Pathology of Swine

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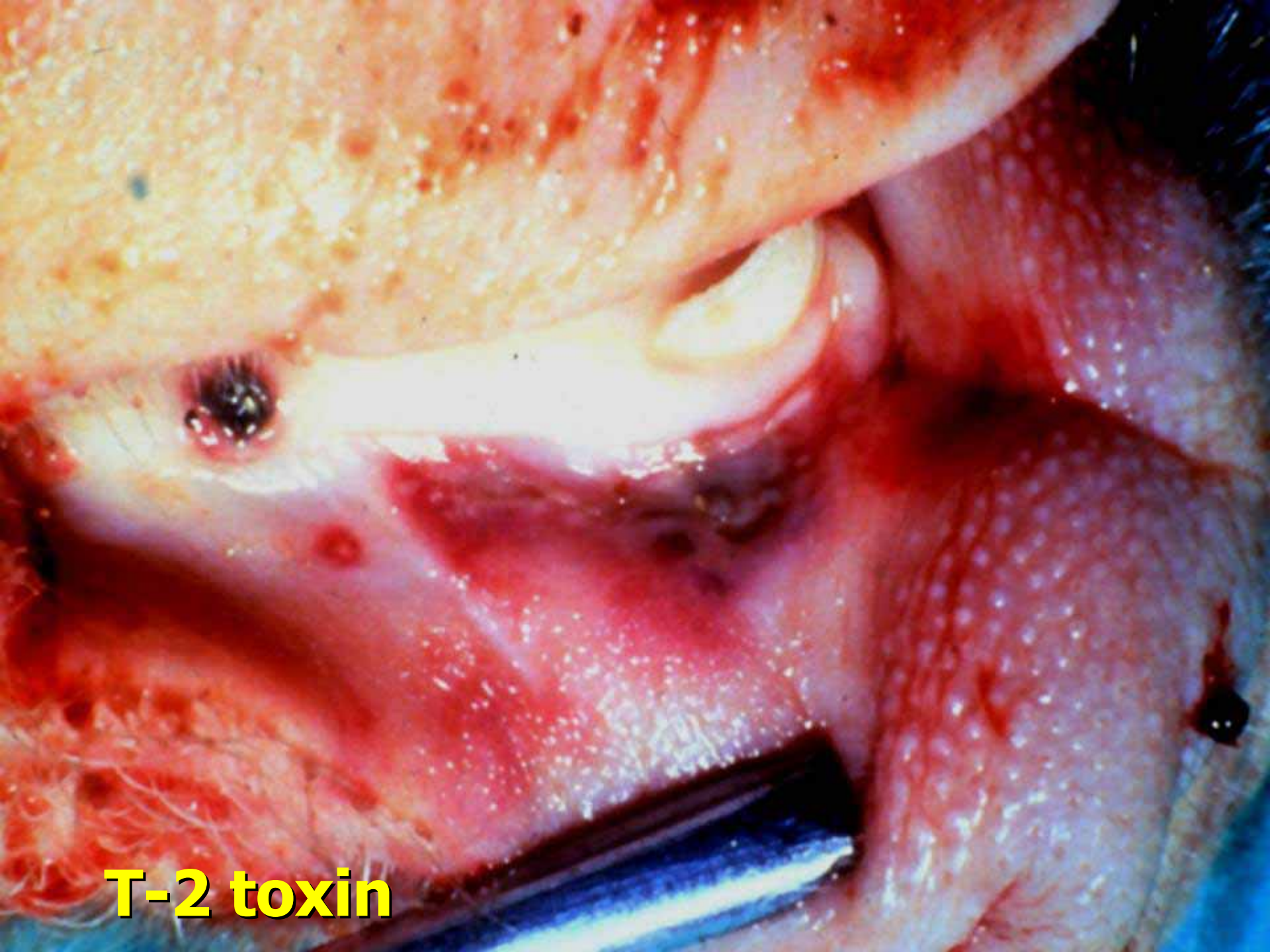
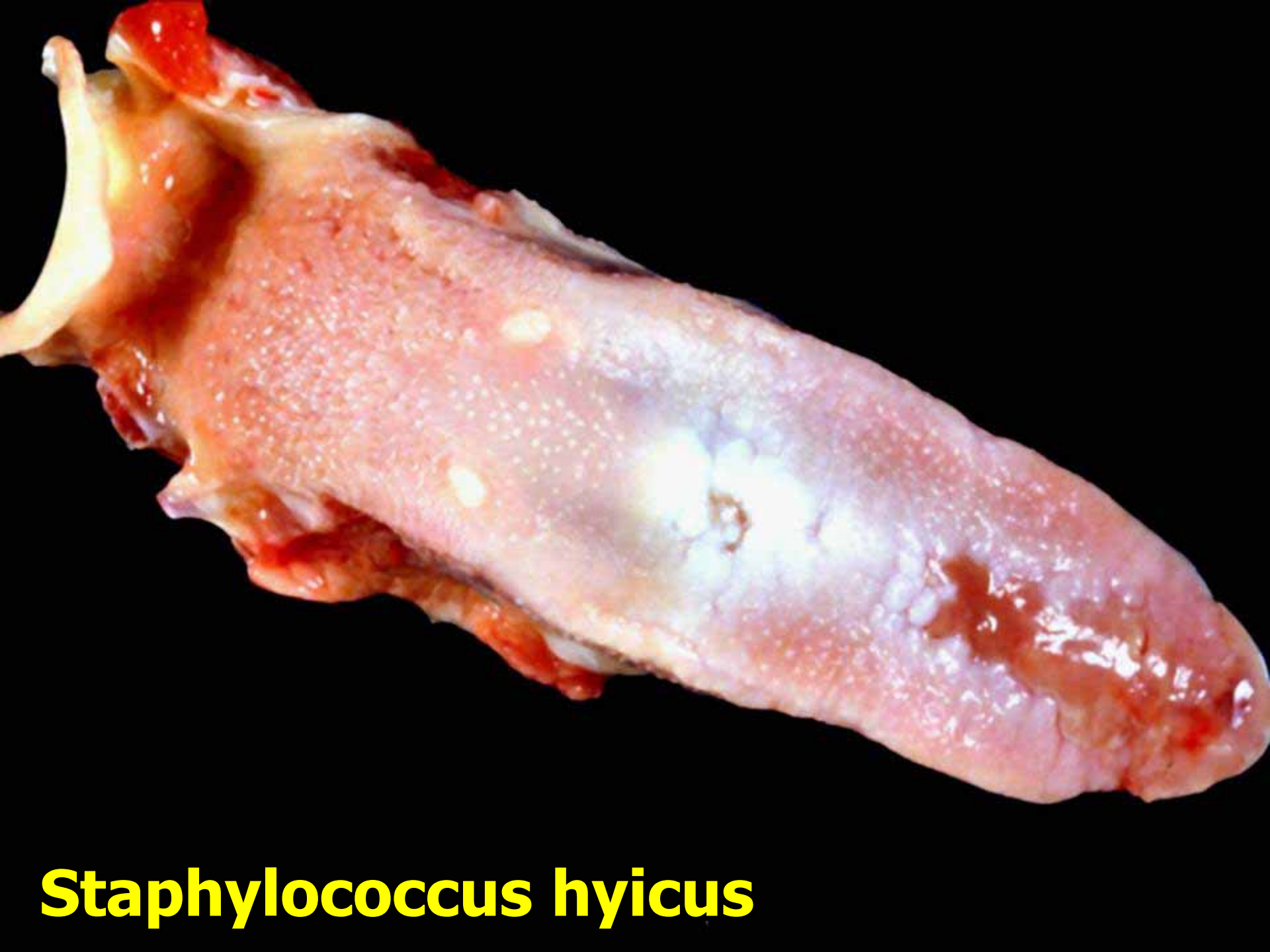
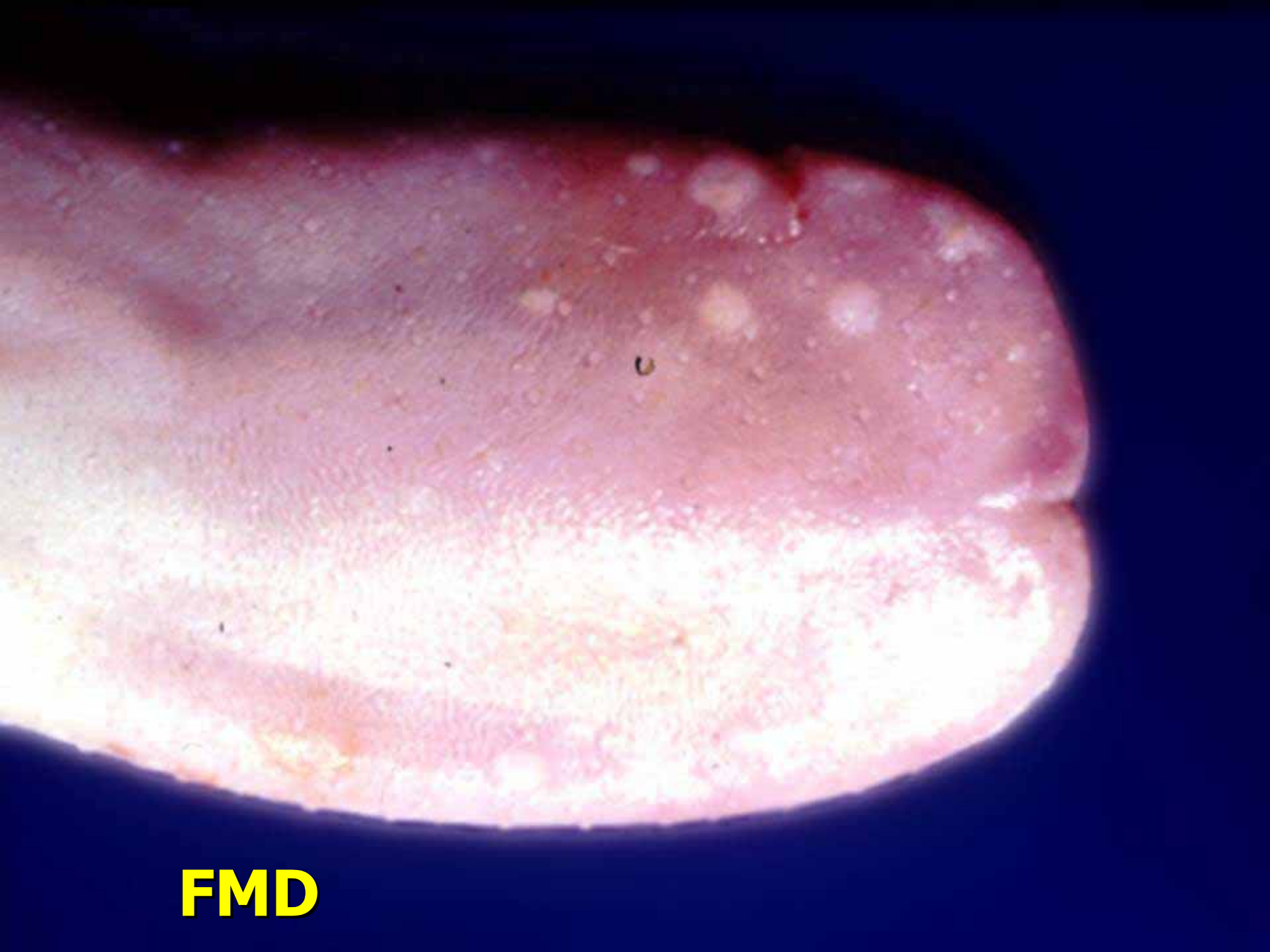
Gastrointestinal System


Teeth clipping

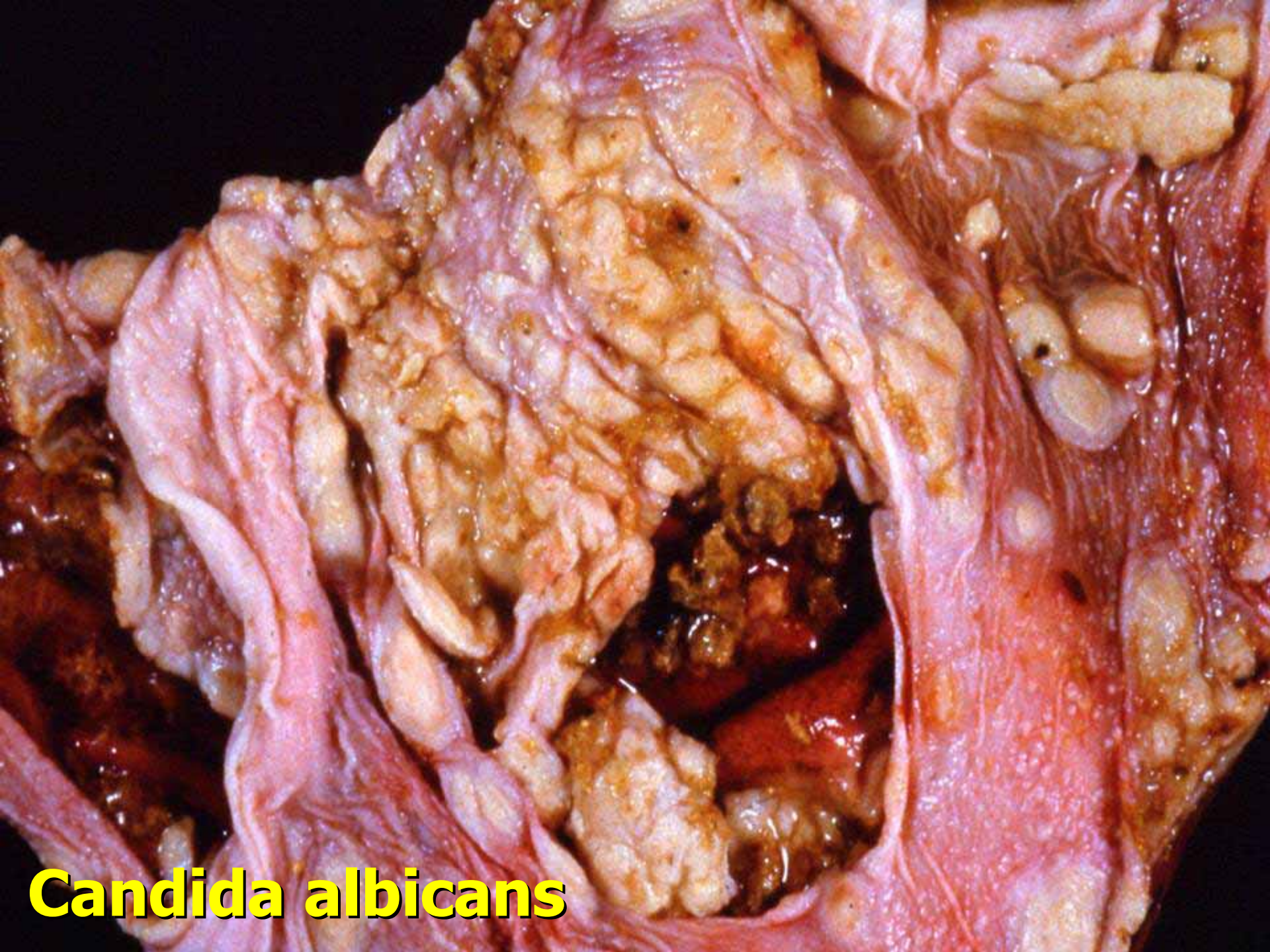

T-2 toxin



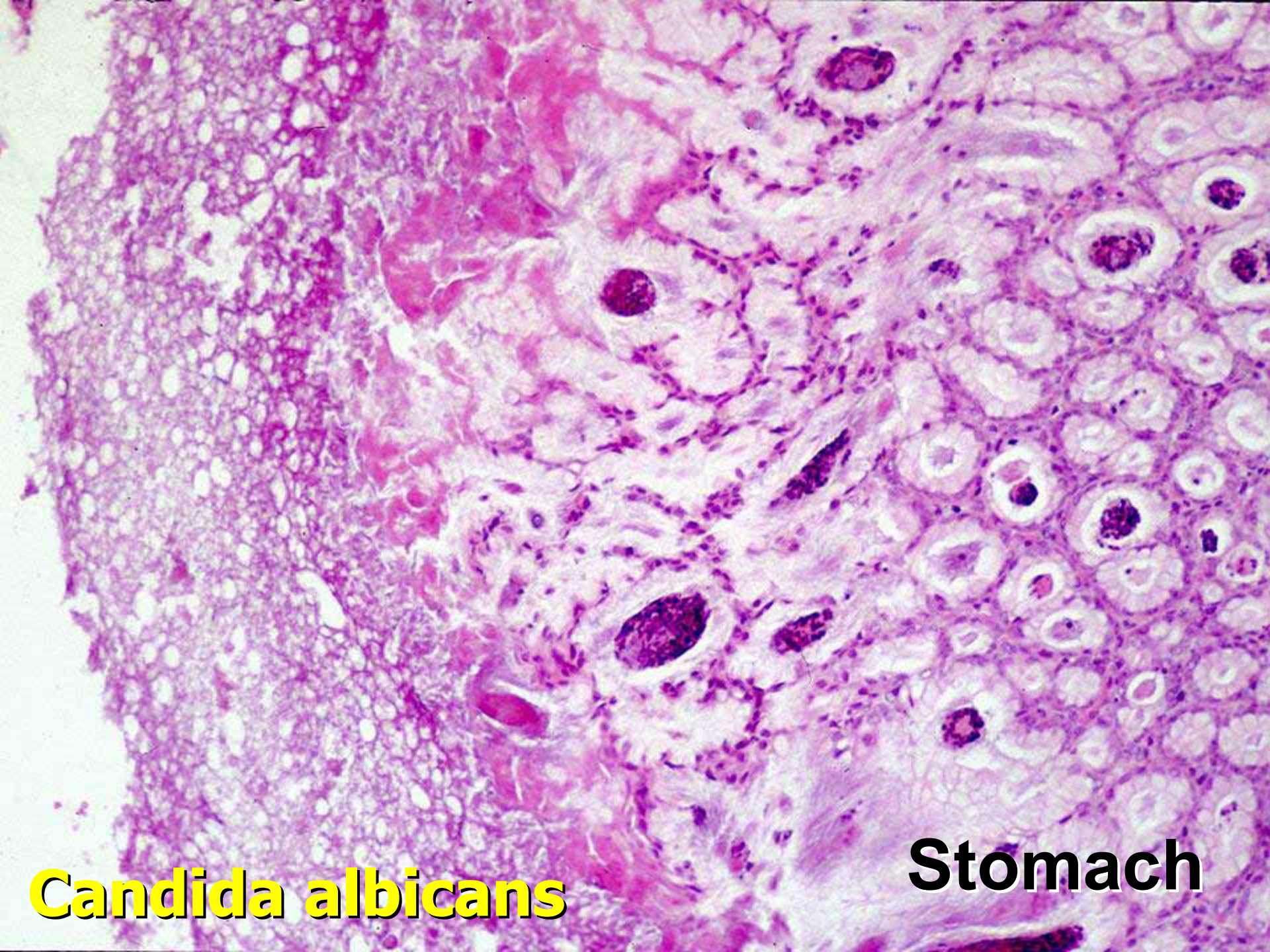
Staphylococcus hyicus


FMD


Candida albicans


Candida albicans


Candida albicans
Esophagus


Candida albicans
Stomach

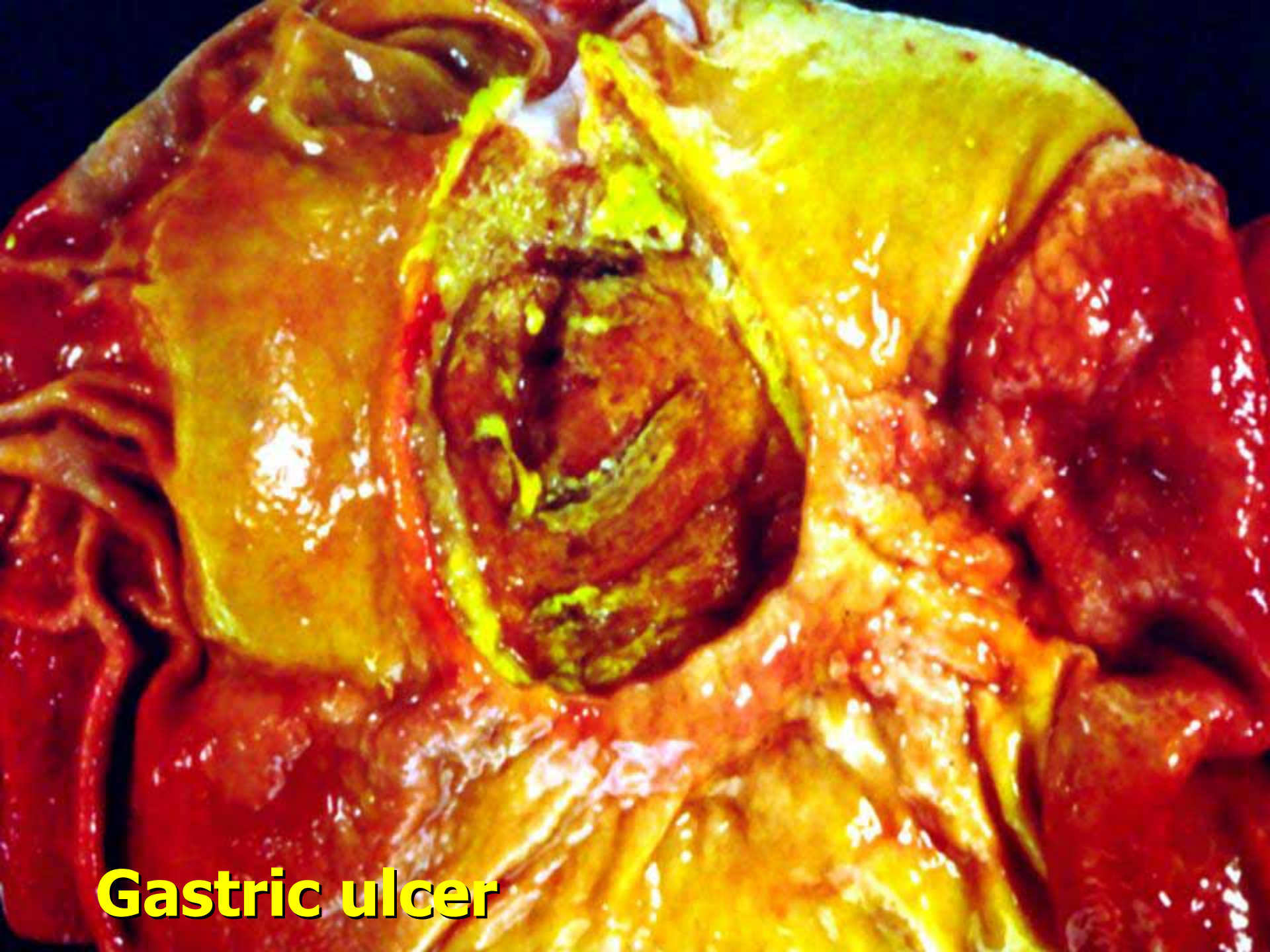

Candida albicans
Esophagus

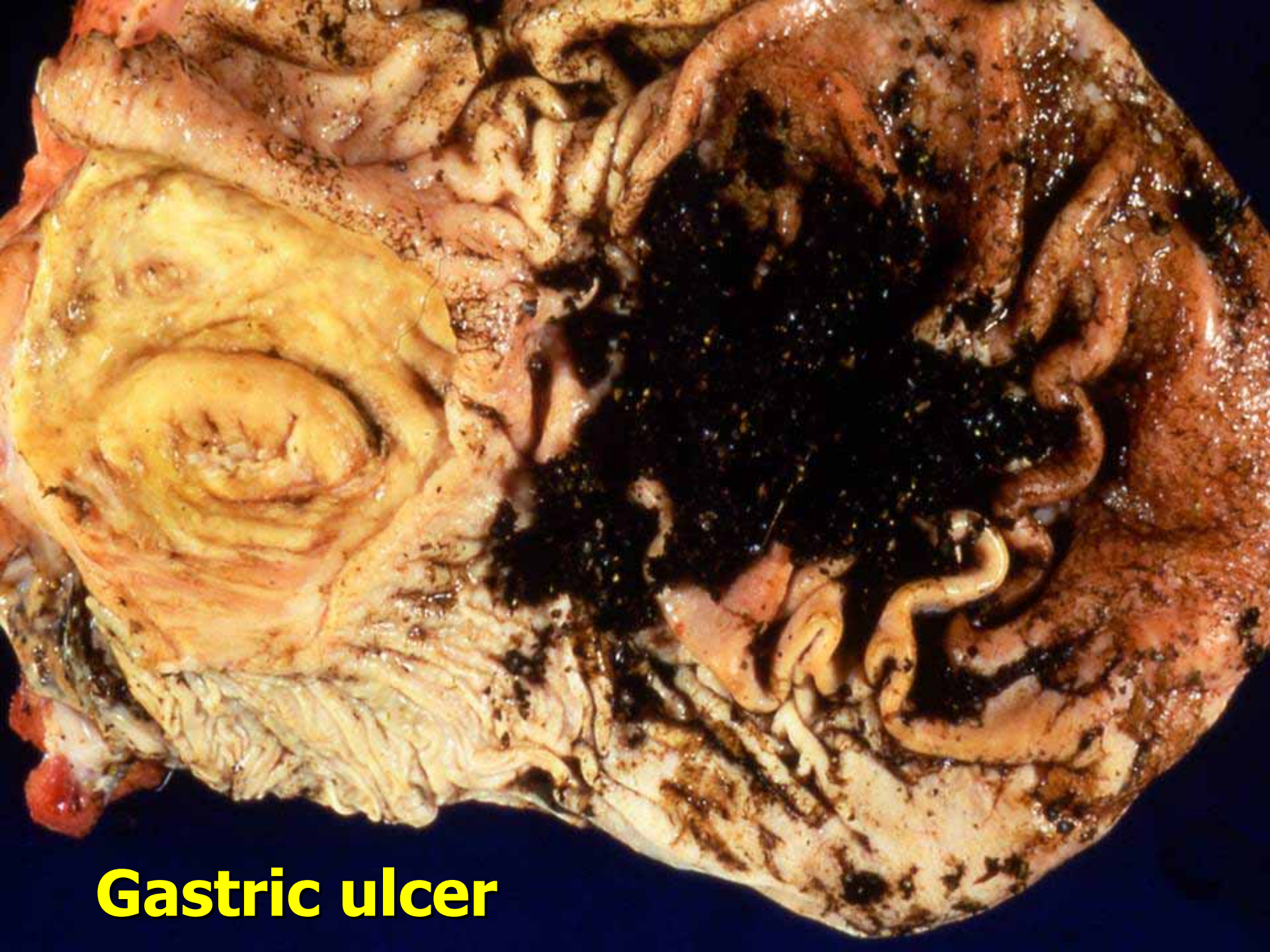
Ulceration of the pars esophagea

- Risk Factors
  - Gender (barrows)
  - Genotype
  - Season (summer)
  - Fine grind of feed (fine or pelleted)
  - Anorexia (concurrent disease)
- *Gastrospirillum sp.* ??


Gastric ulcer


Gastric ulcer


Gastric ulcer

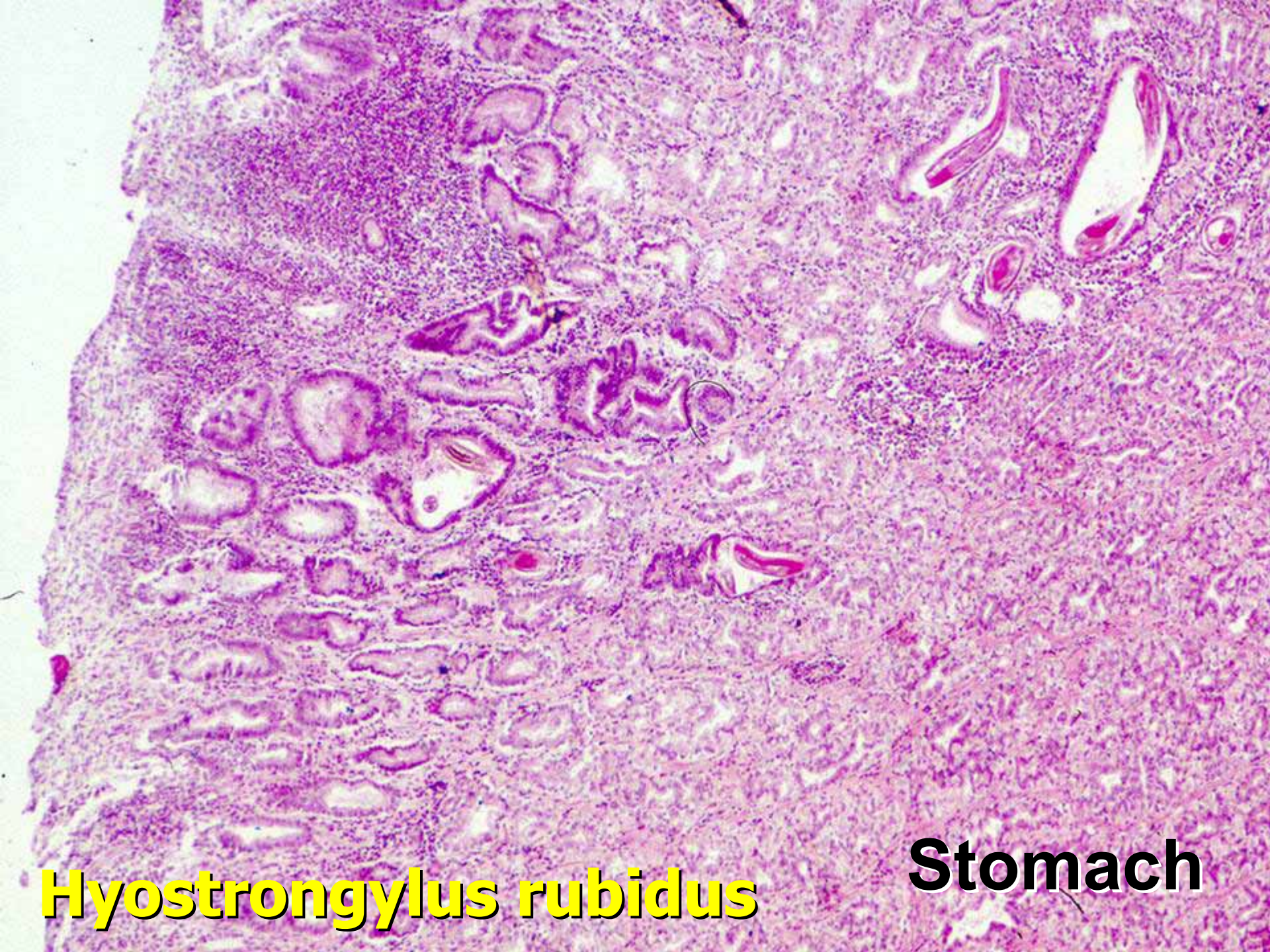

Gastric ulcer


Esophageal perforation

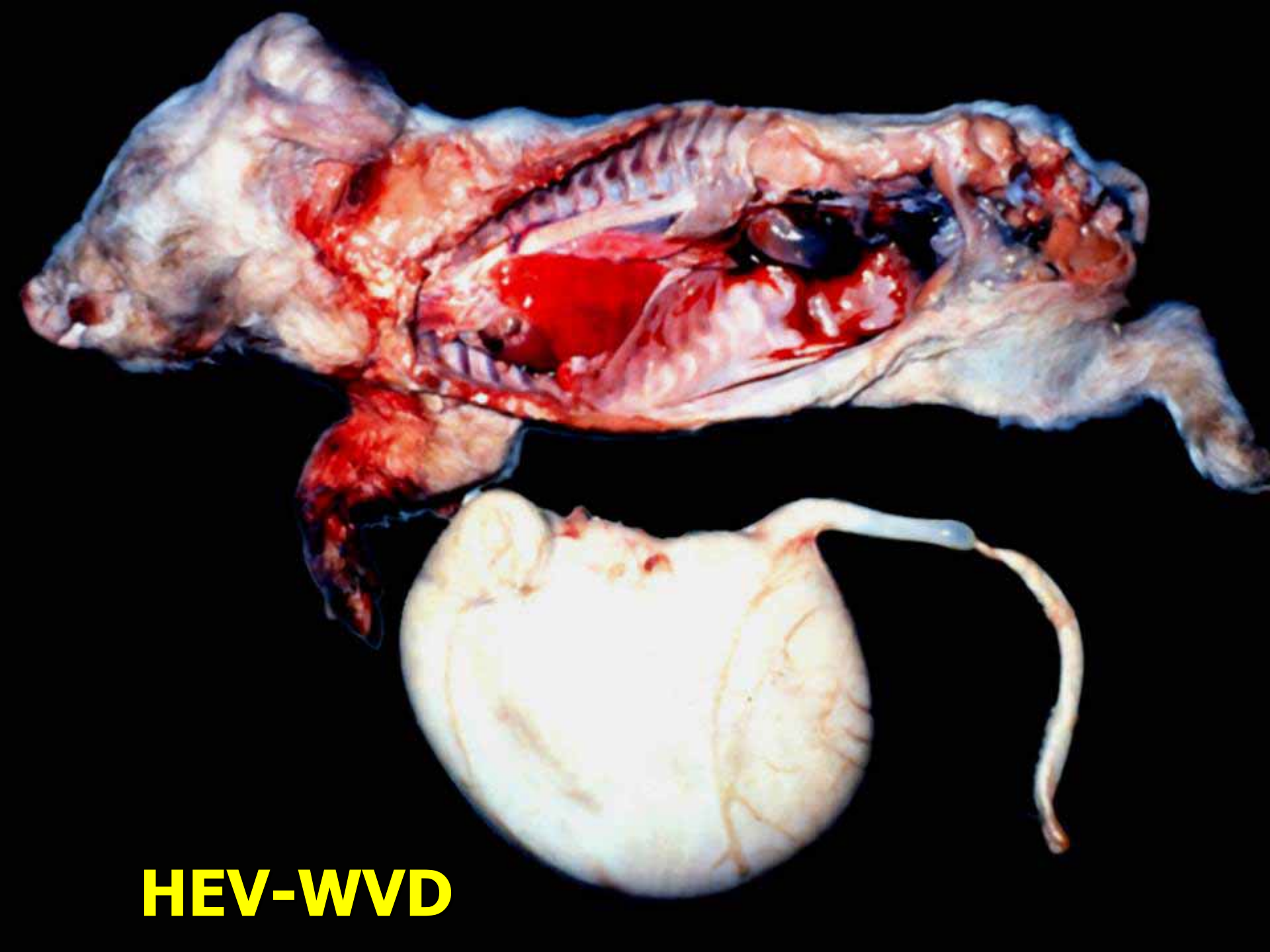

Salmonella typhimurium


Aspergillus fumigatus


Hyostrongylus rubidus


Hyostrongylus rubidus
Stomach


Anisakiasis


HEV-WVD


HEV-WVD

DR. BERNANKE EXPLAINS QUANTITATIVE EASING

Diagnosis of Diarrhea in Swine
General Concepts

- Small intestinal disease
  - High volume, normal frequency, watery
  - Any blood is digested (dark brown)
- Large intestinal disease
  - Low volume, frequent, mucous
  - Often blood, fresh (bright red)
- Virus is transient (12-24 hours)
- Lesions/infection may be segmental
- Autolysis of gut is very rapid

Diagnosis of Diarrhea in Swine
Which Pigs to Sample?

- Euthanized, not already dead*
- Several (more is better)
  - From different litters
  - Representing different parity dams
  - Pooled fecal samples
- Acute (first 12 hours of diarrhea)
  - Mark litters/pens w/ & w/o diarrhea
  - Mark pigs, select new unmarked pigs
  - Not dehydrated animals

Diagnosis of Diarrhea in Swine
Which Samples to Submit?

- Preservation
  - Collect & preserve immediately
  - Fresh/chilled (tie-off colon) and 10%NBF (must be in lumen!)
- Samples
  - S.I. (3+), L.I. (2), cecum, MLN, liver
  - Pooled fecal samples (chilled)
    - not frozen
    - no formalin

Diarrhea in Swine

- Without blood
  - Colibacillosis
  - TGE
  - Rotavirus
  - Coccidiosis
  - Proliferative enteritis (except PHE)
  - Cl. perfringens type A
  - Intestinal spirochetosis
- With blood
  - Cl. Perfringens type C
  - S. cholerasuis (dark digested blood)
  - Proliferative enteritis PHE form
  - Swine dysentery
  - Whip worms

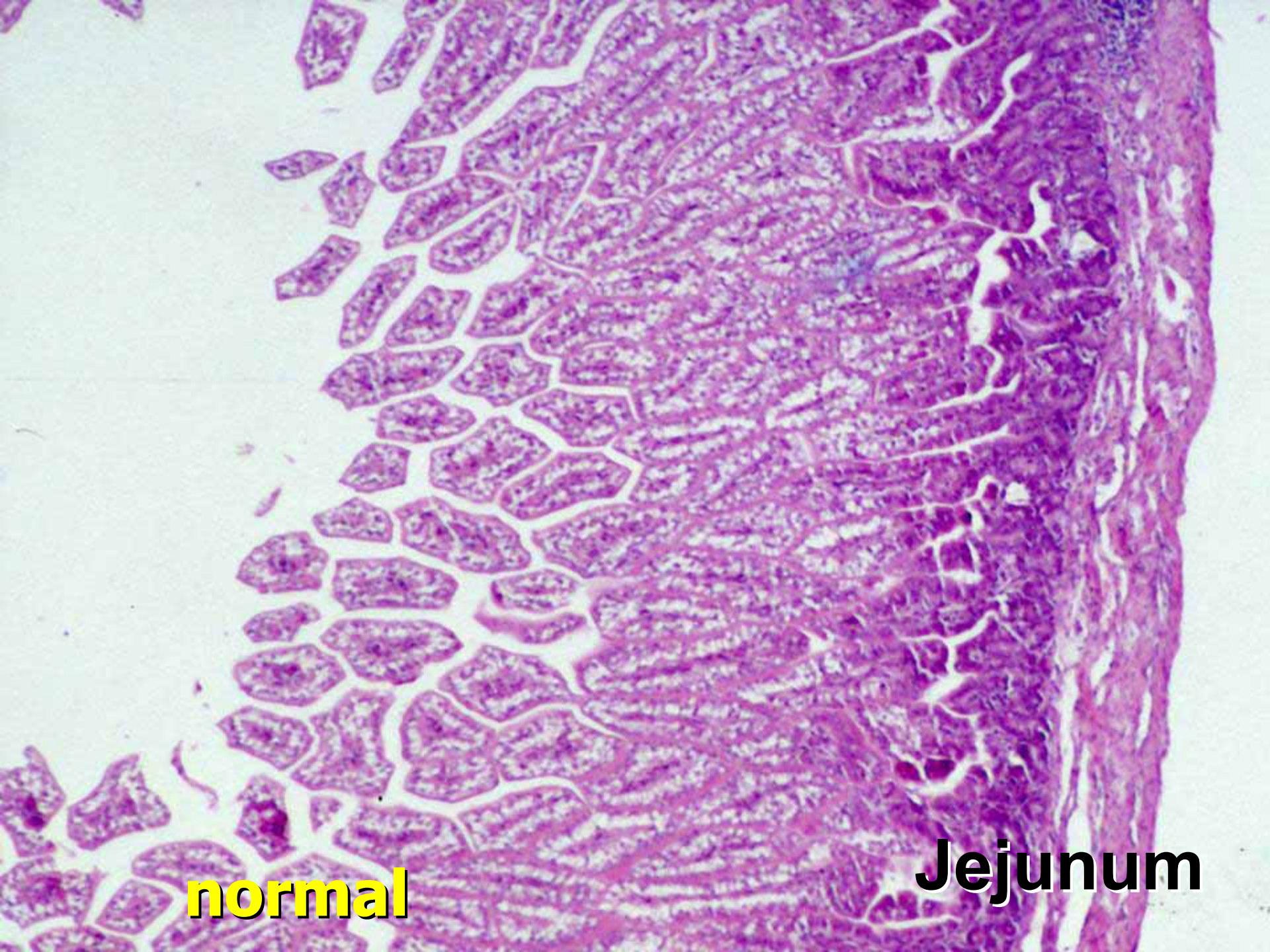
Clinical Differentials

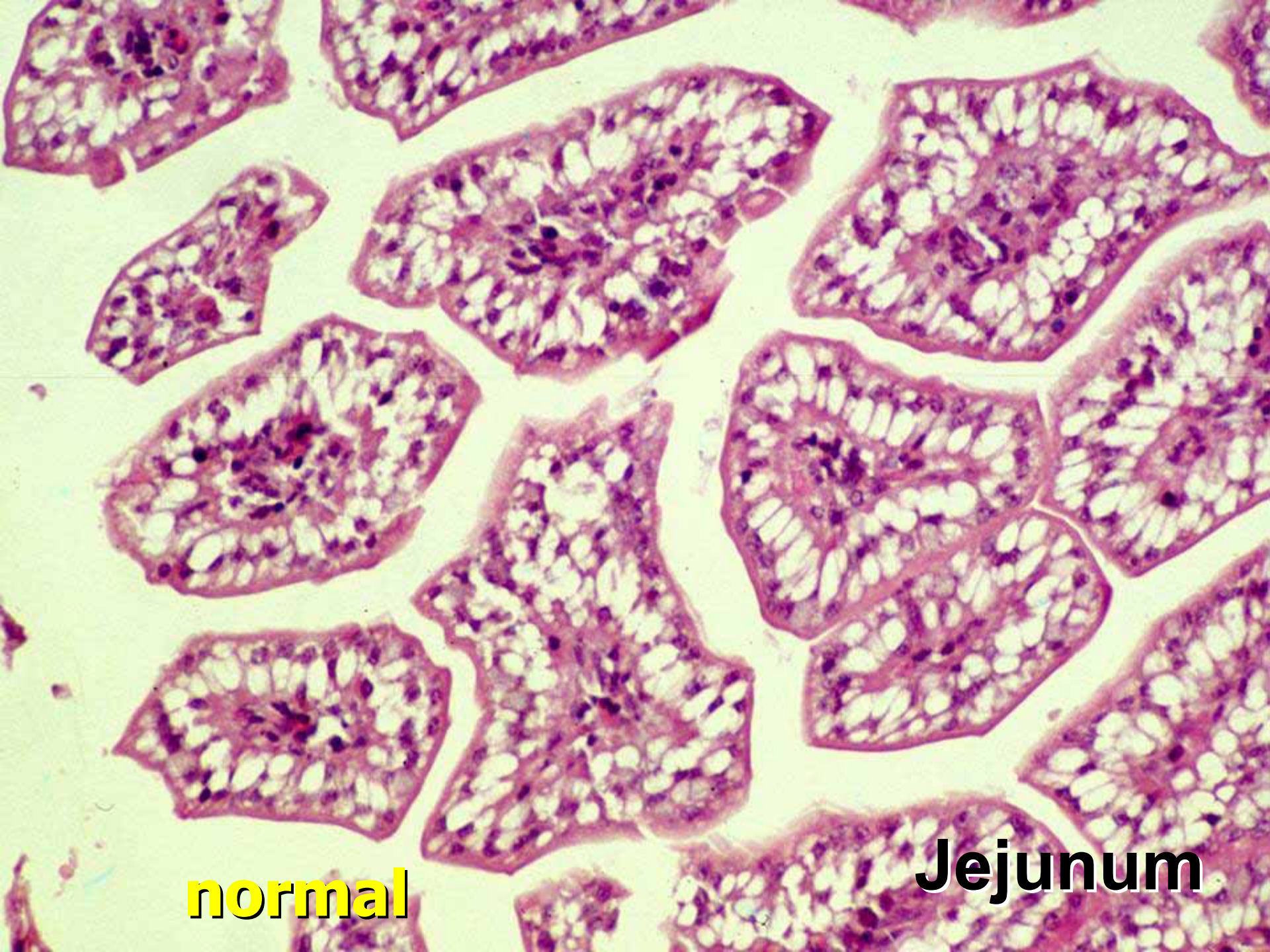
- Grower-finishing pigs found dead with “bloody guts”
  - Gastric ulcer
  - Hemorrhagic Bowel Syndrome
  - Volvulus

Common Diarrheal Diseases in Swine

Cause	Disease	Ages Commonly Affected	Blood in Feces ?
E. coli	Colibacillosis	12 hours to 6 weeks	no
C. perfringens type A	Clostridiosis type A	1 – 7 days	no
C. perfringens type C	Clostridiosis type C	1 – 14 days	yes**
Isospora suis	Coccidiosis	5 – 28 days	no
Rotaviruses, groups A or C	Rotaviral enteritis	12 hours to 5 weeks	no
TGE or PED corona viruses	Epidemic TGE or PED	All ages	no
TGE or PED corona viruses	Endemic TGE or PED	2 – 8 weeks	no
Classical swine fever virus	Classical swine fever	All ages	no
S. typhimurium	Salmonellosis	1 – 6 months	yes*
S. choleraesuis	Salmonellosis	1 – 6 months	yes*
Trichuris suis	Whipworms	2 – 6 months	yes**
Brachyspira hyodysenteriae	Swine dysentery	2 – 6 months	yes**
Lawsonia intracellularis	Porcine proliferative enteritis	2 – 6 months	no
Lawsonia intracellularis	Porcine hemorrhagic enteropathy	4 – 12 months	yes**


normal


normal
Jejunum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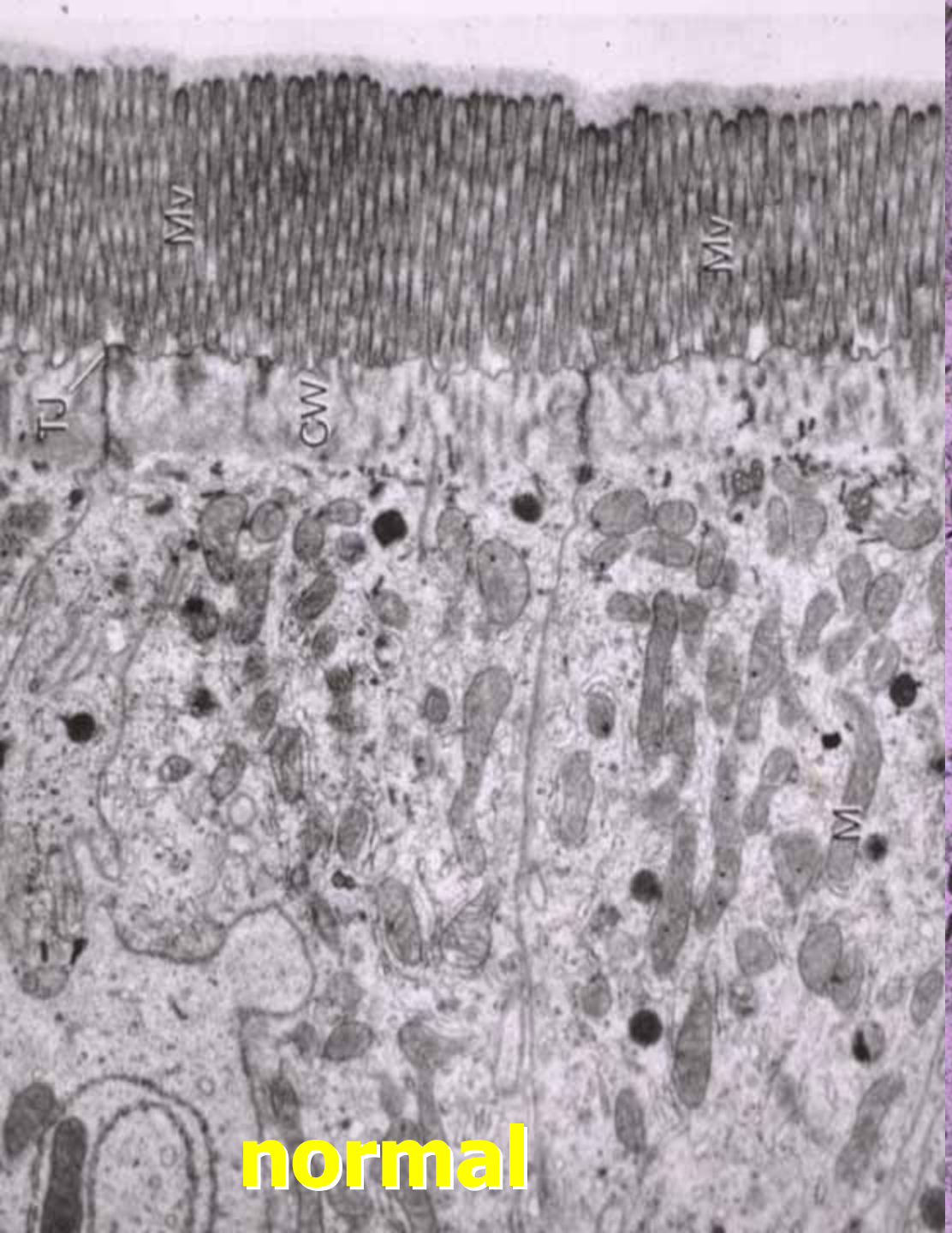
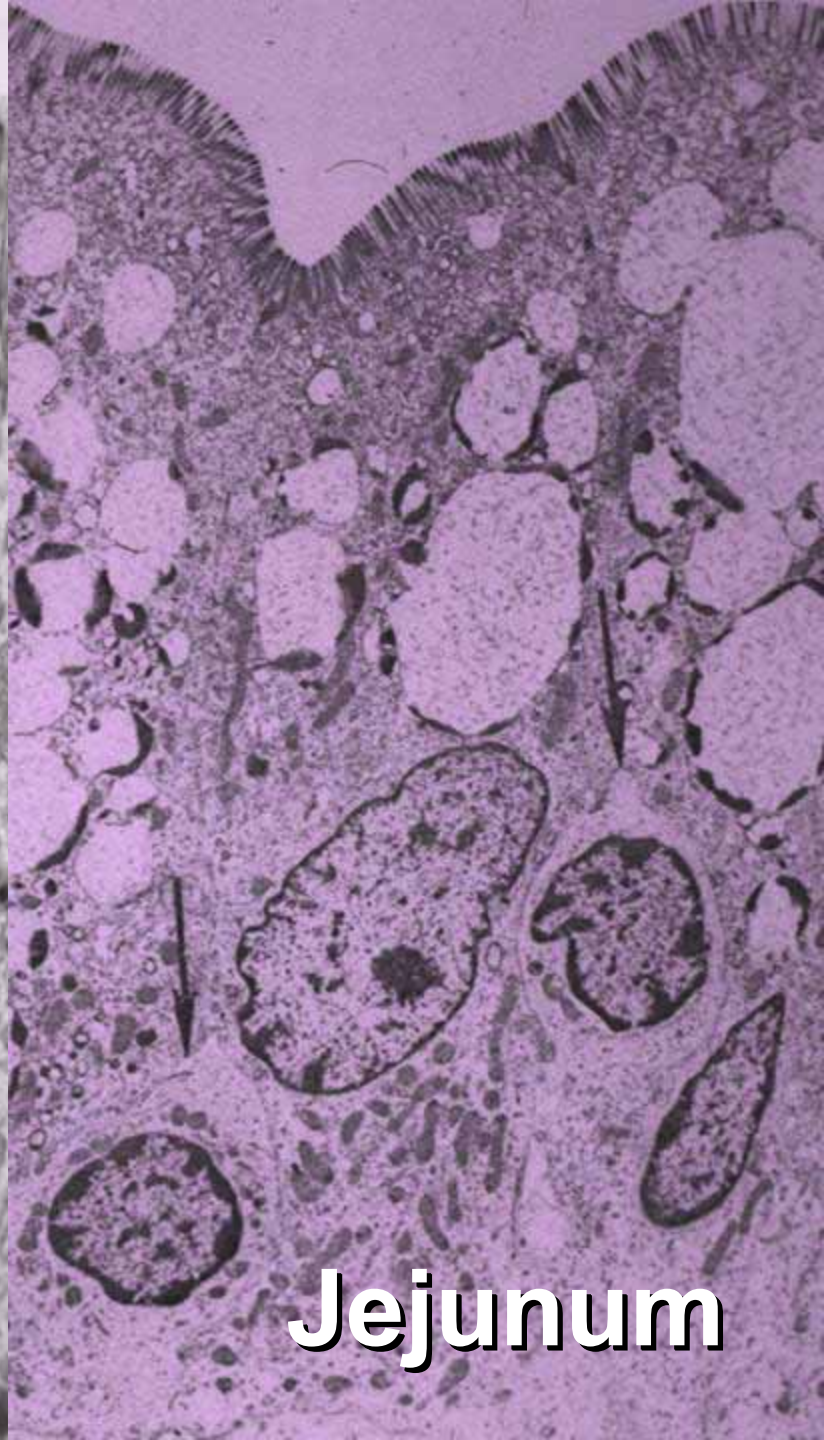

Mv
Mv
TJ
GW
M
normal


Jejunum

E. coli

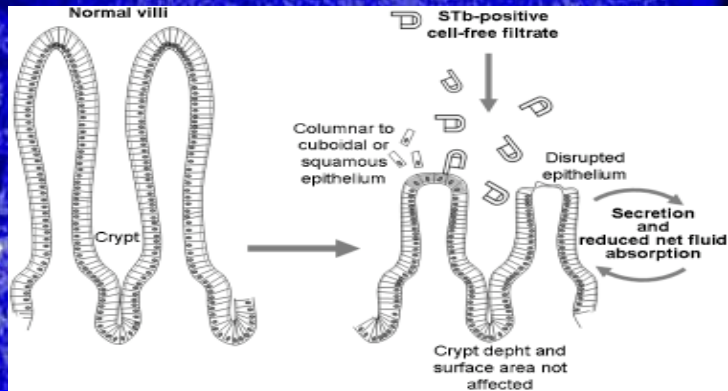
- Colonizes lower ileum, cecum, colon of most vertebrates soon after birth
- Predominant (10^8 CFU/g) facultative anaerobe in feces
- Most strains: low virulence, opportunistic infections
- Typing via O (lipopolysaccharide) and H (flagellar) antigens

E. coli

Virotype	Virulence factor	Disease
Enterotoxic	pili, LT, $ST_{a,b}$	Diarrhea
Enteroaggregative	bundle forming pili, EAST	Diarrhea
Enteropathogenic	effacing enteroadherence	Diarrhea
Enterohemorrhagic	SLT, effacing enteroadherence	Diarrhea, dysentery, HUS
Enteroinvasive	invasins, no SLT	Diarrhea, dysentery
Necrotoxic	fimbria, CNF-1, -2	Diarrhea, septicemia

ETEC

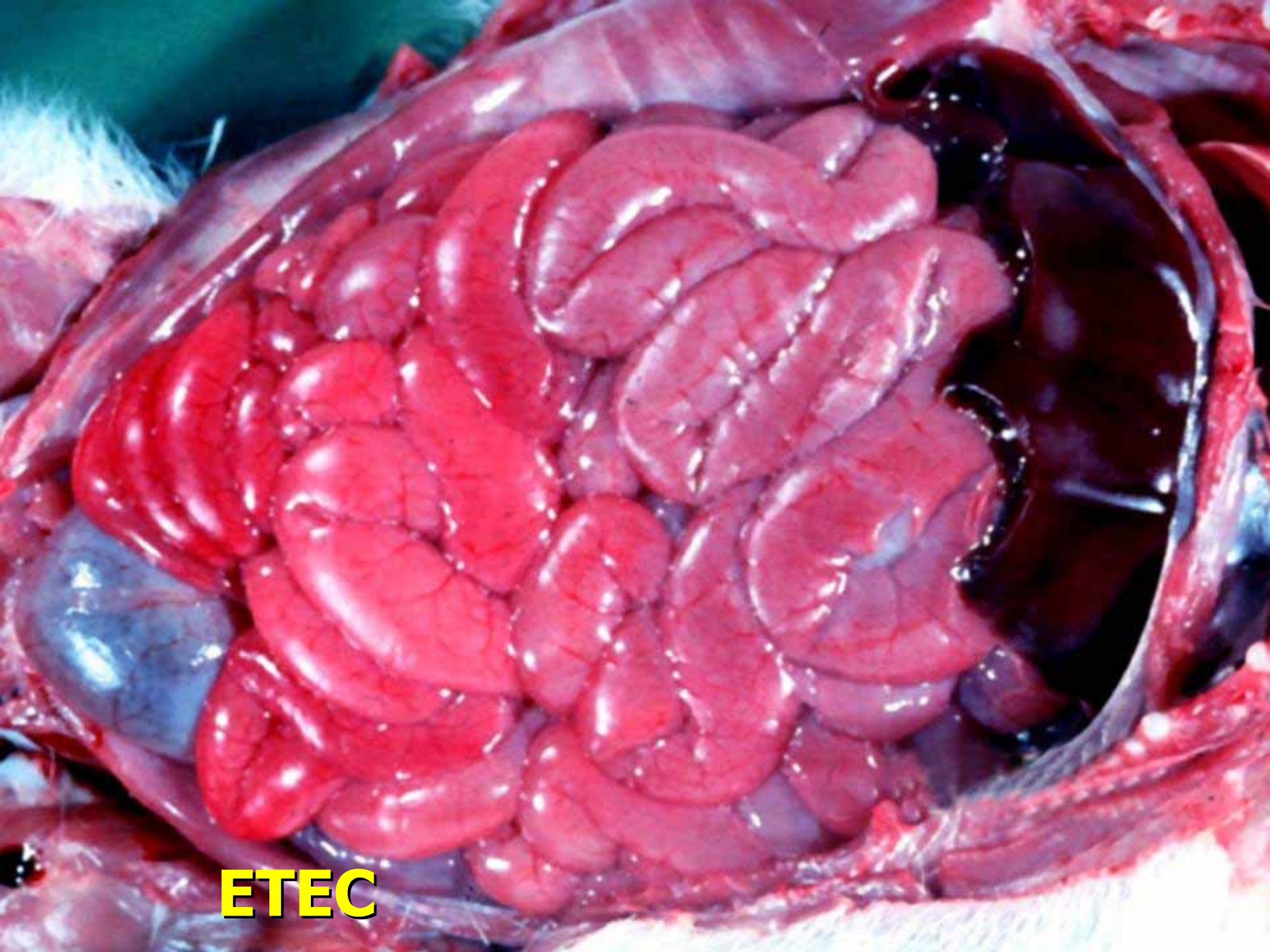
- Hemolytic or non-hemolytic
- Small intestine only
- Colonize via fimbria
  - suckling: K88, 987P, K99, F41
  - weaned: K88, F18ac (2134P)
- Secrete enterotoxin(s)
  - LT adenylate cyclase - cAMP
  - Sta guanylate cyclase - cGMP
  - STb cytotonic, but causes villus stunting, enterocyte damage at villus tips

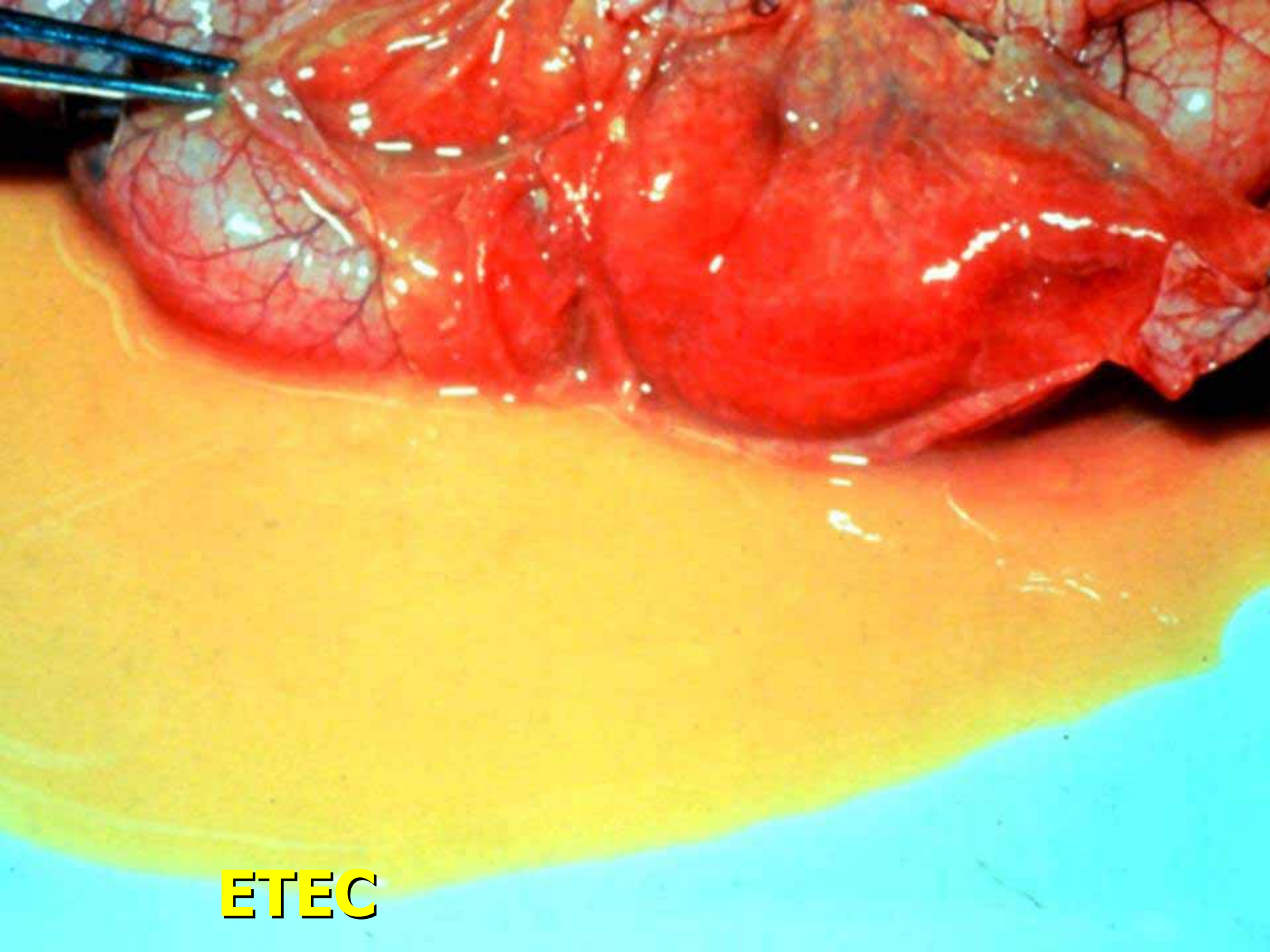


E. coli

Pathotype	Fimbriae
ETEC	K88, K99, 987p, F17, F18, F41, F1845
EPEC	Yes, not focal to pathogenesis
EHEC	Yes, not focal to pathogenesis
EIEC	Yes, not focal to pathogenesis
NTEC	P-fimbriae
EAggEC	Bundle-forming pili

Fimbrial adhesin	Host	O serogroups
K88 (F4)	Pig	8, 141, 147, 149
K99 (F5)	Pig, calf, lamb	8, 9, 20, 107
987p (F6)	Pig	9, 20, 141
F41	Pig, calf	9, 101
F18	Pig	138, 139, 141
F1845	Calf	101
F17	Calf, lamb, kid	No data


ETEC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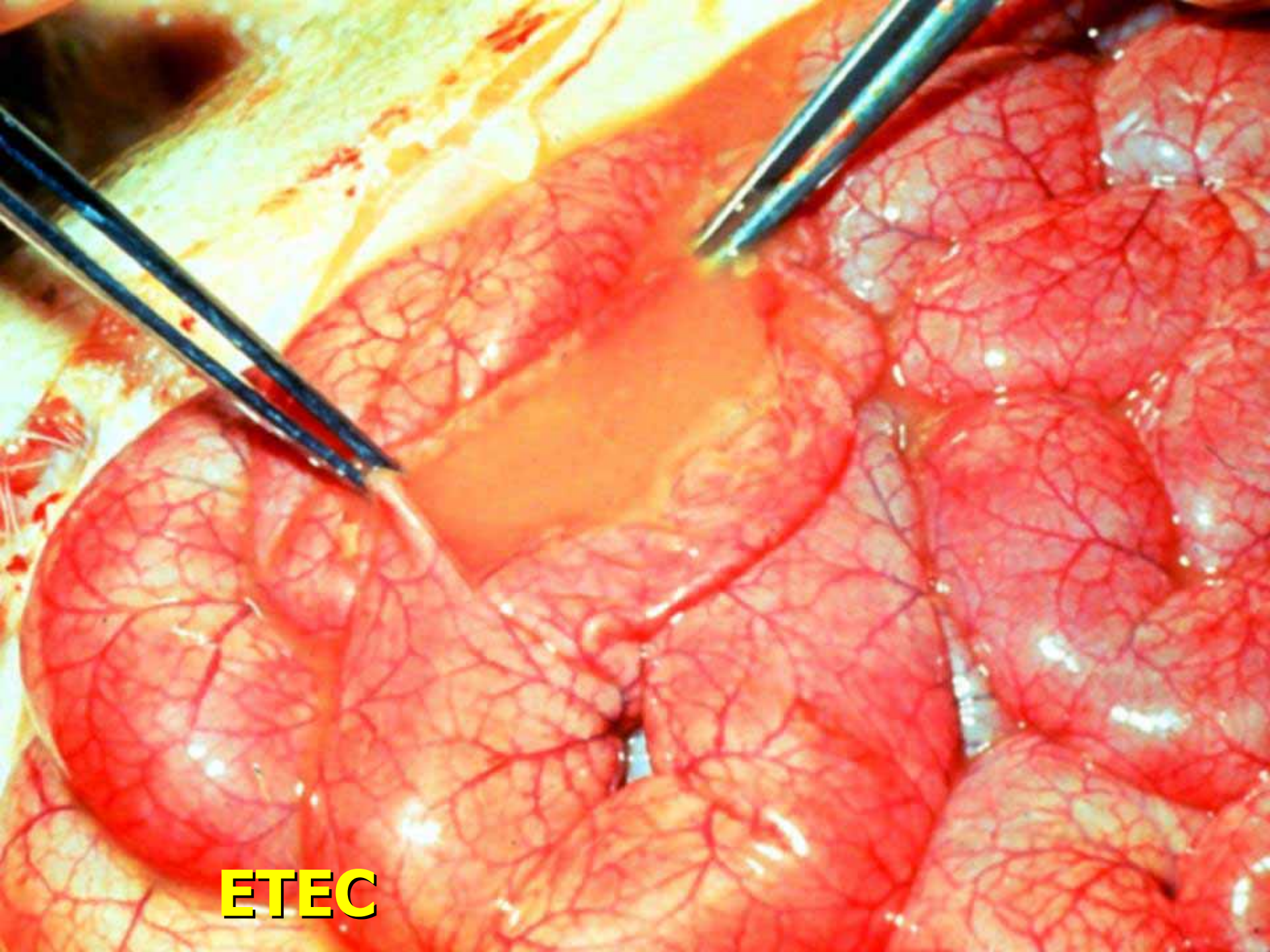
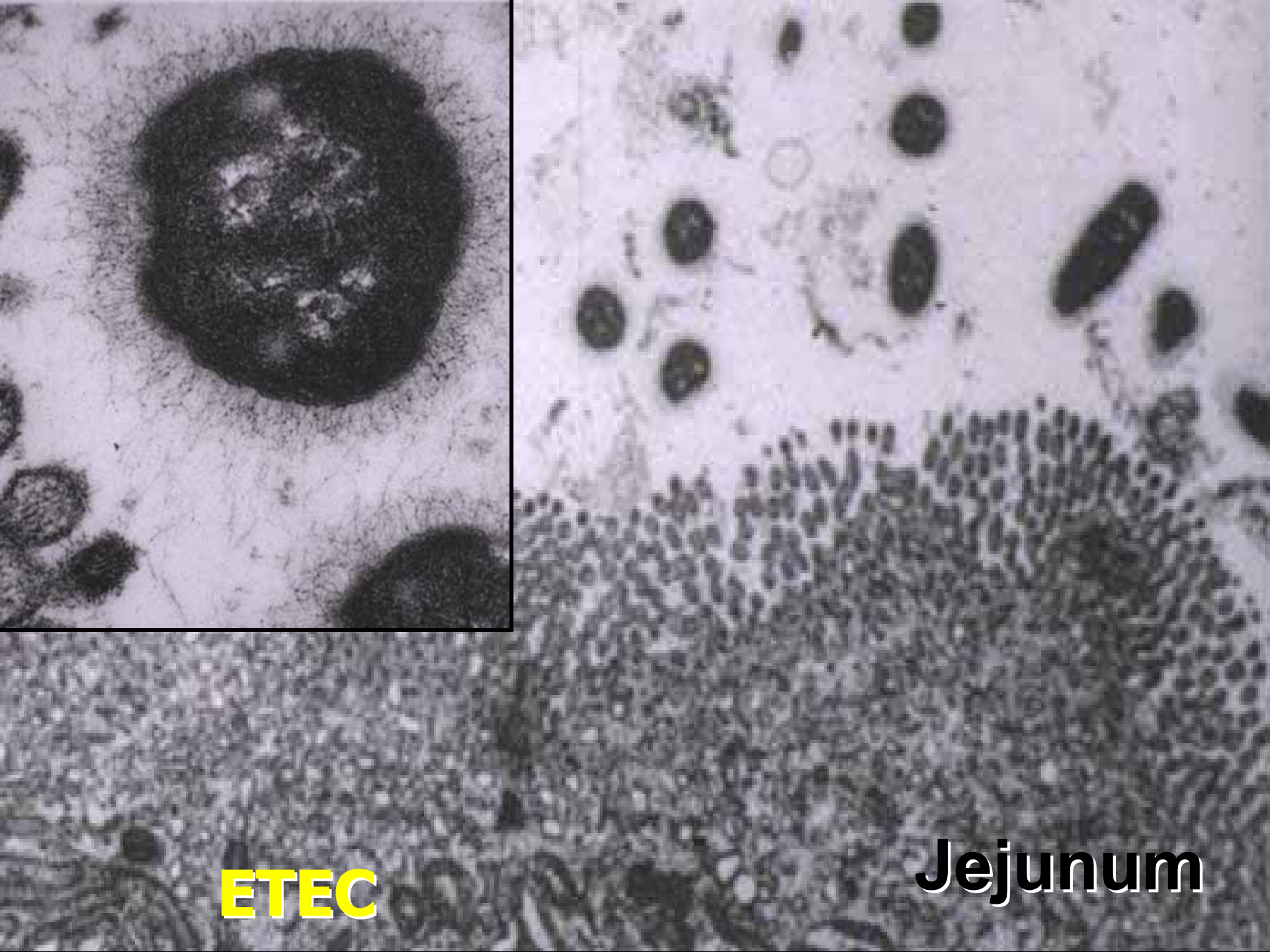

ETEC

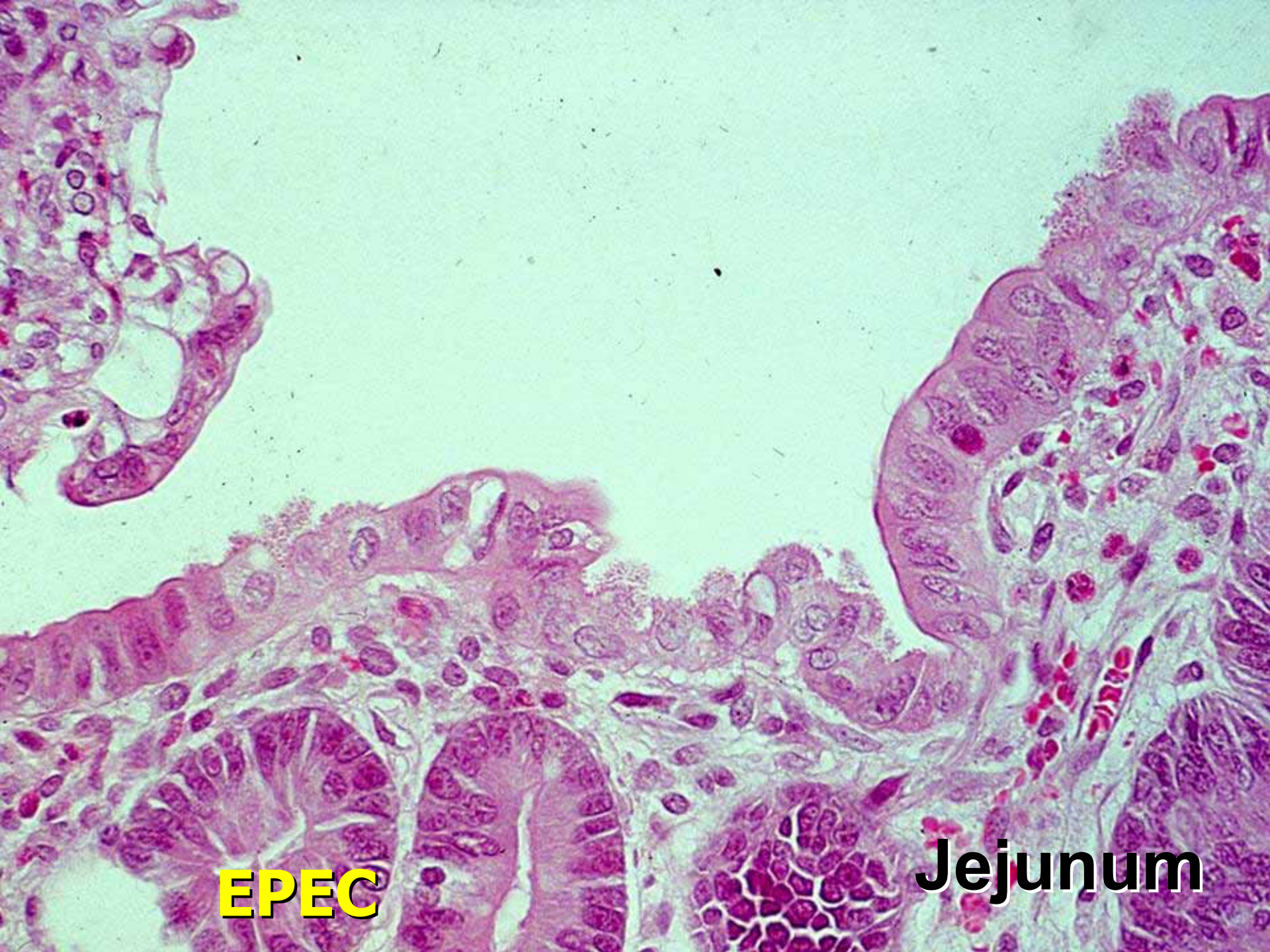

ETEC
Jejunum

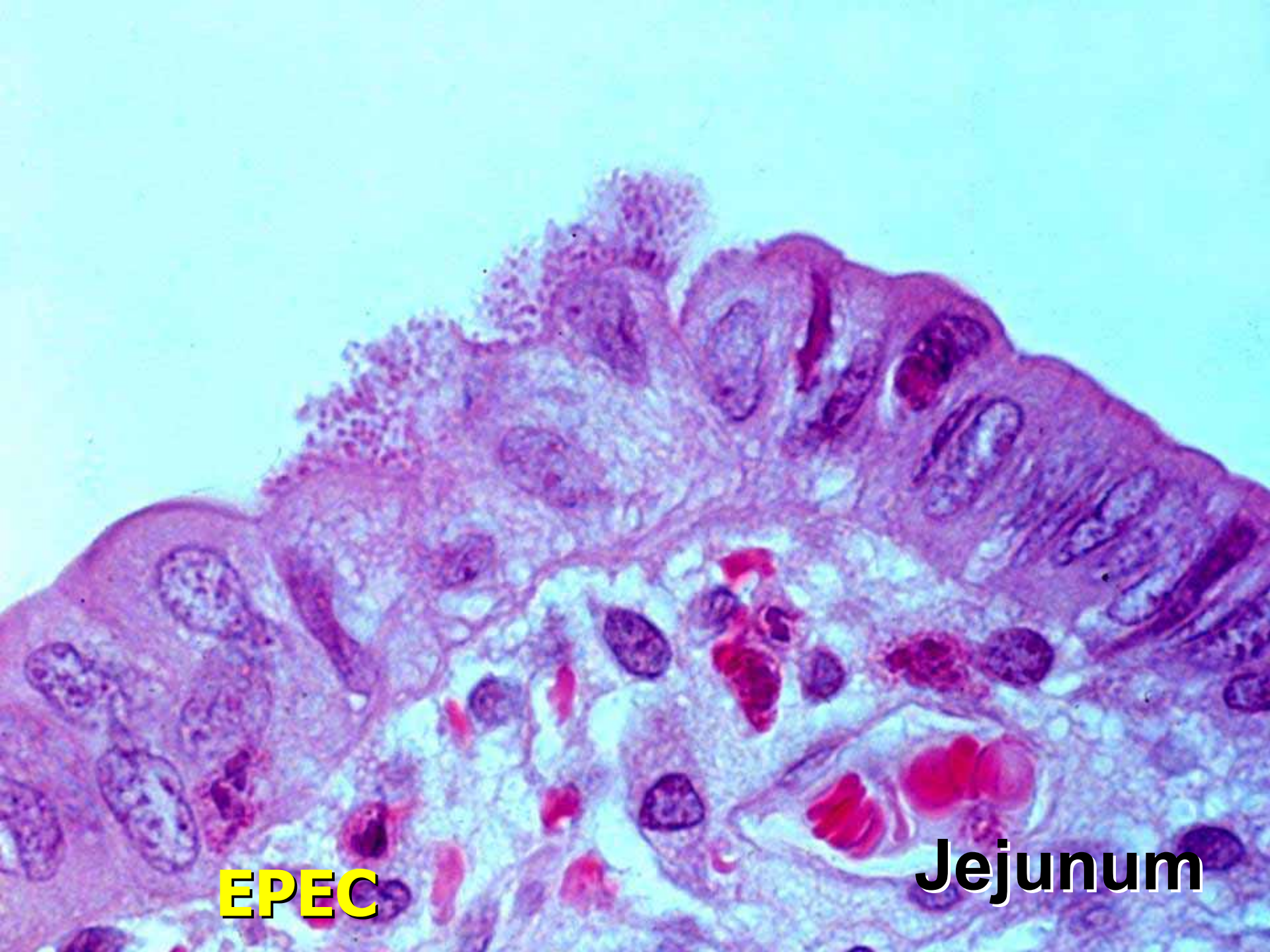

ETEC
Jejunum


ETEC
Jejunum

EPEC (AAEC)

- 1-6 weeks of age, uncommon
- "Classic AE lesion"
- Small and large intestine
- *eae* gene product 94 kd protein "intimin"
- verotoxin negative


EPEC
Jejunum


EPEC
Jejunum

Hallmarks

- Attach, intoxicate:
  ETEC, EAggEC, NTEC
- Attach, efface:
  EPEC
- Attach, efface, intoxicate:
  EHEC
- Attach, efface, enter:
  EIEC

The "Diarrhea Plague" claims another innocent victim.

Atrophic Enteritis

- TGE virus
- Rotavirus groups A, B, C
- Coccidia (Isospora suis)
- Chlamydia
- Porcine enteric calicivirus
- Astrovirus
- Parvovirus (crypt cells)

Transmissble Gastroenteritis

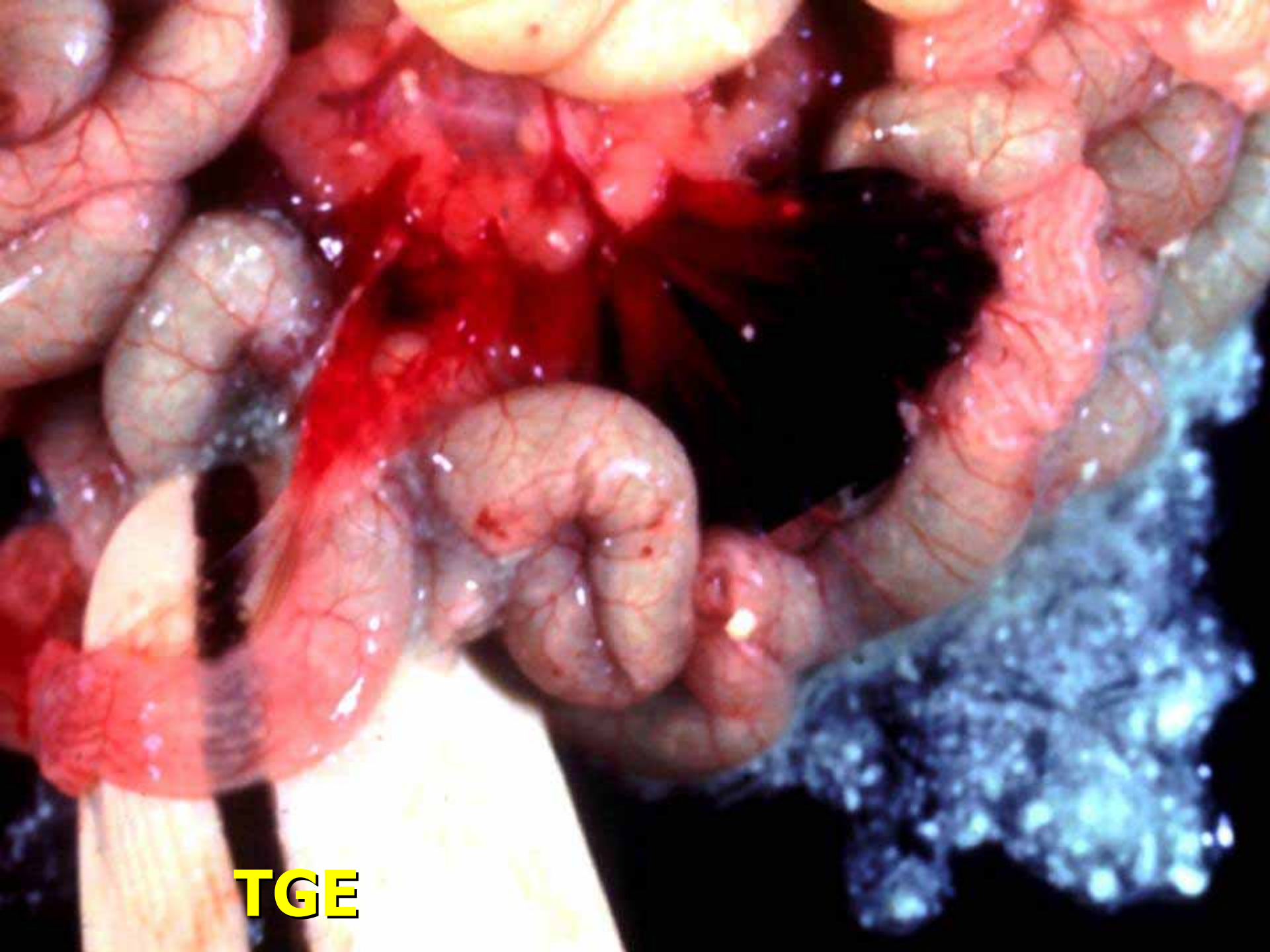
- Coronavirus; infects all ages of pigs
- Replicates in small intestinal villous epithelial cells
- Cells swell and rupture or slough; 36 hours!
- Viral shedding in feces
  - Most shed in first 36 hours
  - Shedding usually ceases in 2 weeks
  - Reported up to 104 days P.I.

TGEV Diagnosis

- Pigs in first 24 hours of diarrhea
- FA test on S.I., Elisa, RT-PCR
- EM on feces
  - cecal contents if post-mortem
  - pool 3-4 pigs per sample for endemic; test at least 15 pigs
- Paired serology
  - SN test
  - Differential competitive ELISA

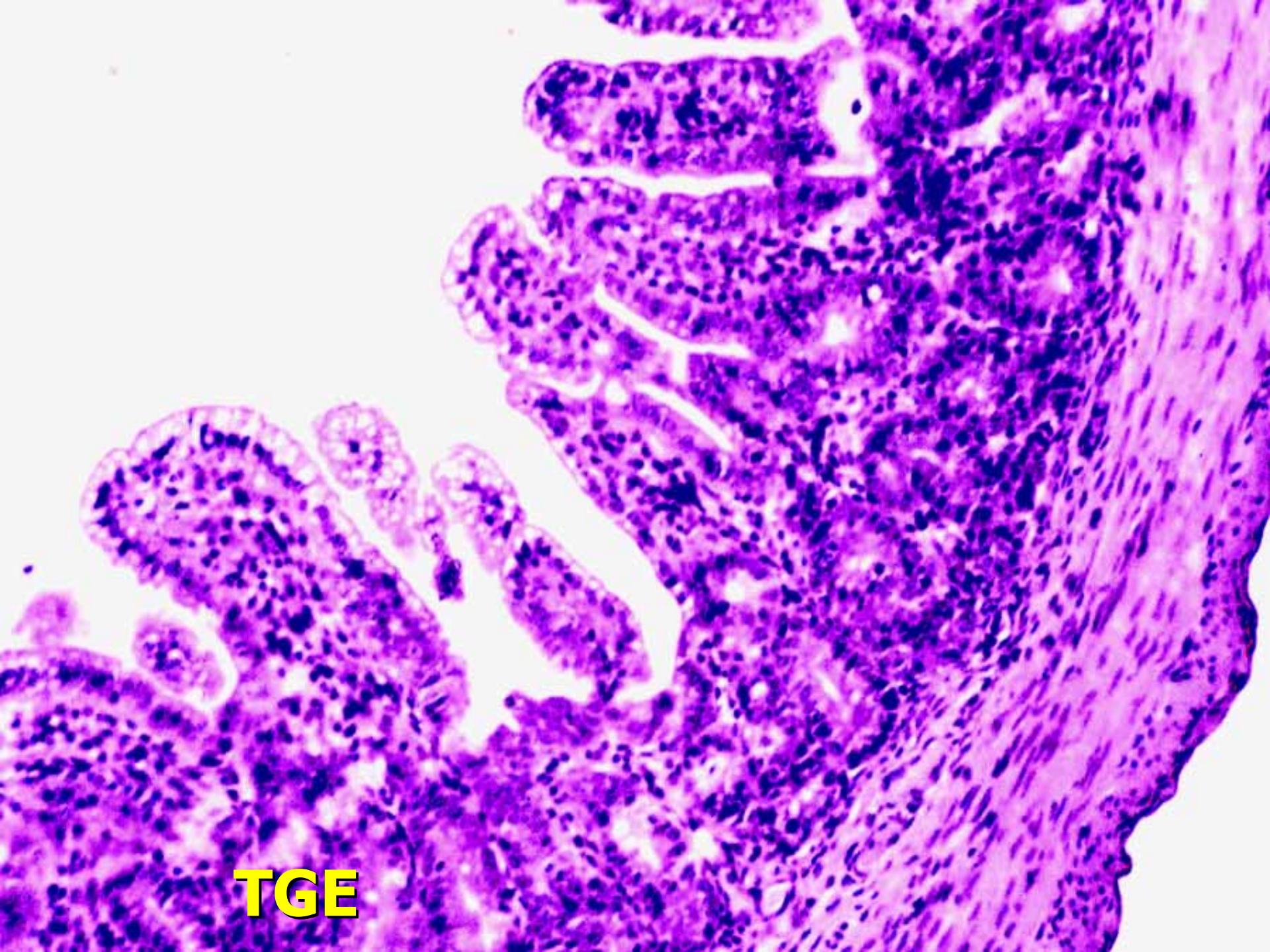

TGE


TGE


TGE


Normal


TGE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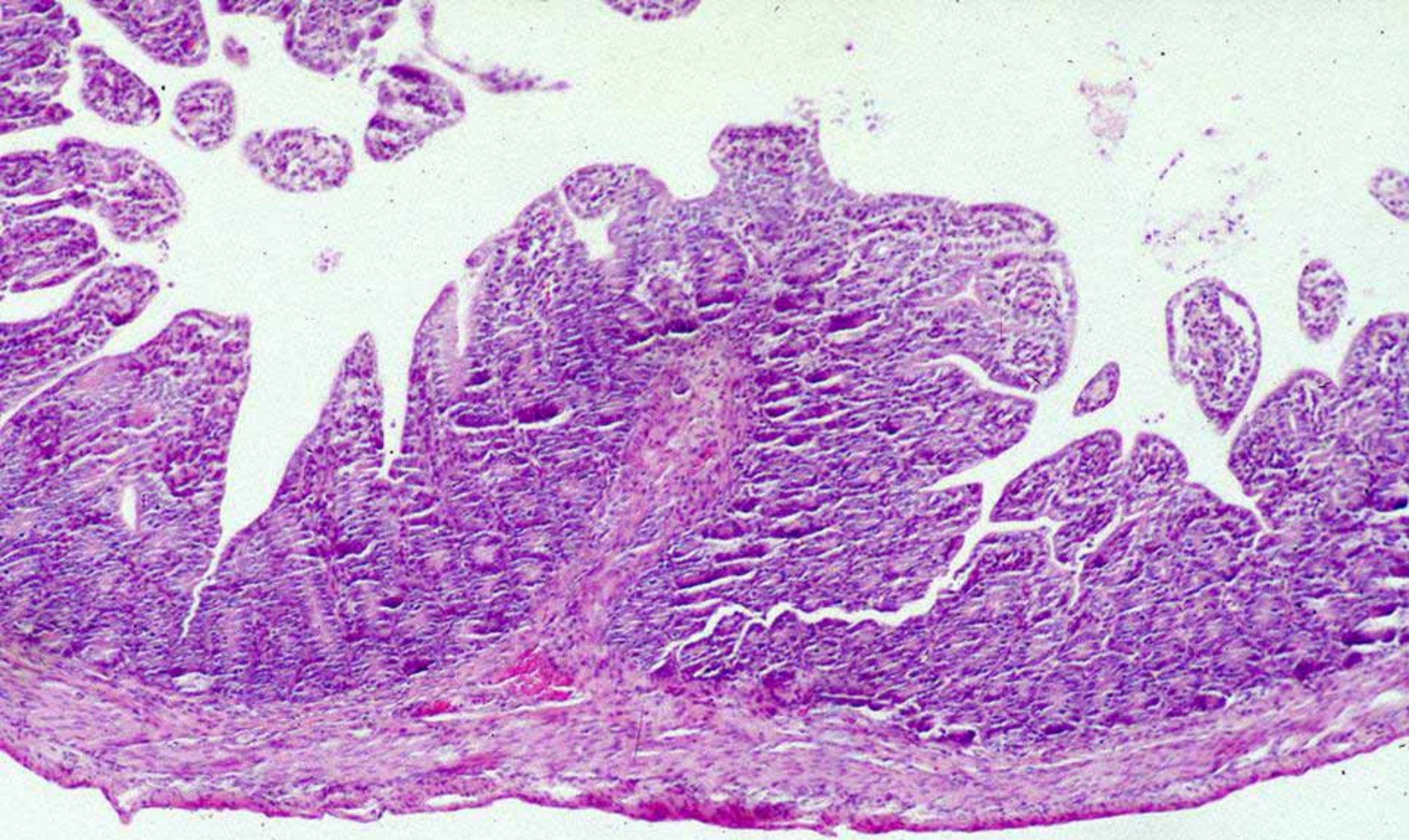
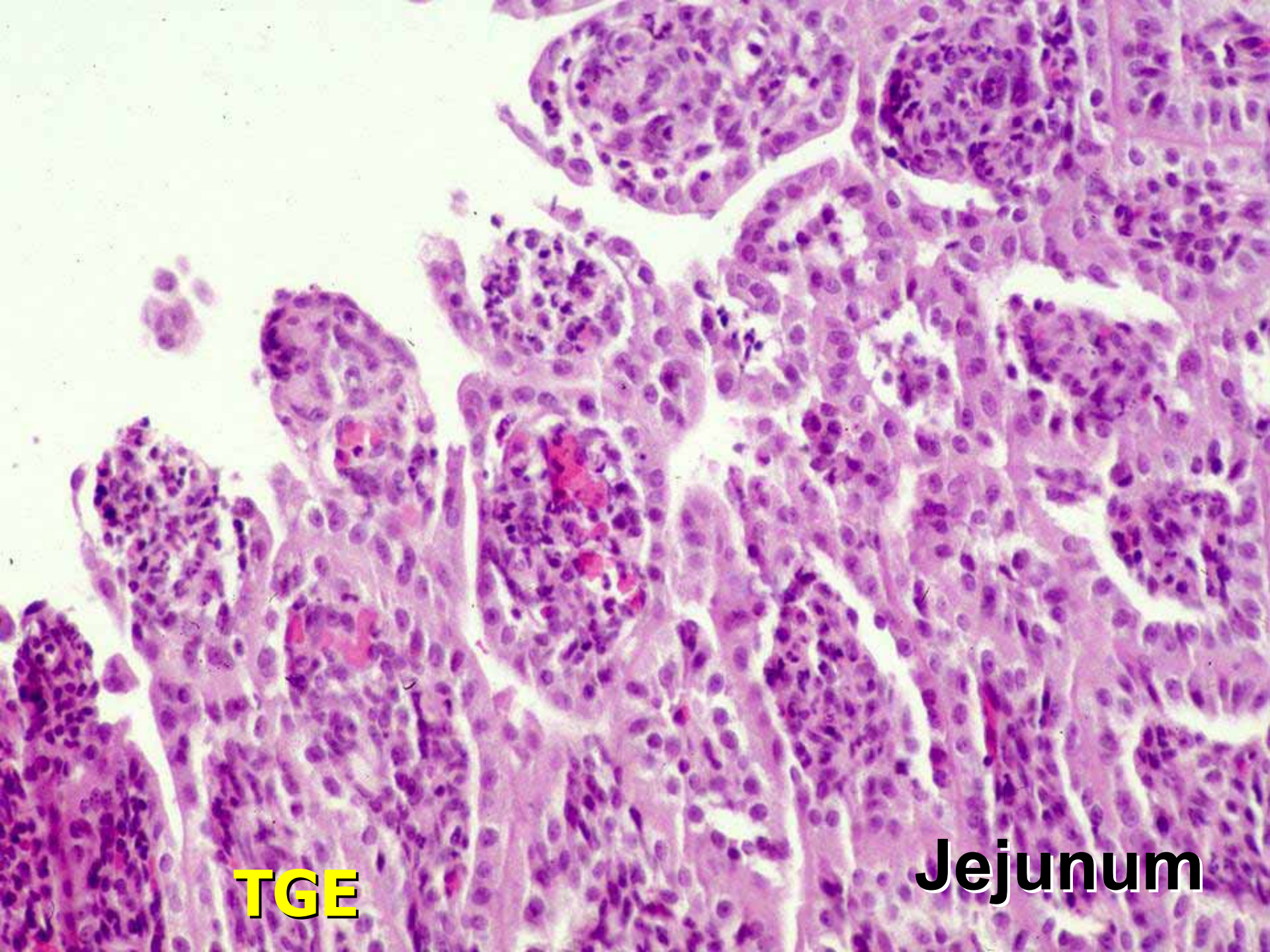


TGE

Jejunum


TGE
Jejunum