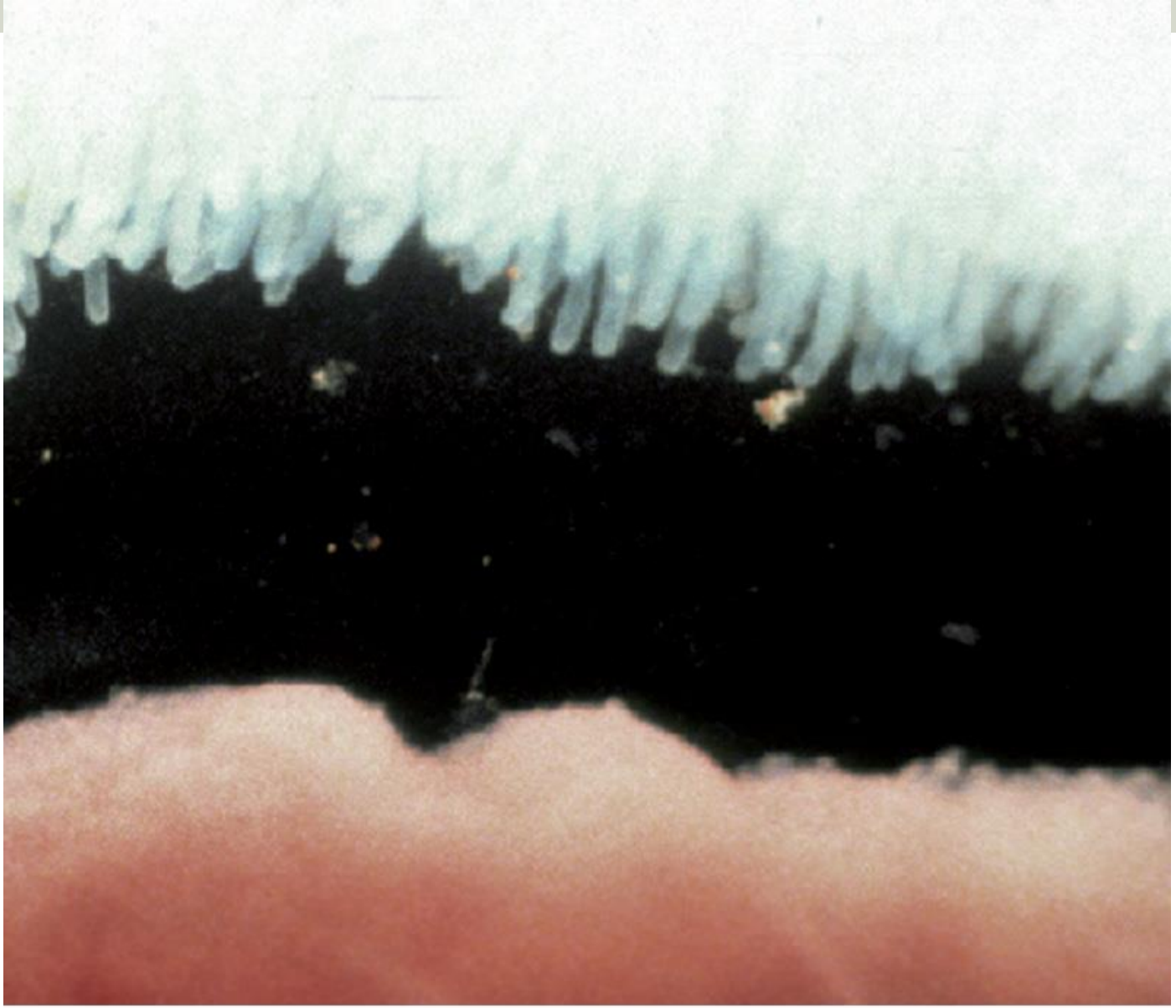
New Variant PEDVs

Age	All age, especially in suckling piglets.
Clinical signs	Watery diarrhea, piglets may die from dehydration
Gross lesions	1. Small intestine is distended with yellow, foamy fluid, and the wall is thin and transparent 2. Stomach is distended with curdled milk
Microscopic lesions	1. Villous height : crypt depth ratio reduction 2. Cell exfoliation

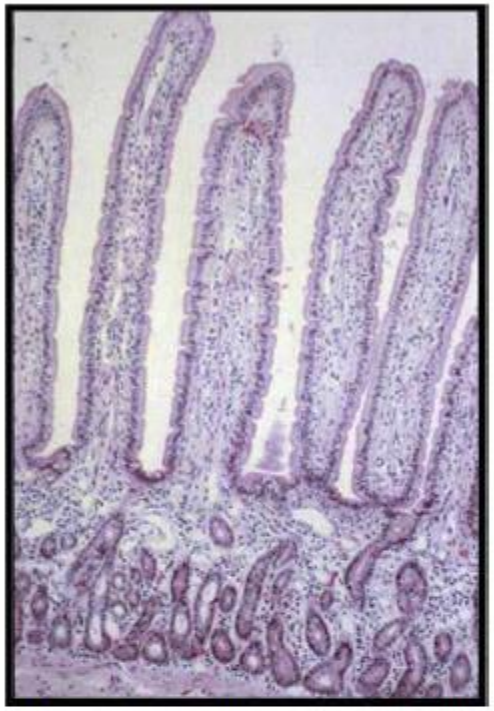


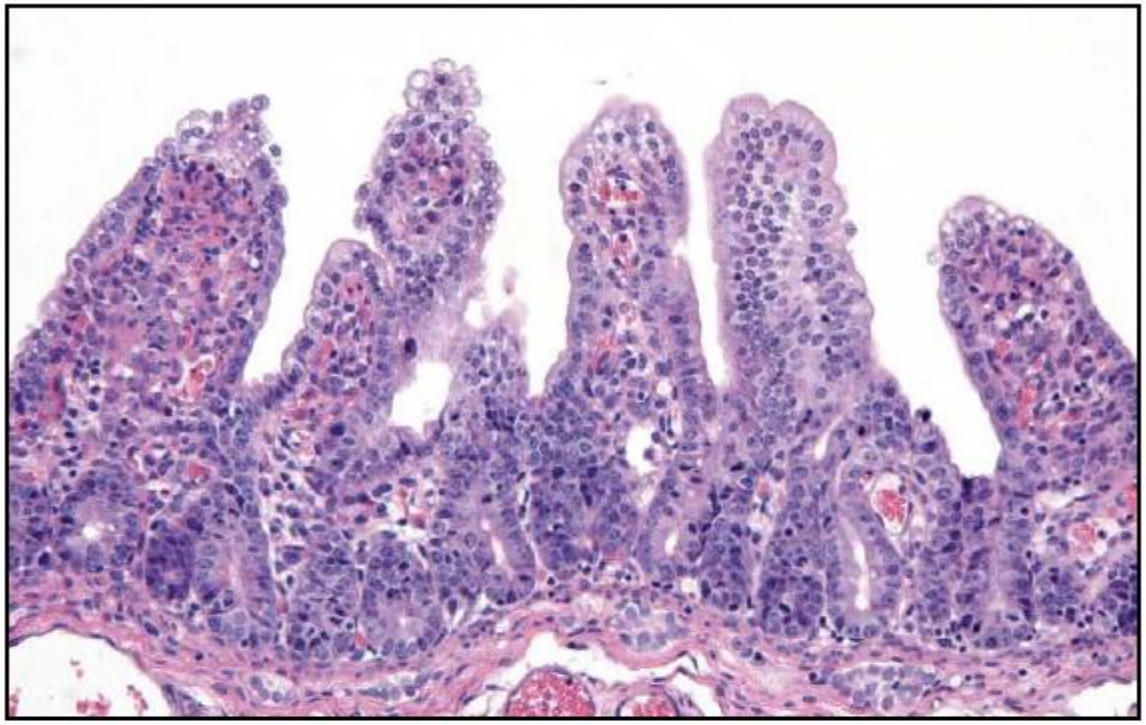
(Jung and Saif, 2015; Straw et al., 2006)



Wet mount, intestinal villi, transmissible gastroenteritis, small intestine, piglet. There is notable villous atrophy*(bottom)* compared with normal intestine *(top)*

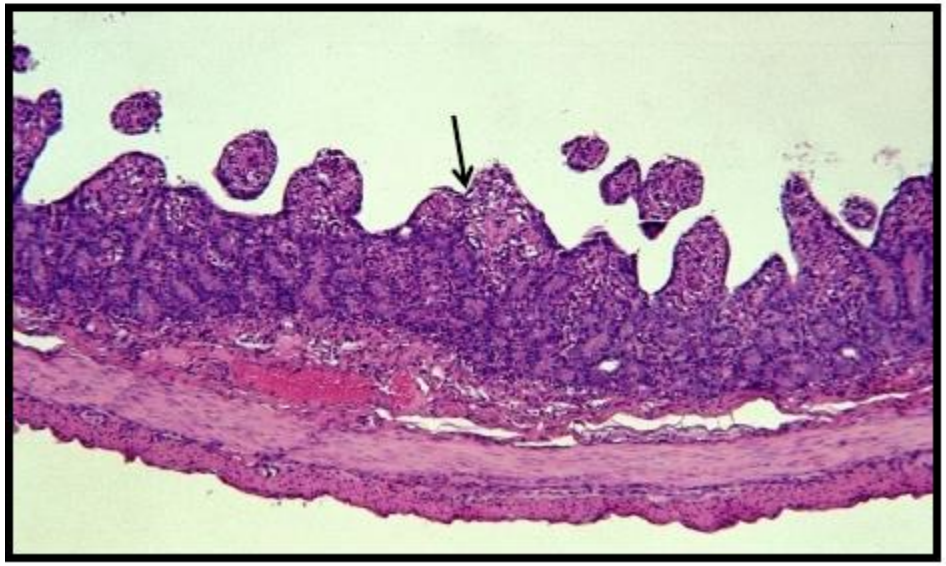


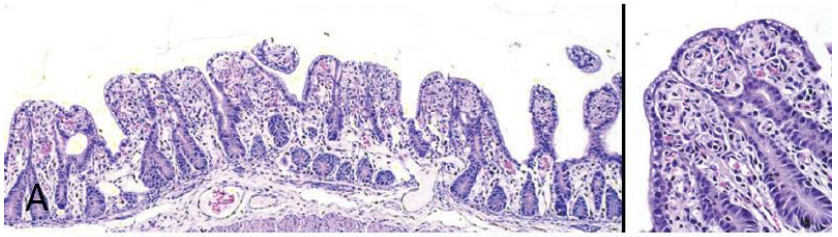
Normal length intestinal villi



Rotavirus enteritis, jejunum, piglet. There is notable blunting and fusion of intestinal villi secondary to virus-induced cytolysis of enterocytes covering the tips and sides of intestinal villi.

Pathologic Basis of Veterinary Disease, 5th ed., Mosby-Elsevier



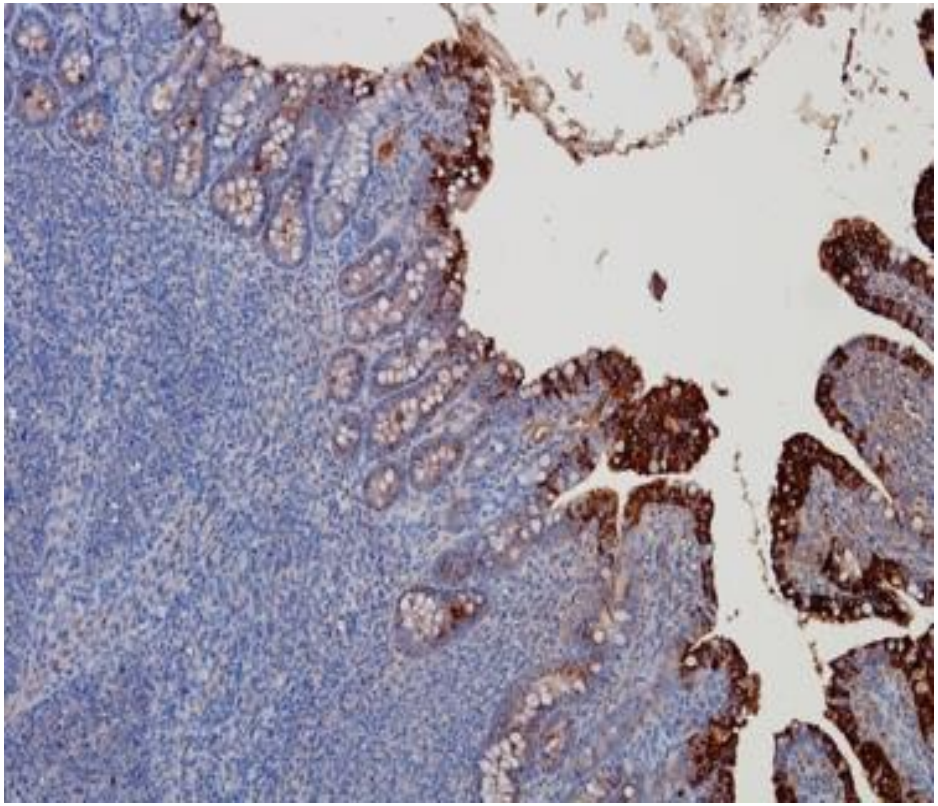


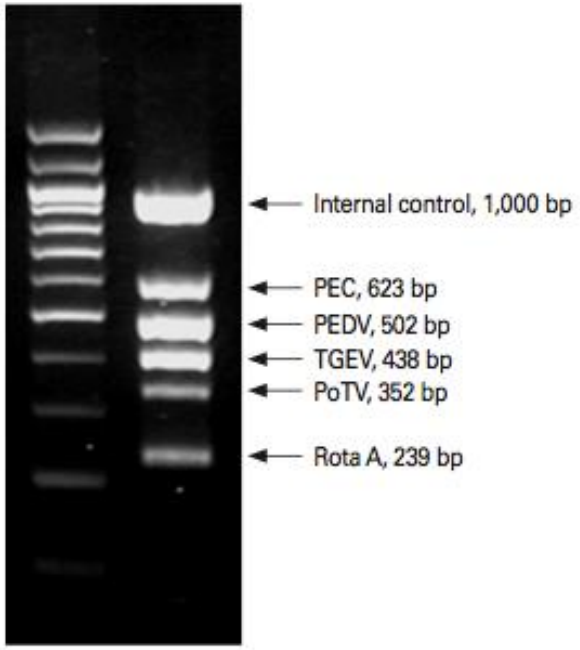
TGE, small intestine, piglet. Marked villous atrophy & fusion (arrow).

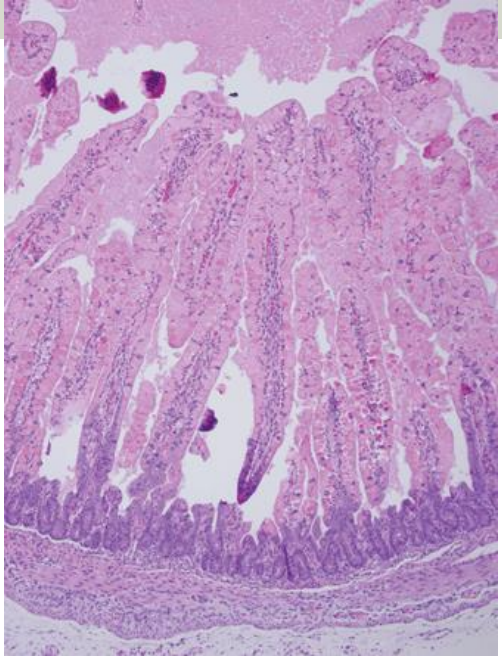
診斷

RT-PCR or real time RT-PCR: Detect PEDV genetic material from feces, oral fluid, environment and feed

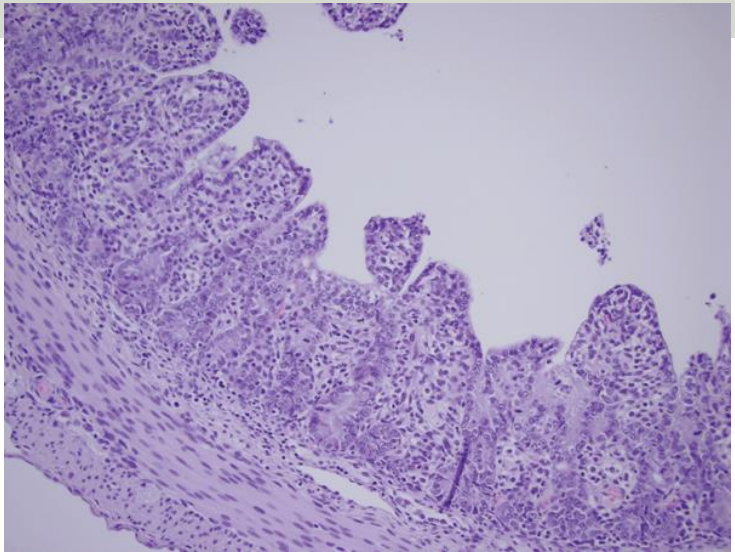
IHC: antibodies to detect PEDV antigen



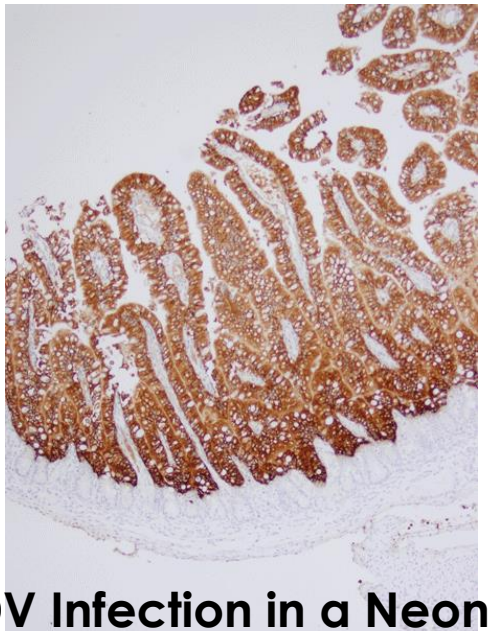




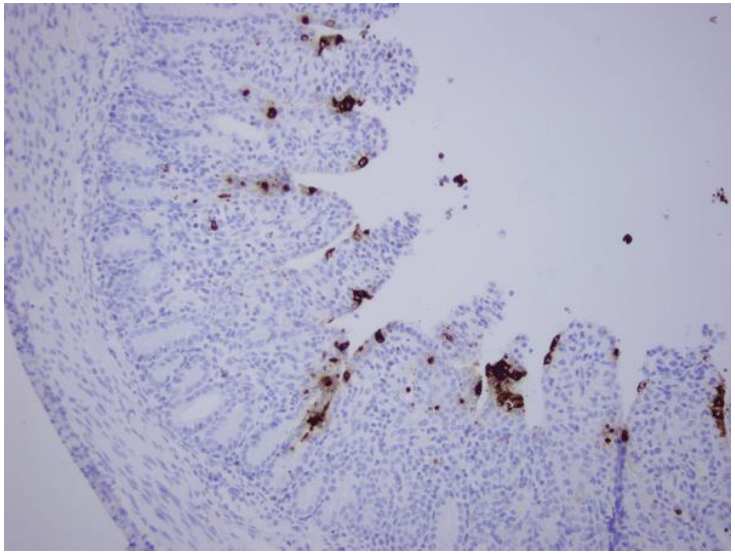
Intestinal Villi from Normal Neonatal Pig



Severely Damaged Neonatal Pig Gut Post-PEDV Infection



Early PEDV Infection in a Neonatal Pig

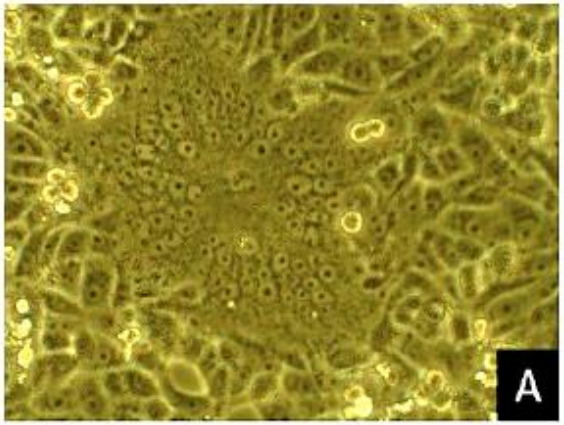


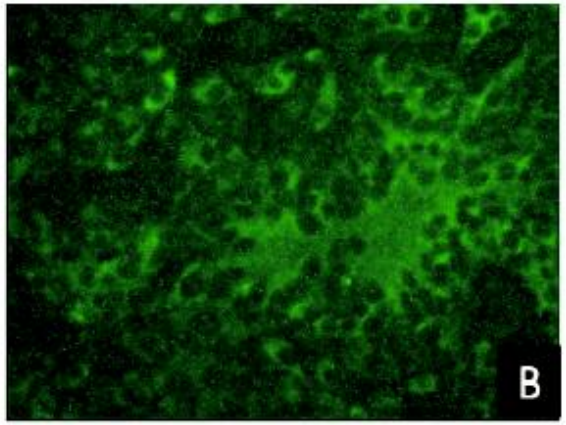
Neonatal Pig 36 Hours After PEDV Infection

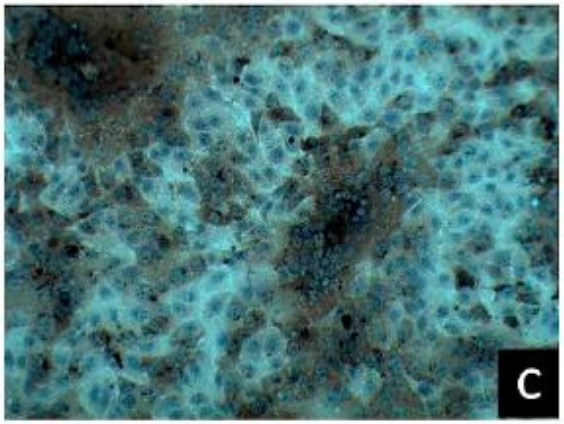
https://www.aasv.org/pedv/Conceptsforherdexposure121713.pdf

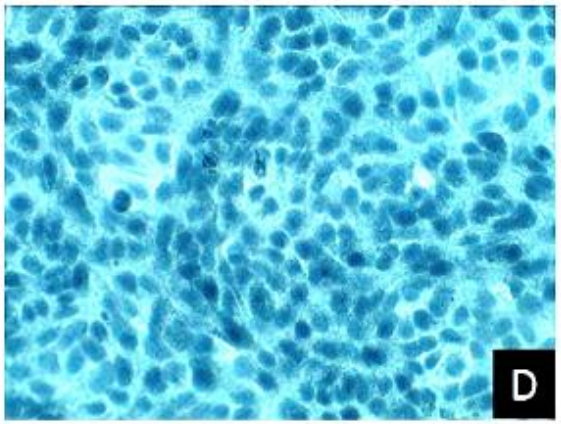
診斷

Viral isolation, ICC, IFA, TEM









http://humanviruses.org/wp-content/uploads/2014/01/Coronavirdae-Cov-1-15-14.png

診斷

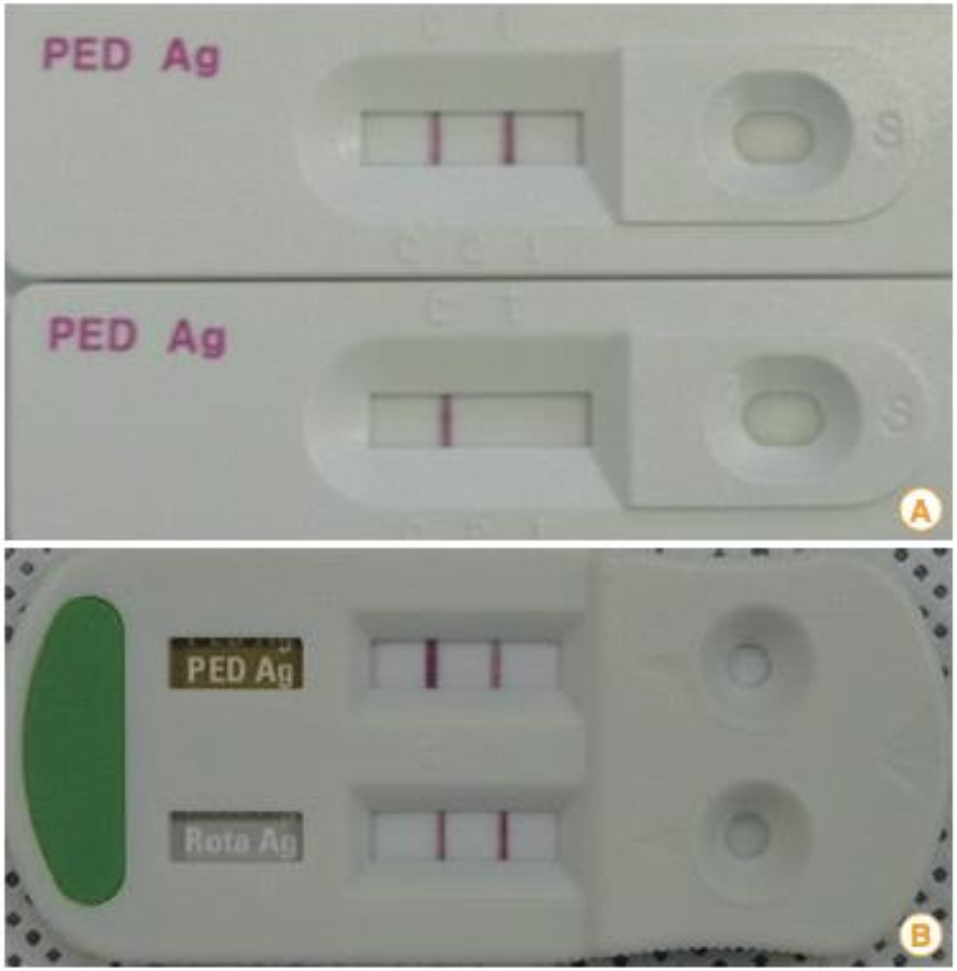
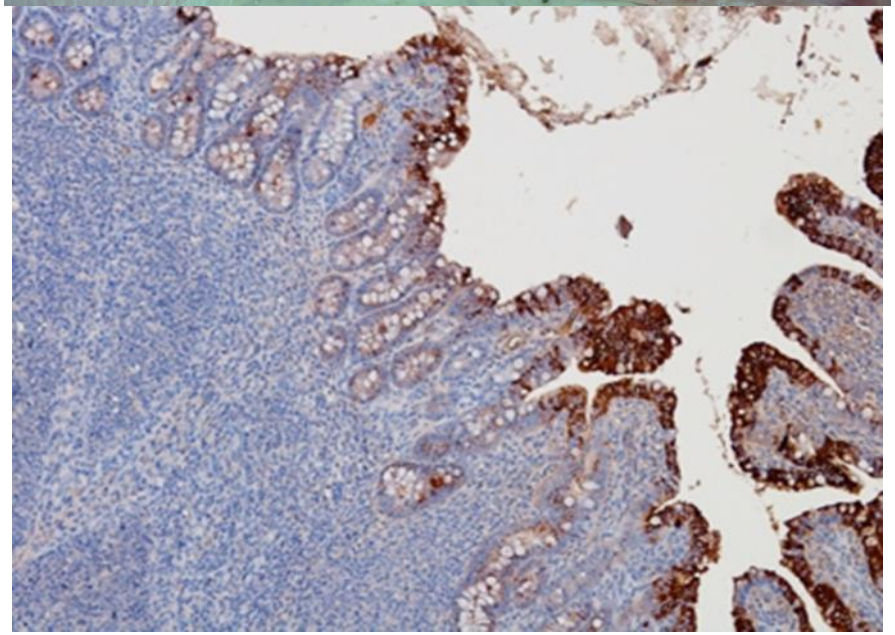


Fig. 3. Results of an immunochromatographic assay kit that can be used for porcine epidemic diarrhea virus (PEDV) detection. (A) The upper and lower panels show positive and negative results, respectively. (B) Dual-detecting immunochromatographic kit for the detection of PEDV and porcine rotavirus.



病變：小腸絨毛萎縮，充滿氣體及黃色水樣內容

免疫組織化學染色可見病毒抗原於萎縮之絨毛上皮細胞

Rotavirosis: diagnostic tools and criteria

Clinical signs

- Profuse yellow-white watery diarrhoea, with undigested milk
- Lethargy
- Vomiting
- Anorexia
- Poor average daily gain
- Weight loss

Gross lesions

- Dilation of small intestine
- Watery, yellow, or grey contents of small intestine
- Intestinal walls are thin
- Stomach containing undigested milk

Laboratory investigations

3-5 recently dead/euthanized pigs or intestines

↓

Detection of rotavirus by PCR assays (screening method)

↓

Histopathology (confirmation method)

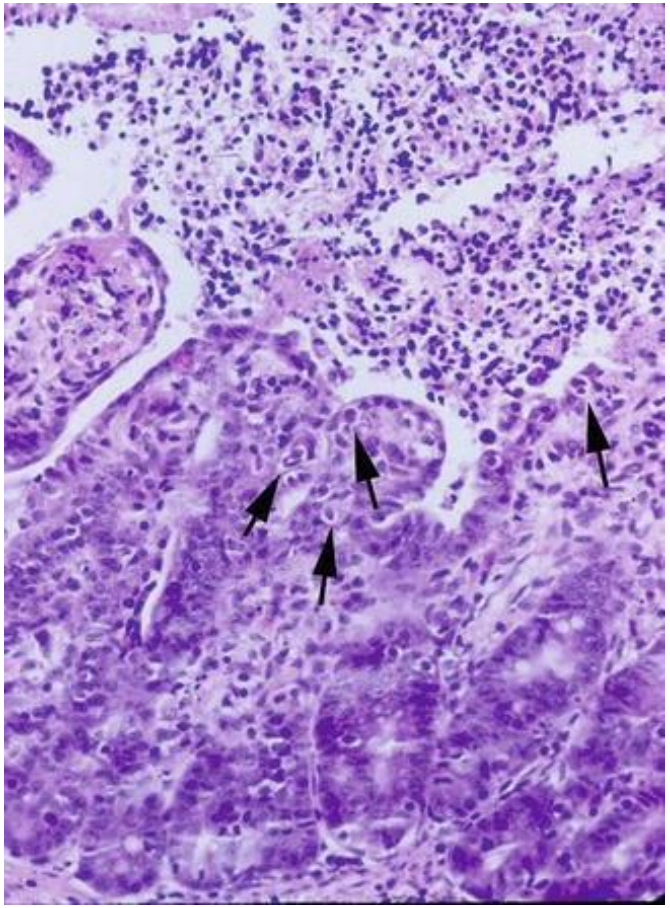
Detection of characteristic microscopic lesions?

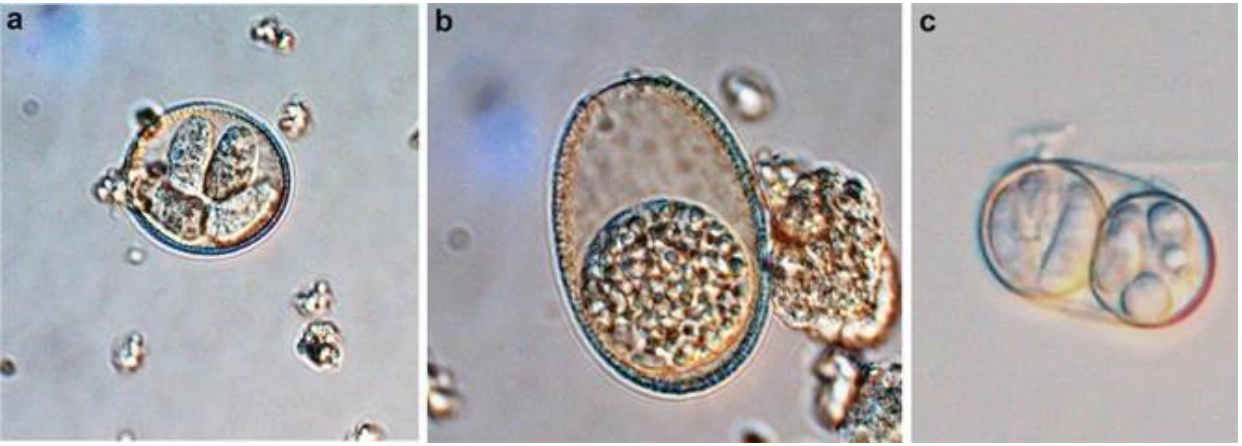
No → Diagnosis of Rotavirosis not confirmed

Yes → Suggestive of Rotavirosis

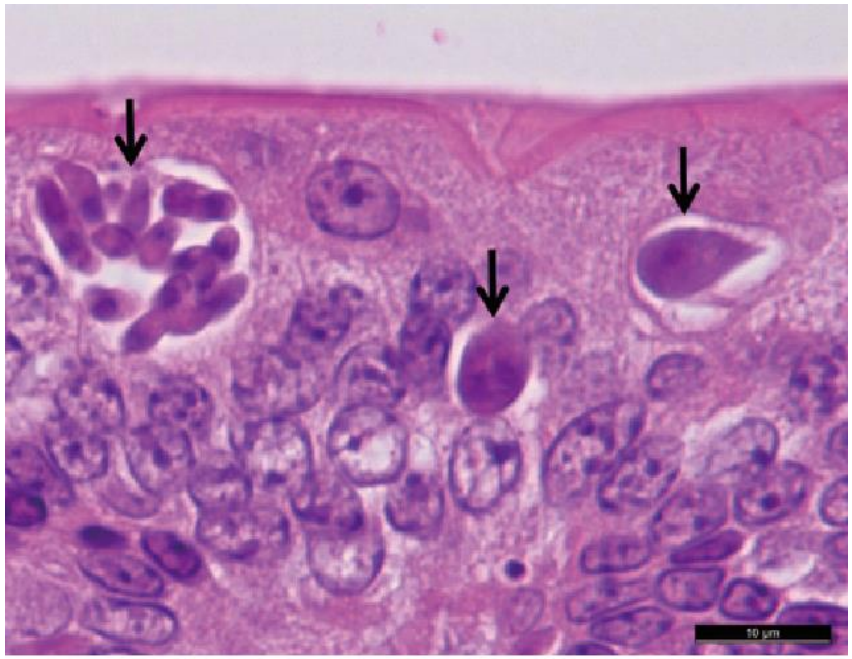
Luppi *et al.*, 2023

豬球蟲症 *Cystoisospora* (syn. Isospora) *suis*



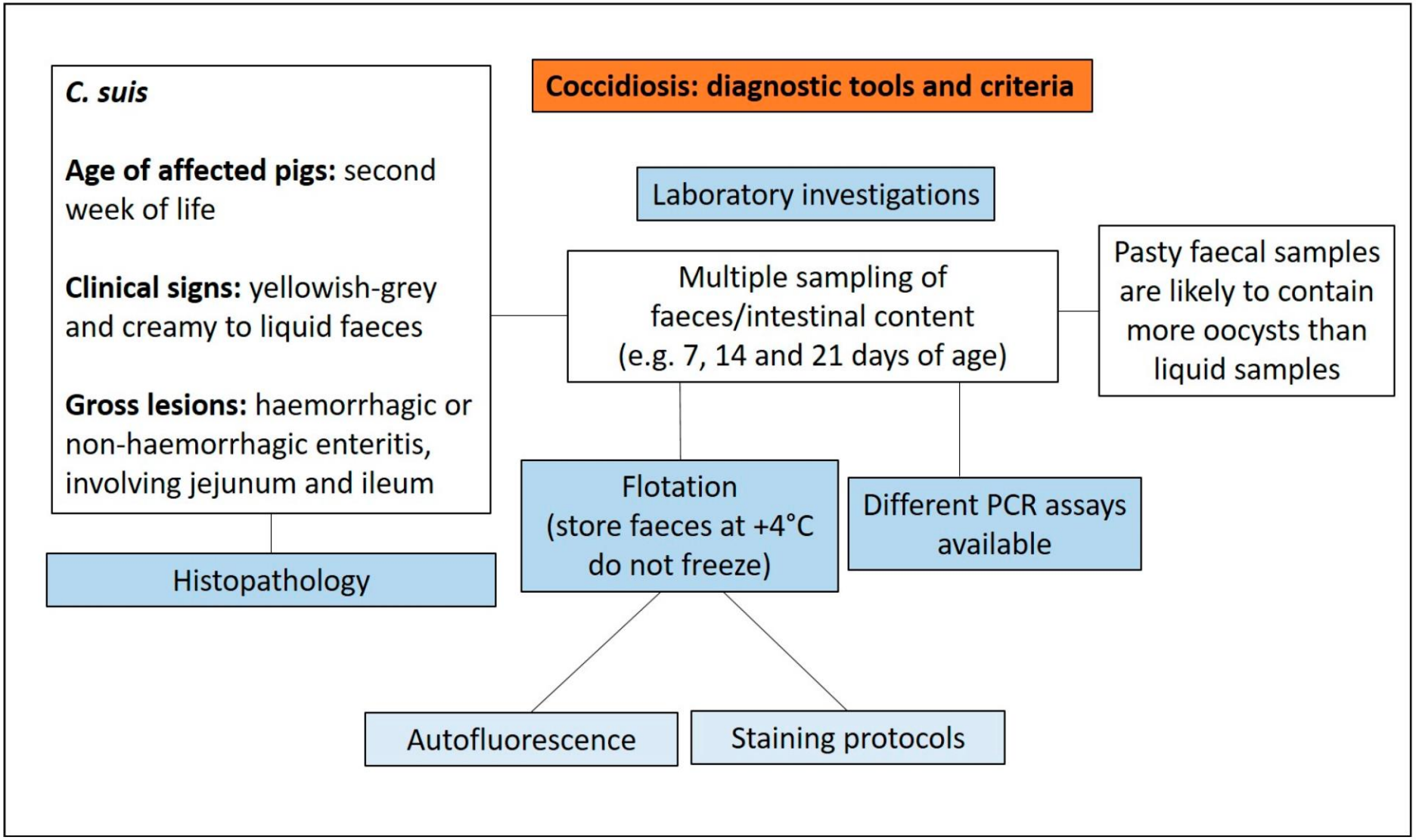


(a) *Eimeria perminuta* (b) *Eimeria scabra* (c) *Cystoisospora suis*



Post-weaned Piglet

Kanamori *et al*., 2018



Luppi *et al.*, 2023

沙門氏桿菌症

•腸炎型：斷奶後保育豬 (*S.* Typhimurium)

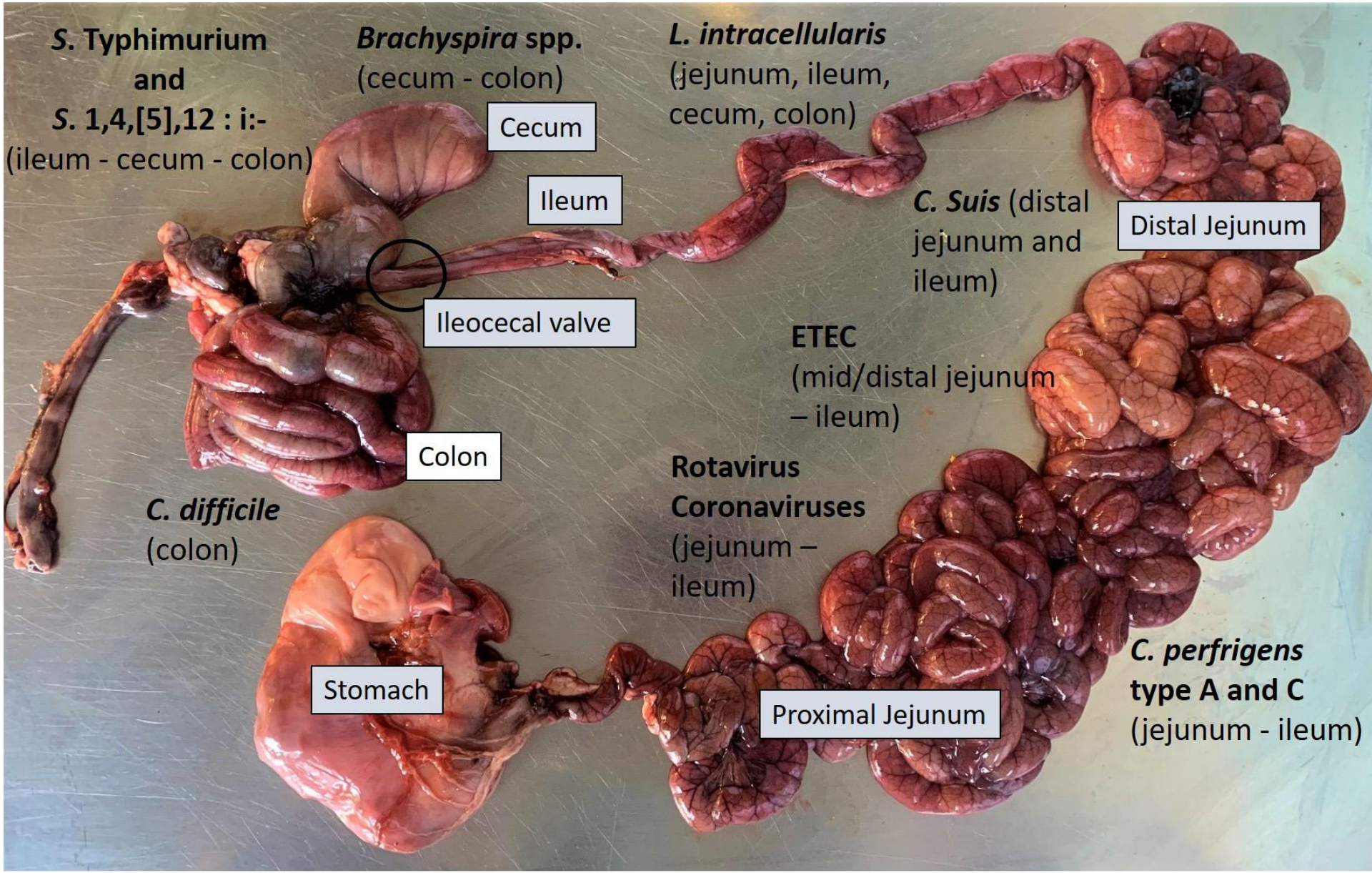
•症狀：黃色下痢，高發生低死亡，發育不良、皮毛粗糙、石頭豬、鈕扣狀潰瘍

•全年會發生（尤其是四、七、十一月季節交替）

•症狀：乳白至黃白色水樣白痢，脫水及酸血症而死

•敗血型：三到四月齡肥育豬 (*S.* Cholerasuis)

•症狀：突然發燒、耳翼發紺、死亡、低發生率高死亡率、肝臟多發白點、腸梗塞

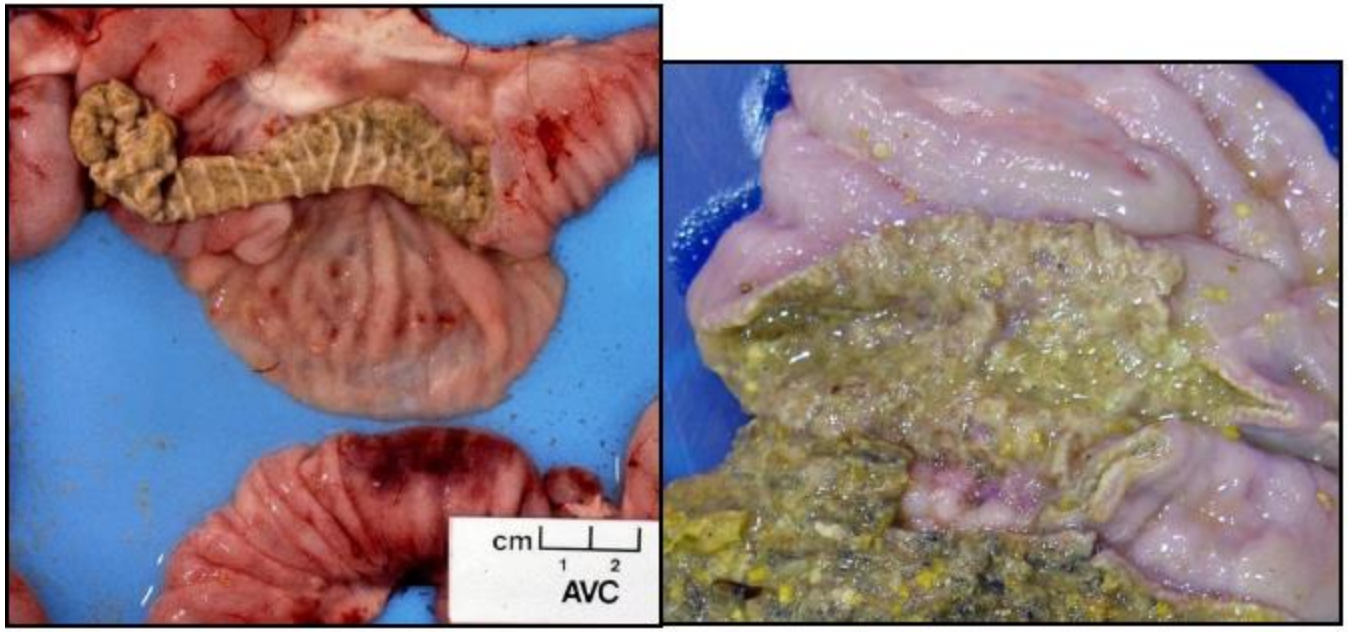


Luppi *et al.*, 2023

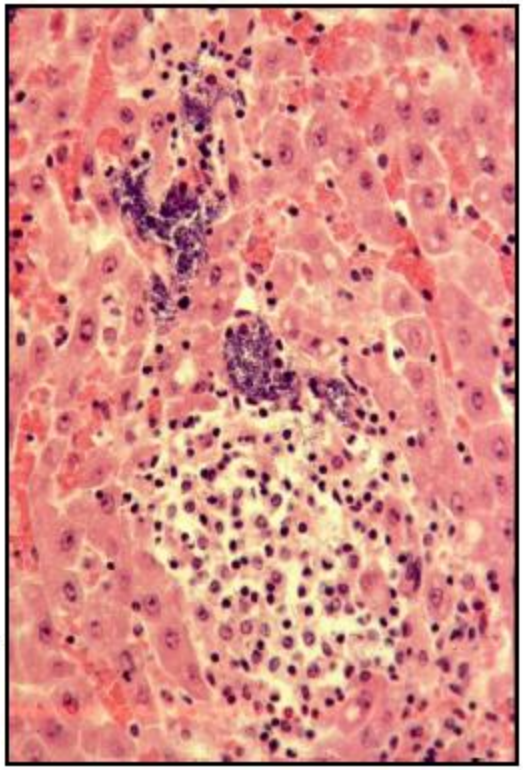
Fibrinous enteritis with involvement of colon and small intestine in pigs infected with *S*. Typhimurium.

Salmonellosis

- **Acute** form
  - Fibrinonecrotic enterocolitis, necrosis of Peyer's patches & mesenteric lymphadenopathy
  - Multifocal hepatitis (paratyphoid nodules) hyperplasia of Kupffer cells



Acute salmonellosis. Yellow-brown intaluminal fibrinous cast, bovine (left) & fibrinonecrotic pseudomembranes in spiral colon, pig (right).



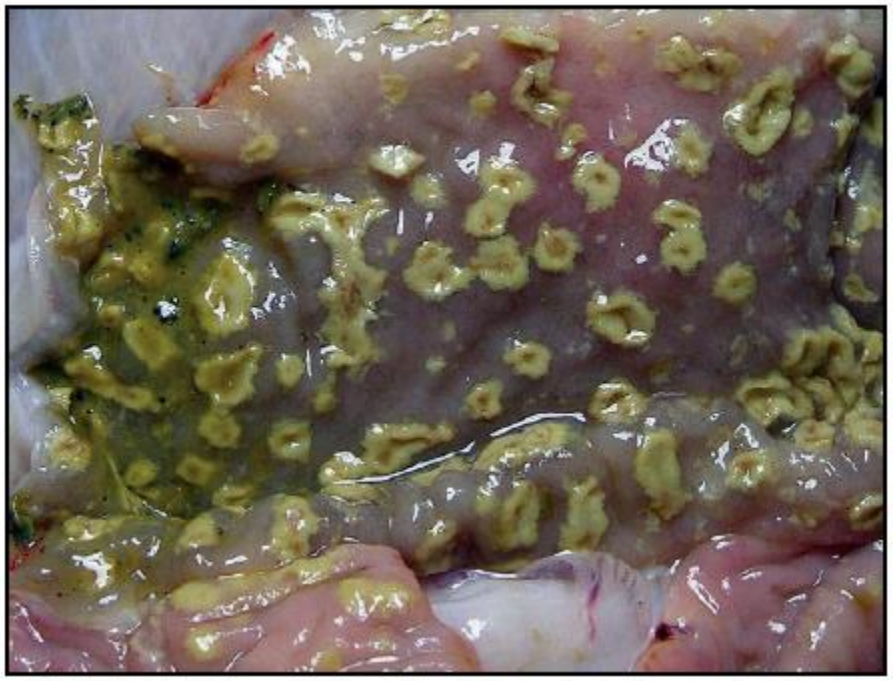
Paratyphoid nodule (p) with intralesional bacteria (arrow) *S. typhimurium*, liver, cow.

Salmonellosis

- **Chronic** form
  - Vasculitis → thrombosis → infarct → button ulcers
  - Ulcerative enterocolitis & proctitis
  - Rectal strictures & obstruction

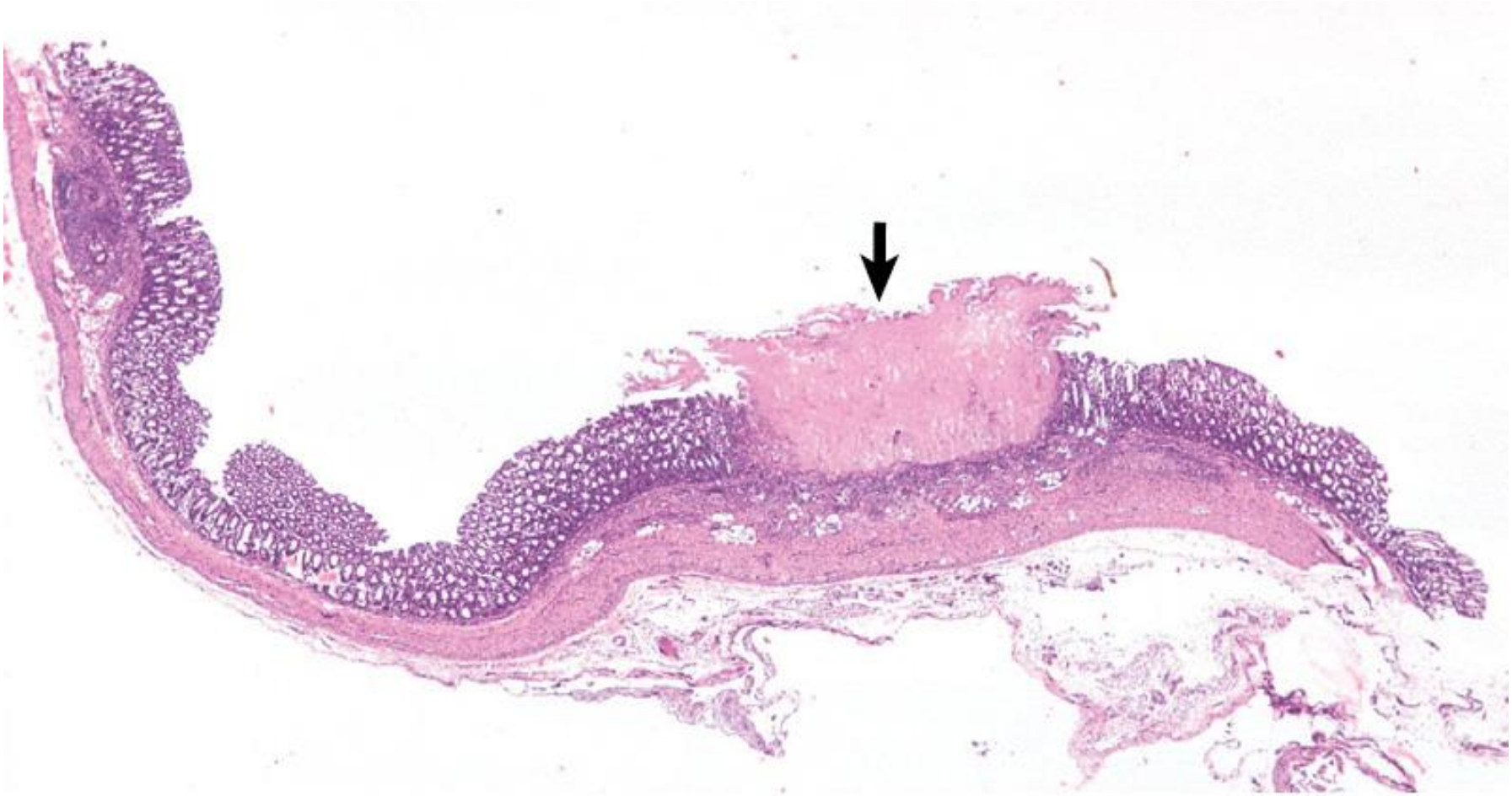
Rectal stricture and megacolon in pigs. Marked dilation of the colon (bottom right) is due to rectal stricture (left) secondary to ulcerative proctitis, ischemia and granulation tissue formation.

Pathologic Basis of Veterinary Disease, 5th ed., Mosby-Elsevier



Button ulcers *(arrows)*, colon, pig. These lesions are focal infarcts due to chronic salmonellosis.

Chronic enteric salmonellosis, colon, pig. Multiple foci of mucosal necrosis *(arrow)* are termed *button ulcers* and are pathognomonic for chronic enteric salmonellosis

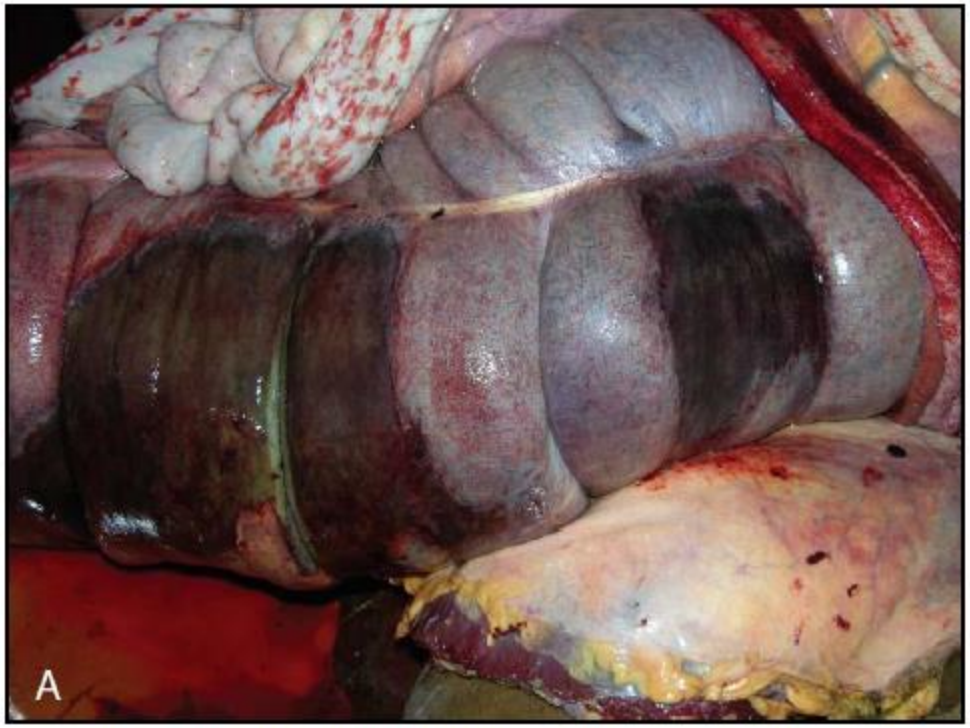


(Courtesy Dr. M.D. McGavin, College of Veterinary Medicine, University of Tennessee.)
Zachary and McGavin: Pathologic Basis of Veterinary Disease, 5th edition.

Salmonellosis

- **Peracute/septicemic** form
  - *S. cholerasuis*
  - Widspread petechial hemorrhages, DIC
  - Fibrinoid necrosis of blood vessels → thrombosis → ischemia, cyanosis
  - Fibrinous polyserositis

Septicemic salmonellosis. Blue-red discoloration of extremities.



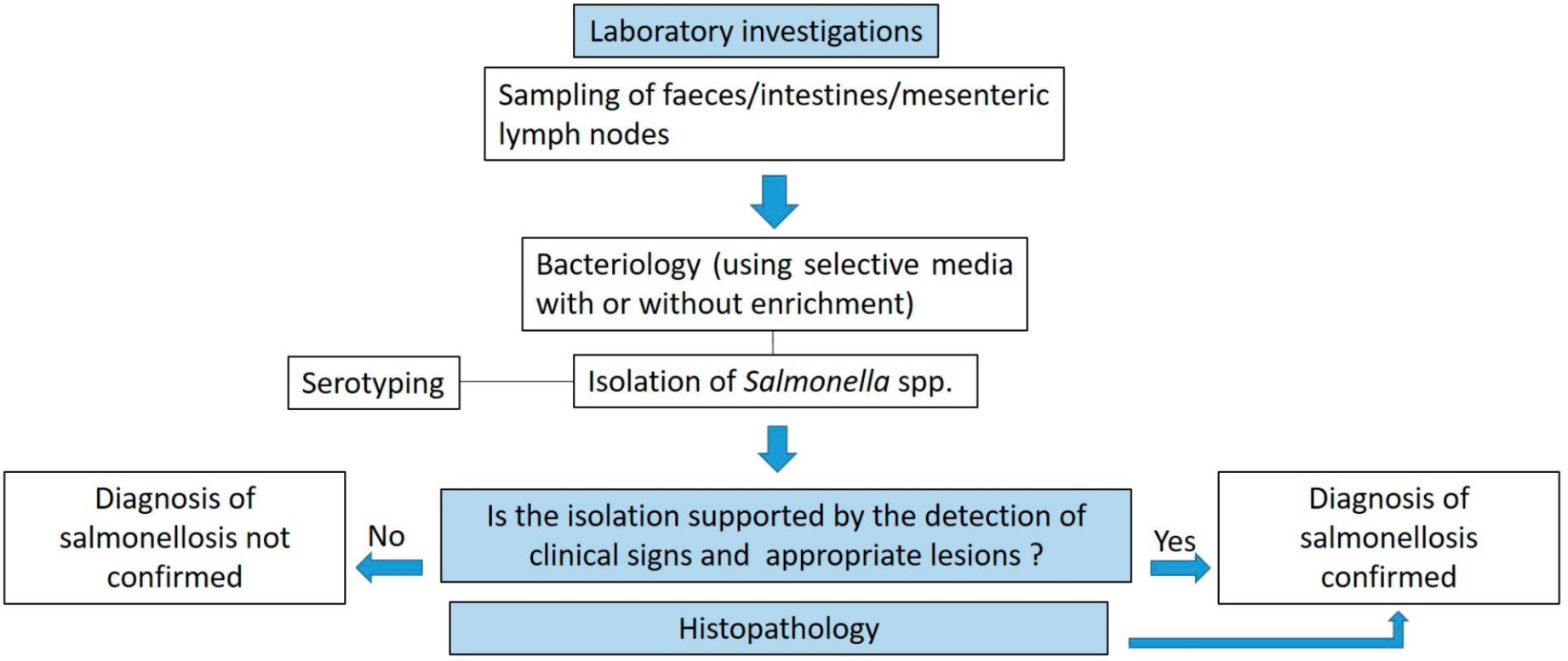
Peracute to acute salmonellosis, colon, horse. Serosal surfaces. Note the areas of hemorrhage and necrosis affecting multiple sacculations. This pattern is consistent with colonic infarcts.

Pathologic Basis of Veterinary Disease, 5th ed., Mosby-Elsevier

Enteric salmonellosis: diagnostic tools and criteria

_S._Typhimurium and its monophasic variant _S._ 1,4,[5],12:i:-

- **Age of affected pigs:** mostly in growing period
- **Clinical signs:** fever, yellow watery diarrhoea that may contain blood and mucus
- **Gross lesions:** necrotic enterotyphlocolitis with diphtheritic membrane on the mucosal surface

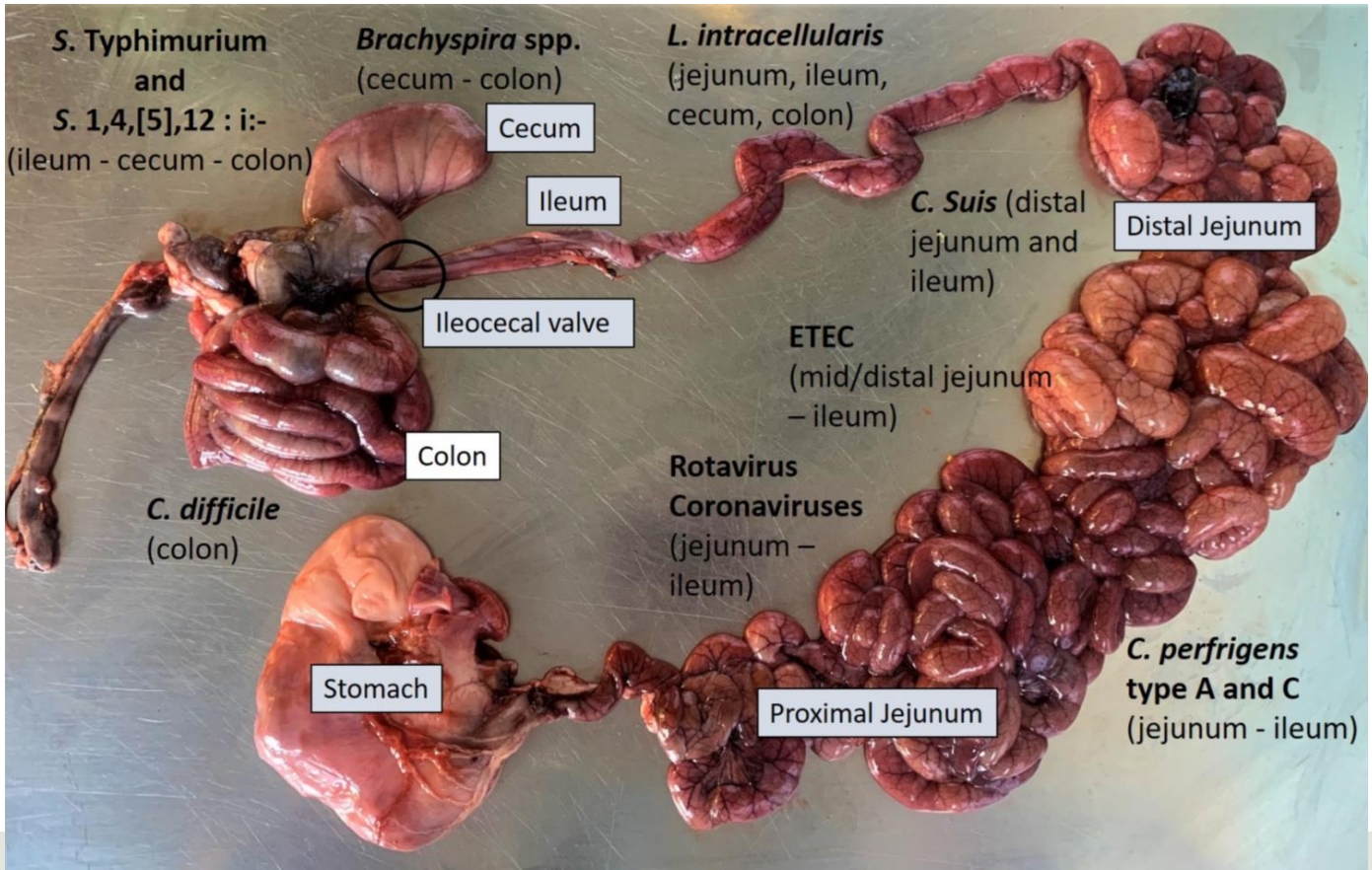


Luppi *et al.*, 2023

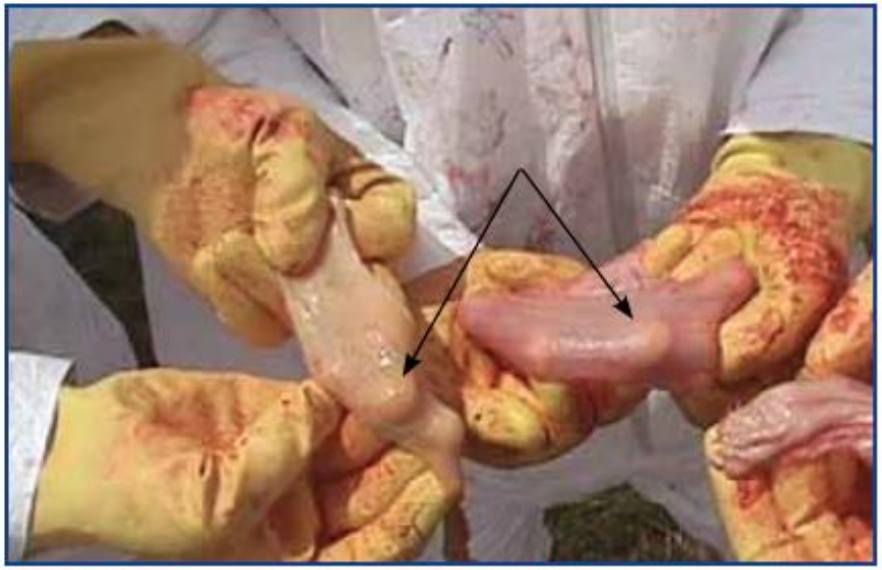
增殖性腸病：羅生氏菌 *Lawsonia intracellularis*

•發生在肉豬

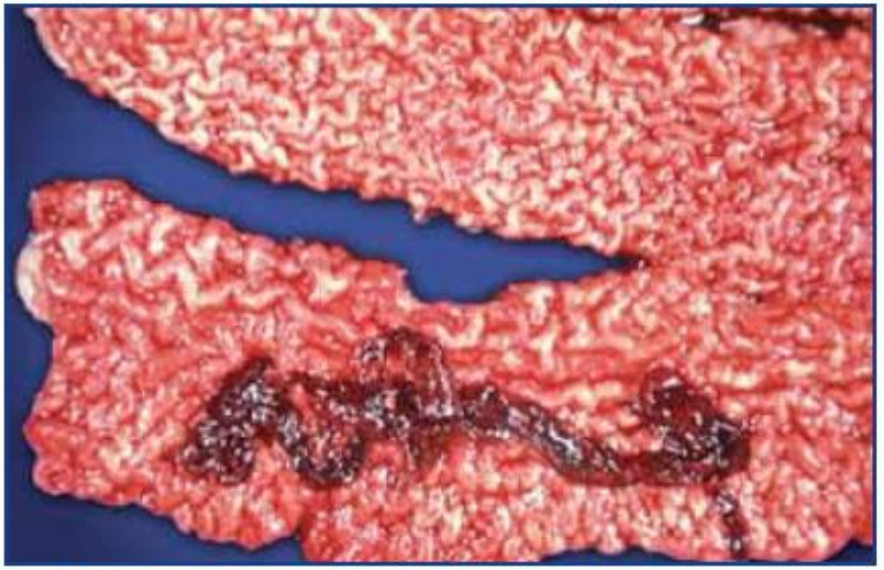
•症狀：黑色瀝青血液便，全身蒼白無血色，四肢無力，小腸後段至肛門成腦迴樣增厚



增殖性腸病：羅生氏菌



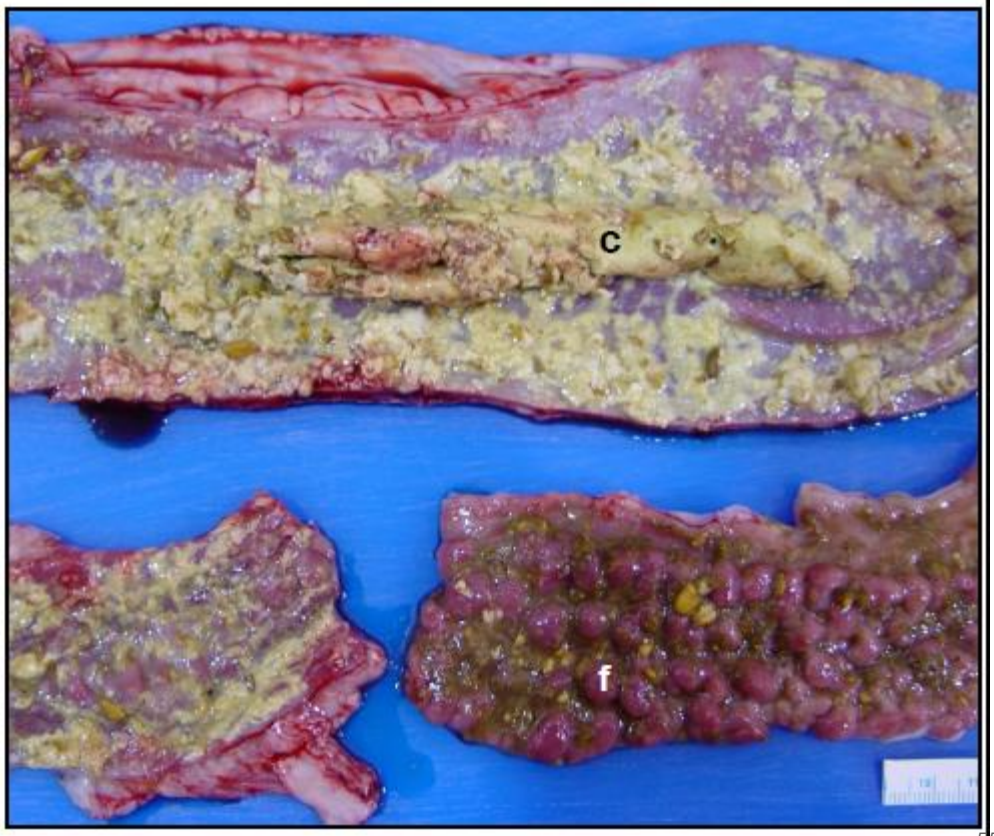
Normal intestine - can see fingers through lining



Thick hyperplastic ileal mucosa with blood clot in lumen.

Lawsonia enteritis, ileum, pig. Notice the corrugated cobblestone appearance of intestinal serosa.

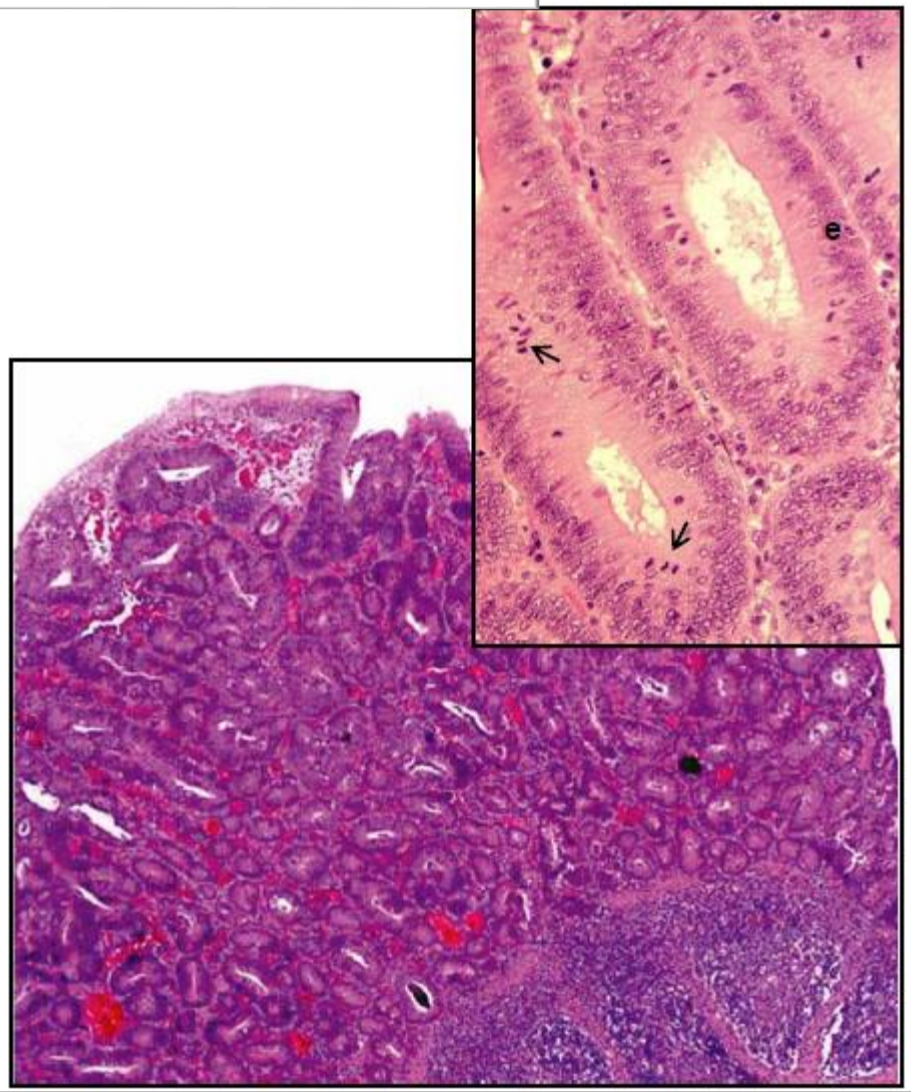
增殖性腸病：羅生氏菌



Lawsonia enteritis, ileum, pig. The mucosa is partially covered by a yellow fibrinonecrotic (diphtheritic) pseudomembrane. A large fibrinous cast (c) is present in the lumen, and there are prominent mucosal folds (f) in one of the segments (necroproliferative form).

增殖性腸病

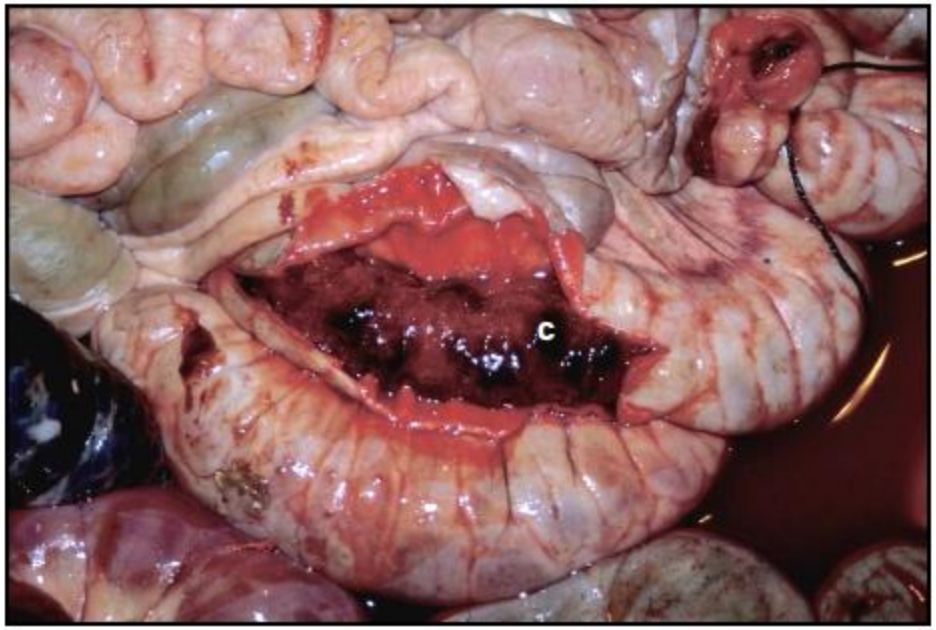
- ***Lawsonia intracellularis***
- Pigs >4 weeks
- **Hyperplasia of crypt epithelium**
  → crypt necrosis
- Morbidity 5-15%; mortality ~ 50%
- **Ileum**
- Synonyms:
  - Proliferative enteropathy (PE)
  - Intestinal adenomatosis complex
  - Proliferative hemorrhagic enteropathy
  - Distal ileal hypertrophy
  - Regional or terminal ileitis



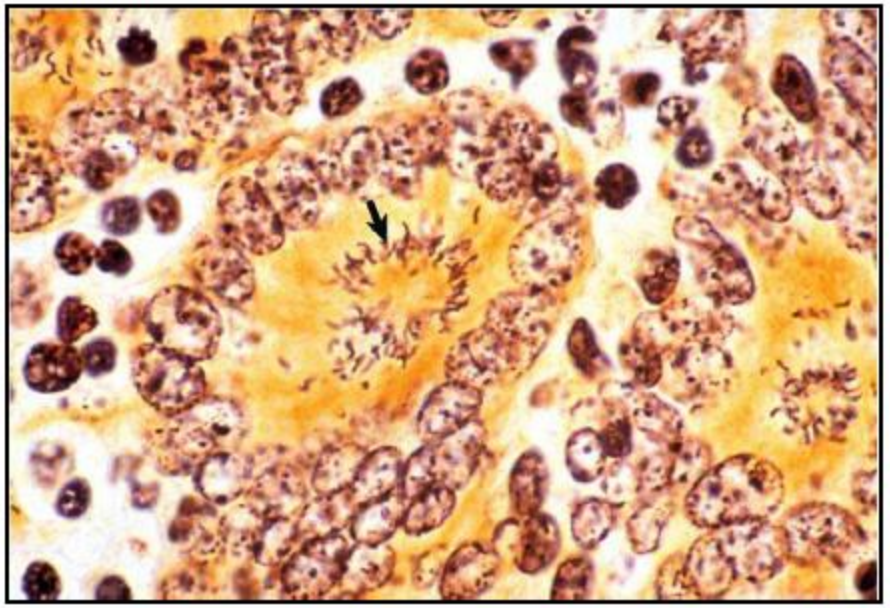
Lawsonia enteritis, ileum, pig. Noticeable hyperplasia of crypts resembling an adenoma. Note hyperplastic glands composed of tightly packed enterocytes (e) and numerous mitoses (arrows, inset).

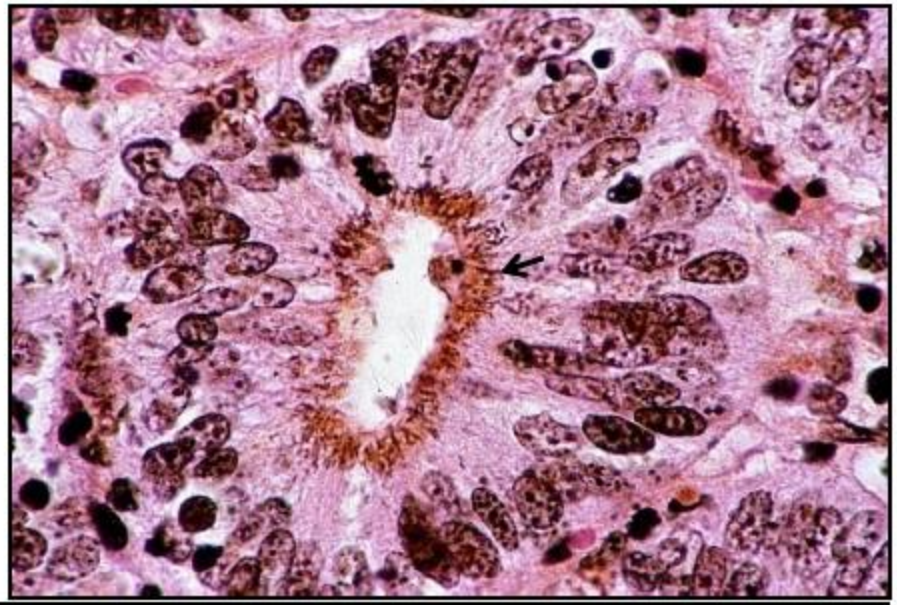
Pathologic Basis of Veterinary Disease, 5th ed., Mosby-Elsevier

Pathologic Basis of Veterinary Disease, 5th ed., Mosby-Elsevier

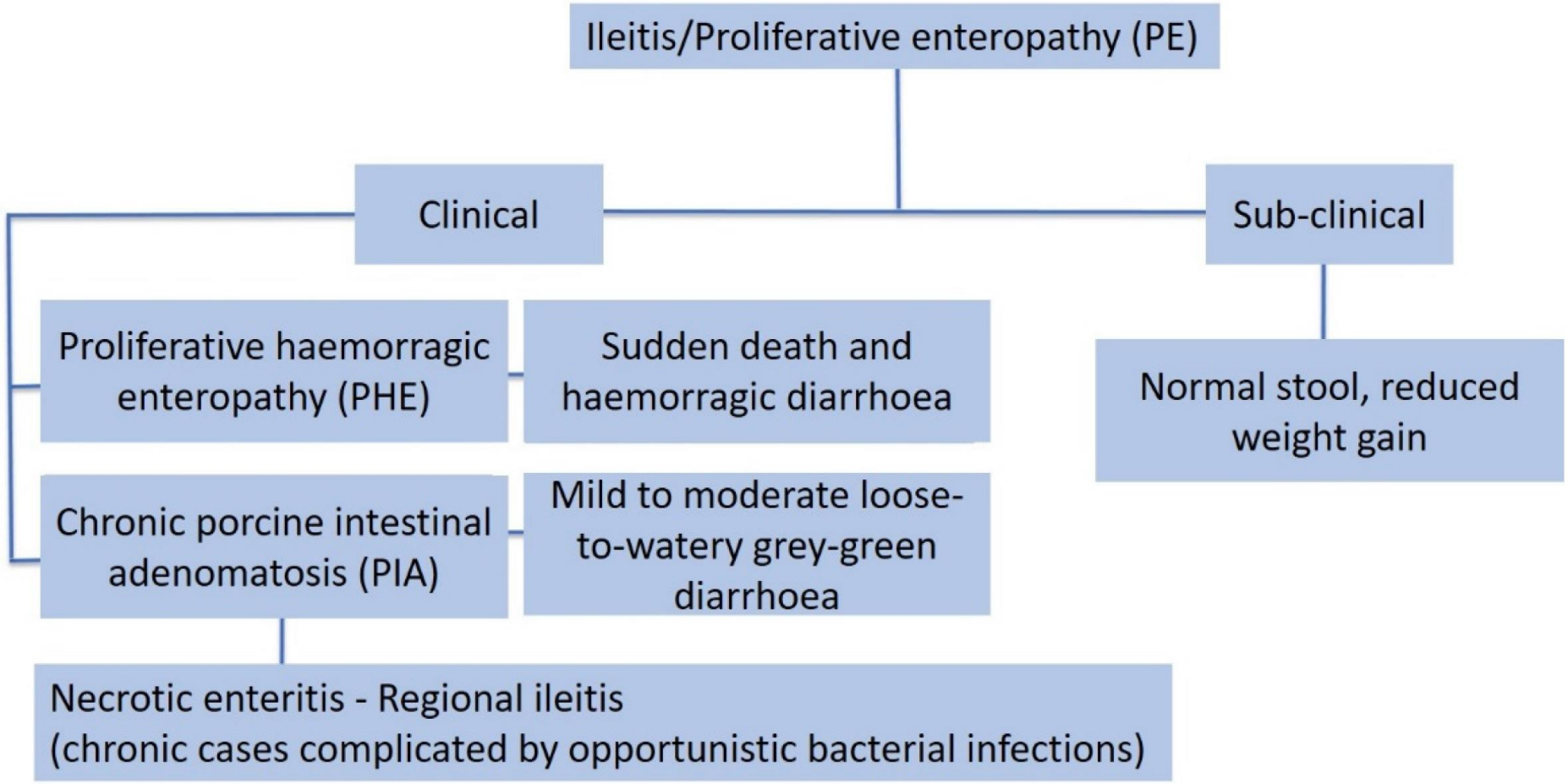


Proliferative hemorrhagic enteropathy. Lawsonia enteritis, ileum, pig. Note the large hemorragic cast in the lumen (c). The serosa is corrugated.





Histo. Curved *Lawsonia* spp bacteria (arrows) are present in the **apical cytoplasm** of enterocytes. **Warthin-Starry stain.**



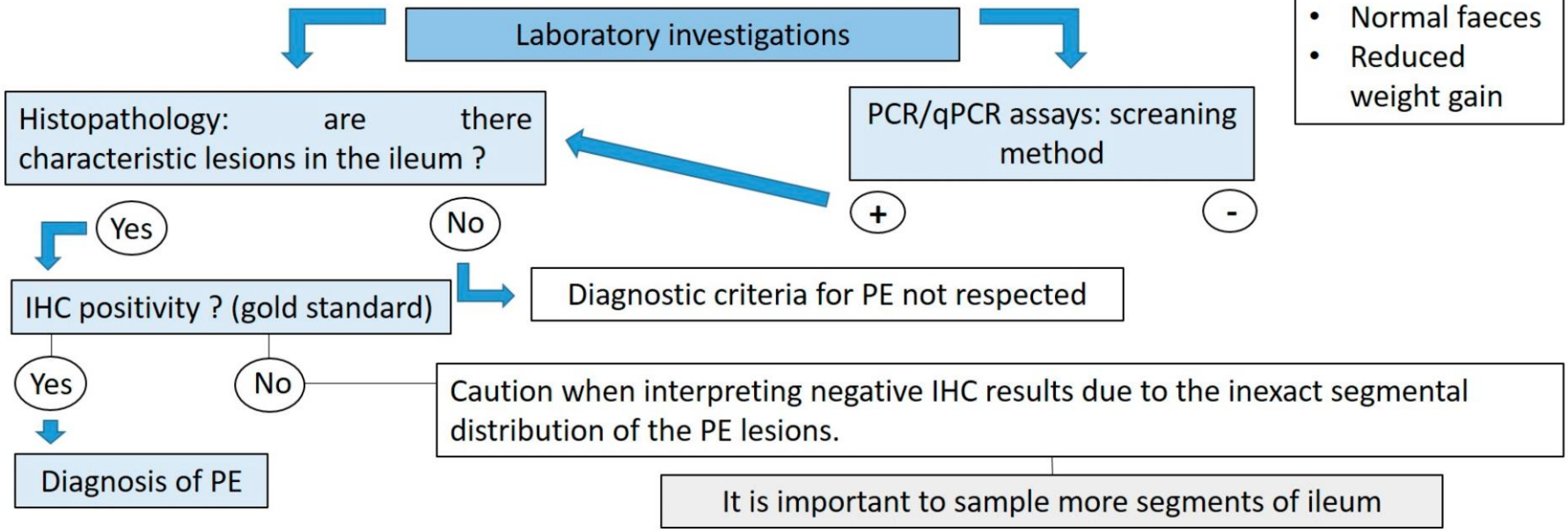
Luppi *et al.*, 2023

Porcine proliferative enteropathy (PE): diagnostic tools and criteria

L. intracellularis

- **Age of affected pigs:** 4-12 months of age **(PHE)**; 6-20 weeks **(PIA)**
- **Clinical signs:** sudden death associated with anaemia, haemorrhagic diarrhoea melena or haematochezia **(PHE)**; yellow watery diarrhoea that may contain blood and mucus **(PIA)**
- **Gross lesions:** the ileum is dilated and the wall is thickened and contains one or more formed blood clots combined with fibrino-necrotic debris **(PHE)**; the mucosa is thickened, corrugated, or with a cerebriform appearance **(PIA)**.

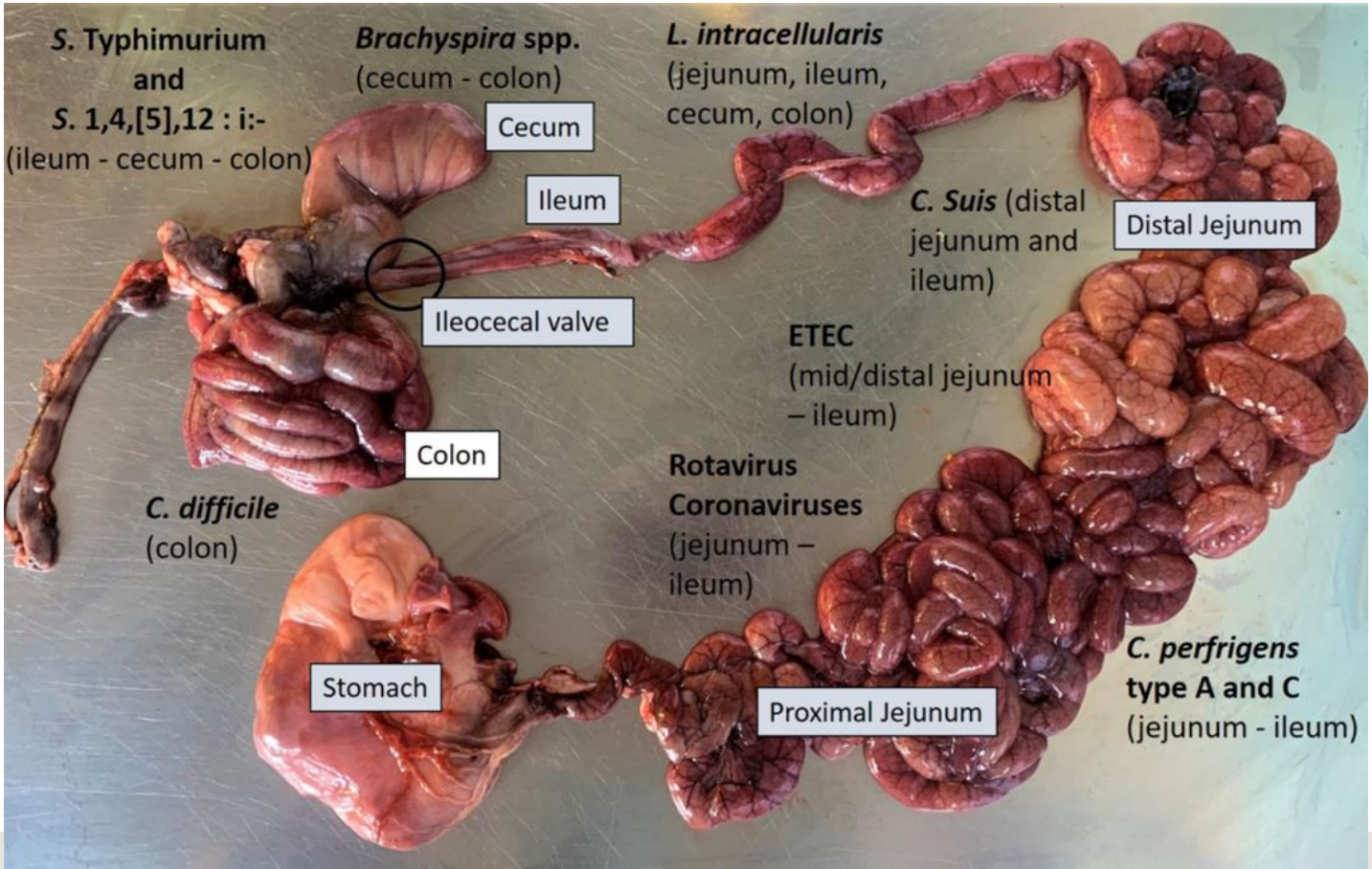
Subclinical form
- Normal faeces
- Reduced weight gain



Luppi *et al.*, 2023

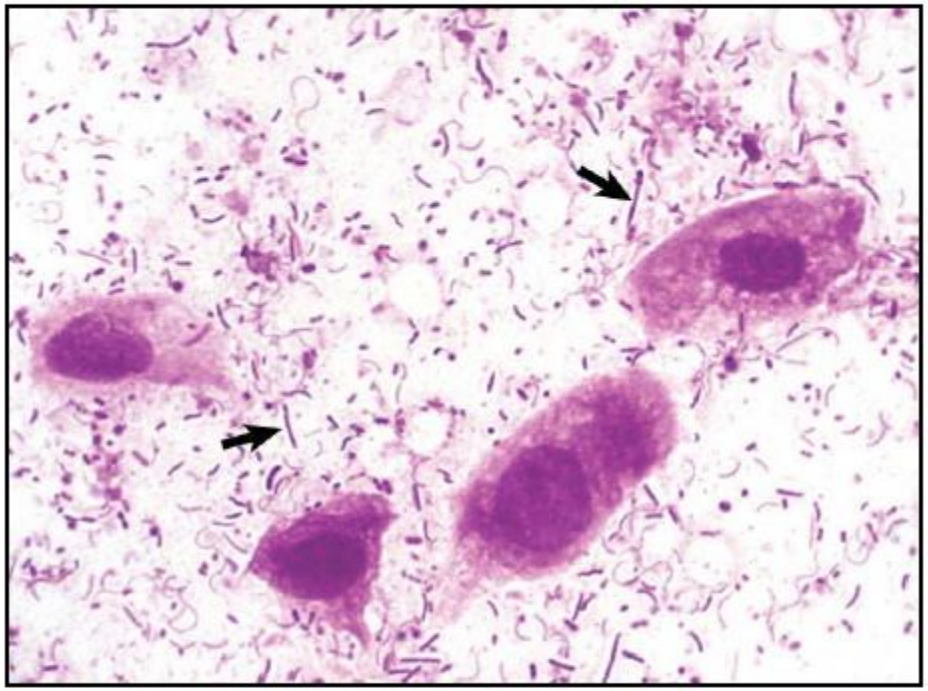
豬赤痢 (Swine Dysentery and Porcine Colonic Spirochetosis)

- 散發發生在五到六月齡肥育豬
- 症狀：暗紅血便突然死亡



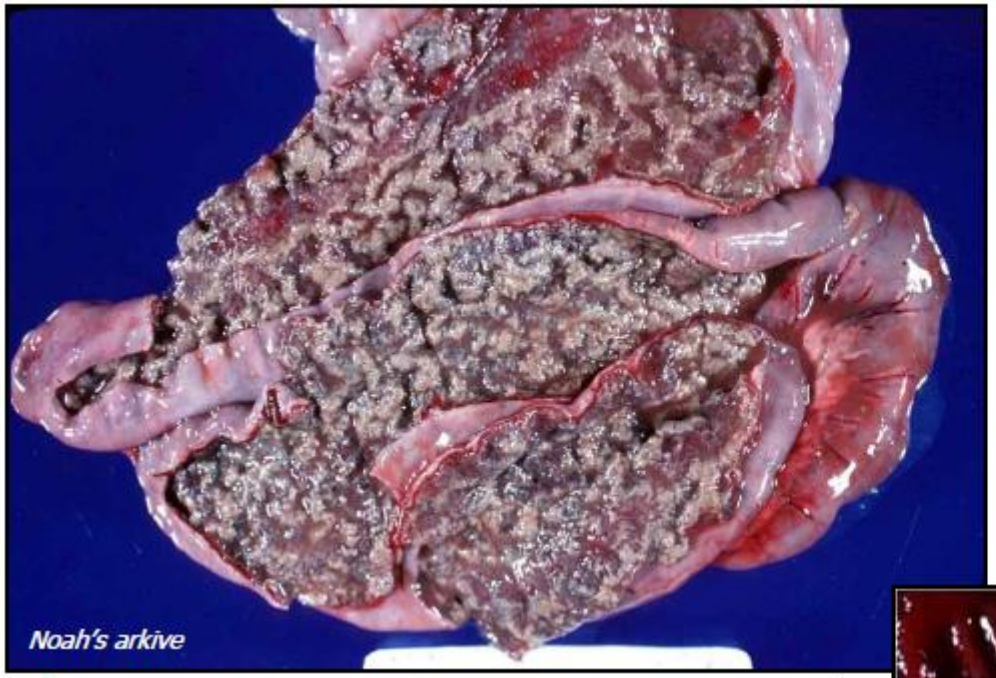
Swine dysentery

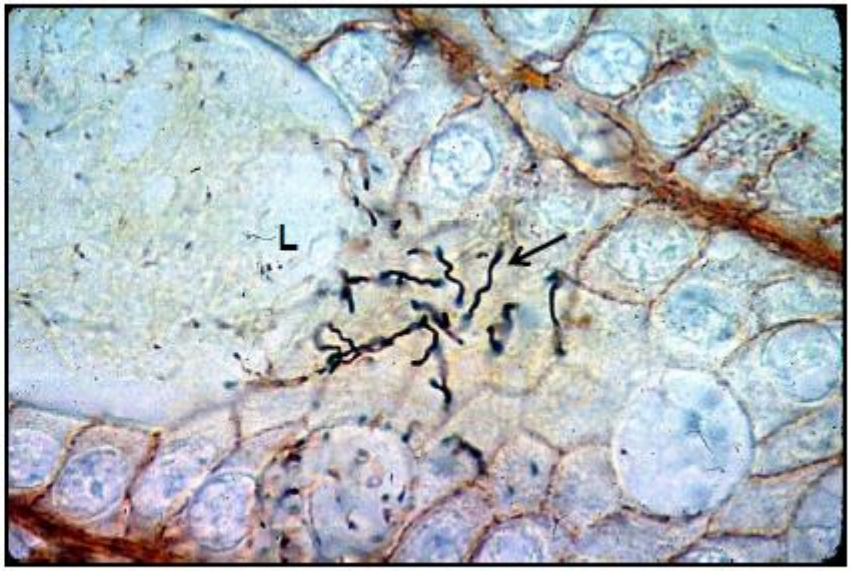
- *Brachyspira hyodysenteriae* + anaerobic bacteria
- Pigs 8-14 wks old
- Morbidity ~ 90%; mortality ~ 30%
- **Colon**
- Findings:
  - Colonic malabsorption syndrome
  - Fibrinonecrotic pseudomembranes
  - Hemorrhage
  - Necrosis of **superficial mucosa**
  - **Luminal spirochetes (Warthin-Starry)**

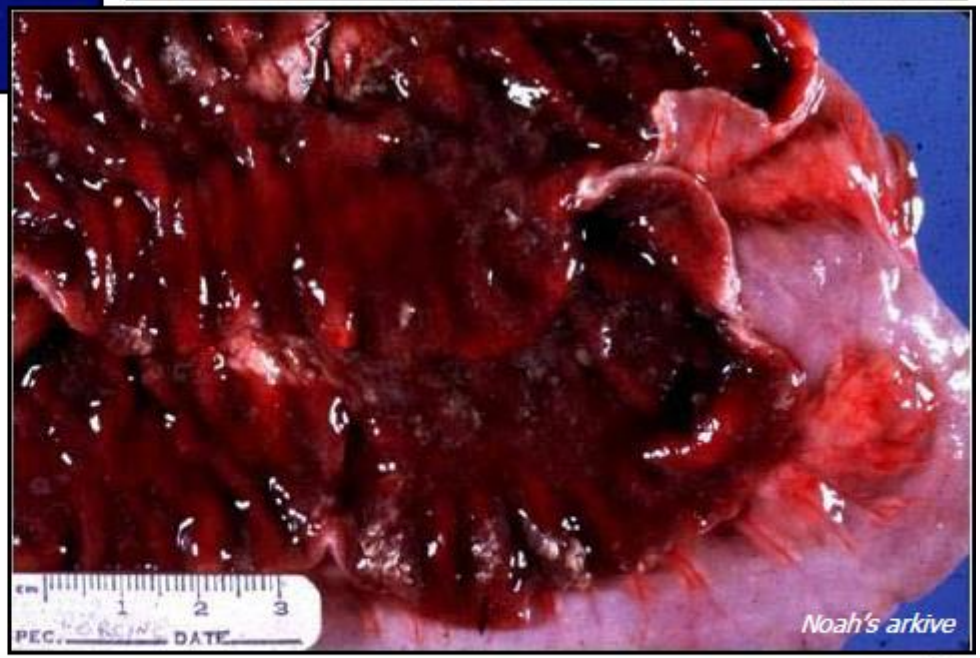


Swine dysentery, colon, pig. This impression smear contains a few enterocytes and numerous bacteria. Note the spiral bacteria *(arrows)* consistent with *Brachyspira* spp. Diff-Quik stain.

Pathologic Basis of Veterinary Disease, 5th ed., Mosby-Elsevier

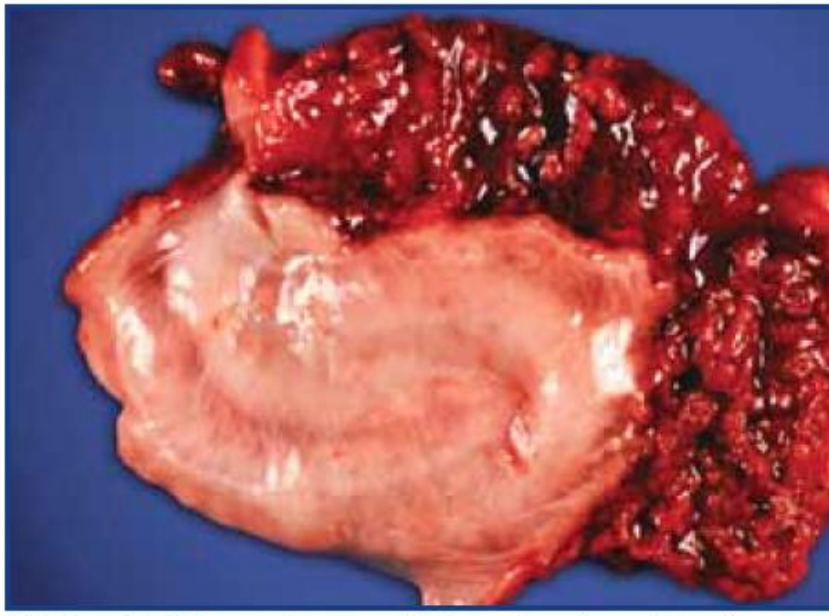




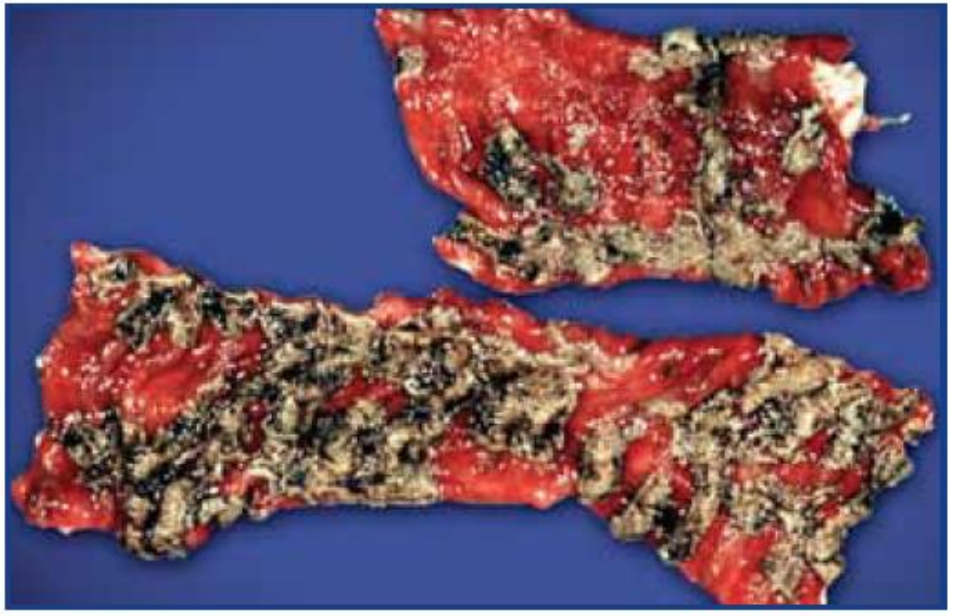


Swine dysentery. The mucosa of the spiral colon has a rough diphtheritic membrane due to necrosis of superficial mucosa and fibrin exudation (top left). Hemorrhagic colitis (bottom right). Bloody anal discharge (bottom left). *Histo*: Colon, several spiral bacteria (arrow) are present in the lumen of a crypt (L). Silver stain.

Edematous and hemorrhagic large intestinal mucosa (inner lining)

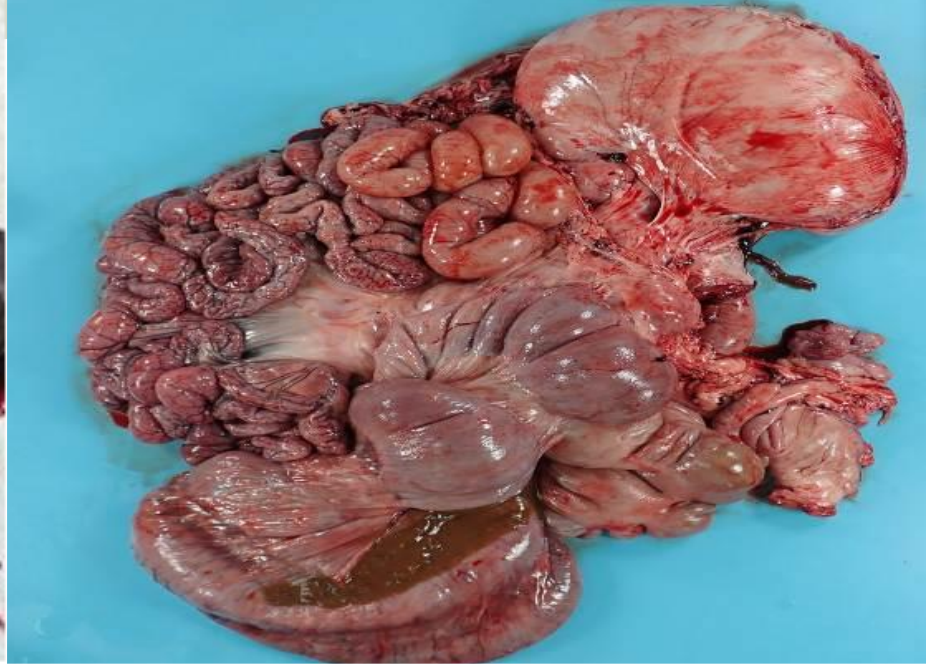


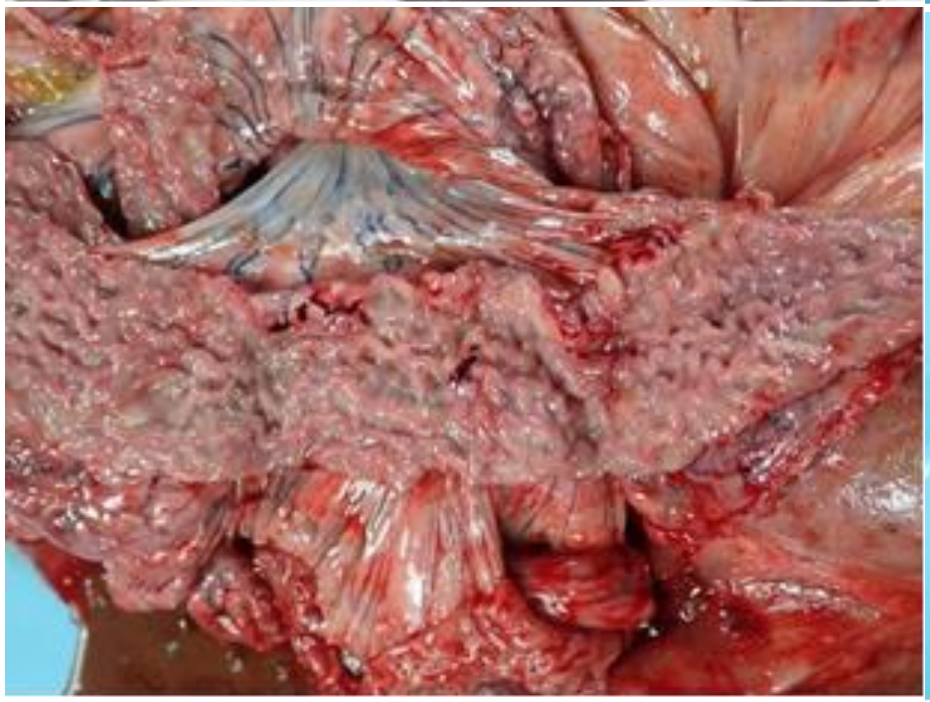
Thick-walled, hemorrhagic and edematous large intestine

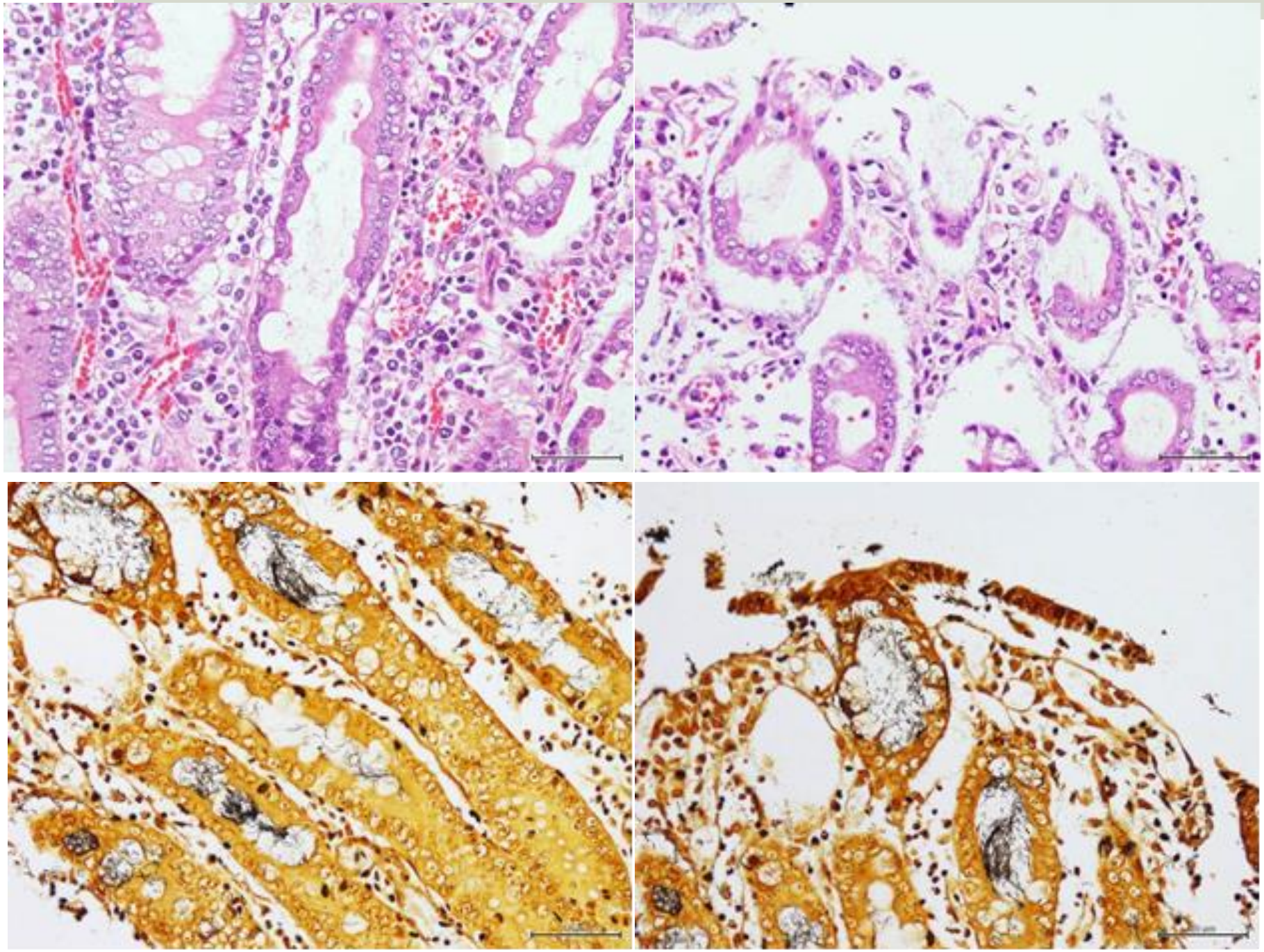


Fibrinonecrotic debris with dark blood clots on the colon mucosa

Chronic Swine Dysentery: less blood but thickened mucosa c
with adherent yellow tan necrotic membrane.



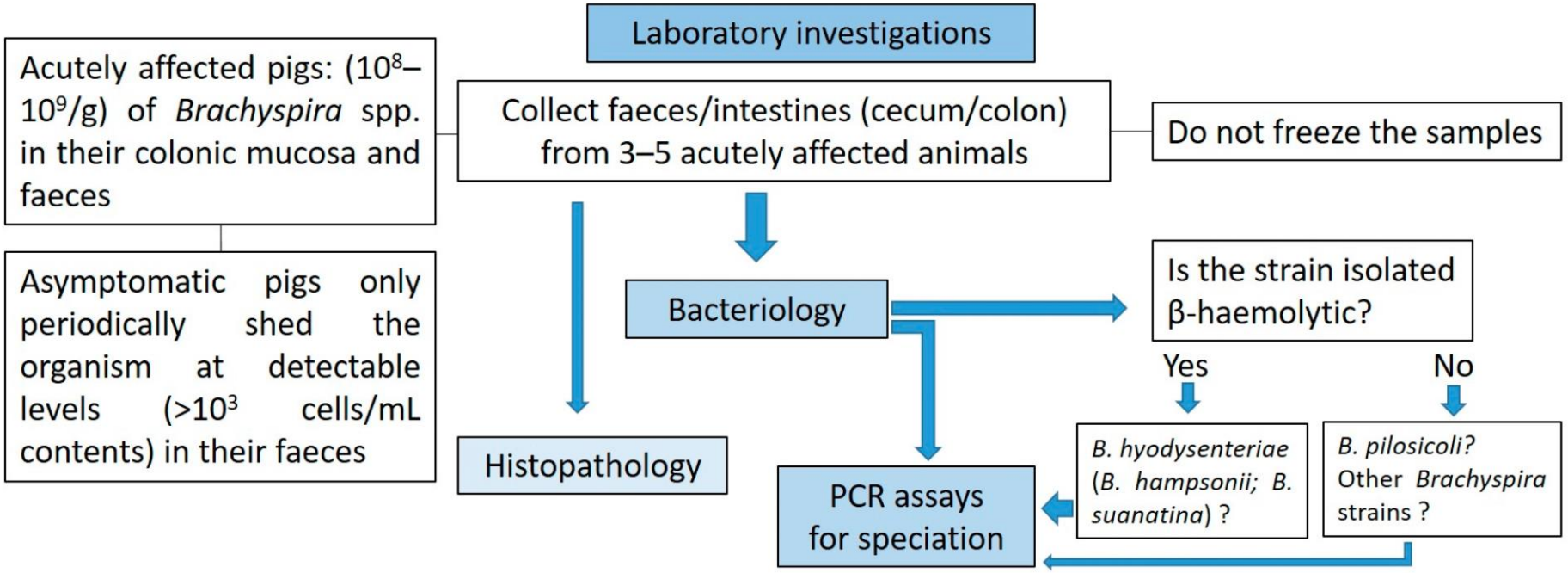




Swine Dysentery (DS): diagnostic tools and criteria

***B. hyodysenteriae* (*B. hampsonii; B. suanatina*)**

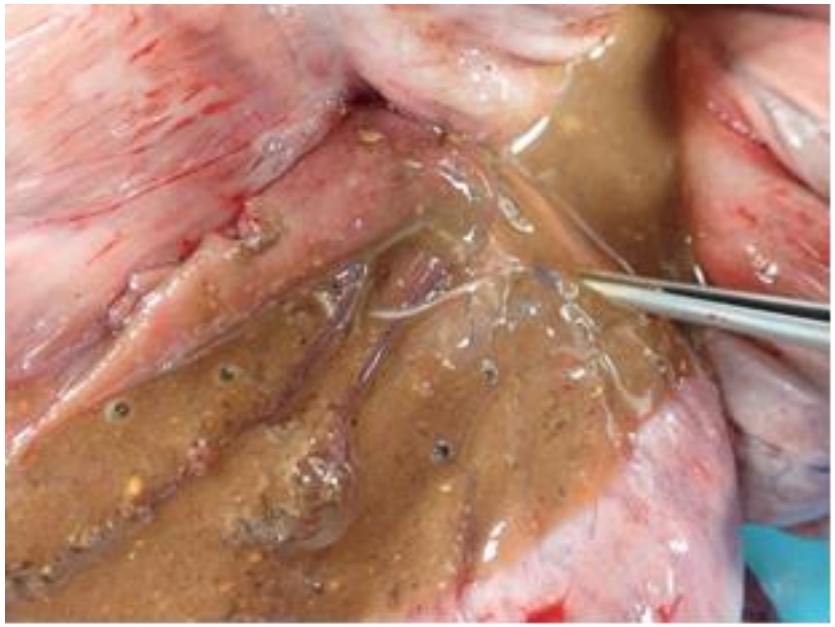
- **Age of affected pigs:** mainly in grower and finisher pigs
- **Clinical signs:** yellow to grey diarrhoeic faeces, with muco-fibrinous exudate and blood
- **Gross lesions:** muco-haemorrhagic typhlocolitis



Luppi *et al.*, 2023

豬鞭蟲症 *Trichuris suis*

- 三到四月齡之肥育豬隻好發，氣候炎熱、豬舍潮濕好發。發生過會一直發生
- 症狀：綠色軟泥便，盲腸內可見有長約一公分蟲體

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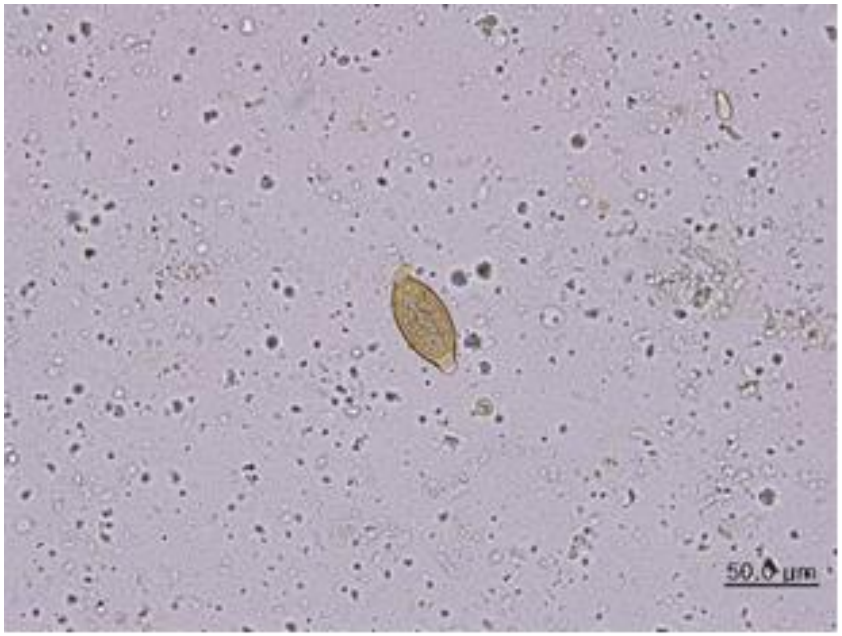
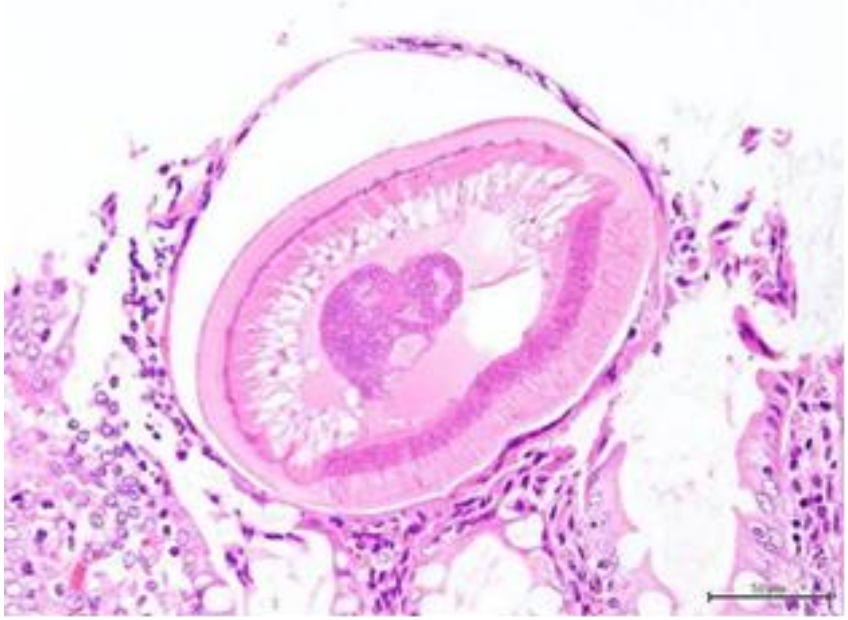

50.0 µm



豬蛔蟲感染 *Ascaris suum*

Intestinal impaction

Reference

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