

Abortion Pathology

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Defining Terms

- Abortion: Expulsion of the fetus before full development; may be alive or dead
- Stillbirth: Expulsion of a dead fetus at full gestational development
 - Determination of term in bovines?
- Embryonic death vs. Fetal death: Occurs earlier in the gestational period
 - May appear as infertility

Frequency of good Dx on abortion cases?

- Confounding factors

- Loss of agent
- In utero autolysis
- Loss of placenta
- Genetic causes
- Toxic causes
- Other non-infectious causes

- In 814 abortions, a specific cause was identified in 29.5%

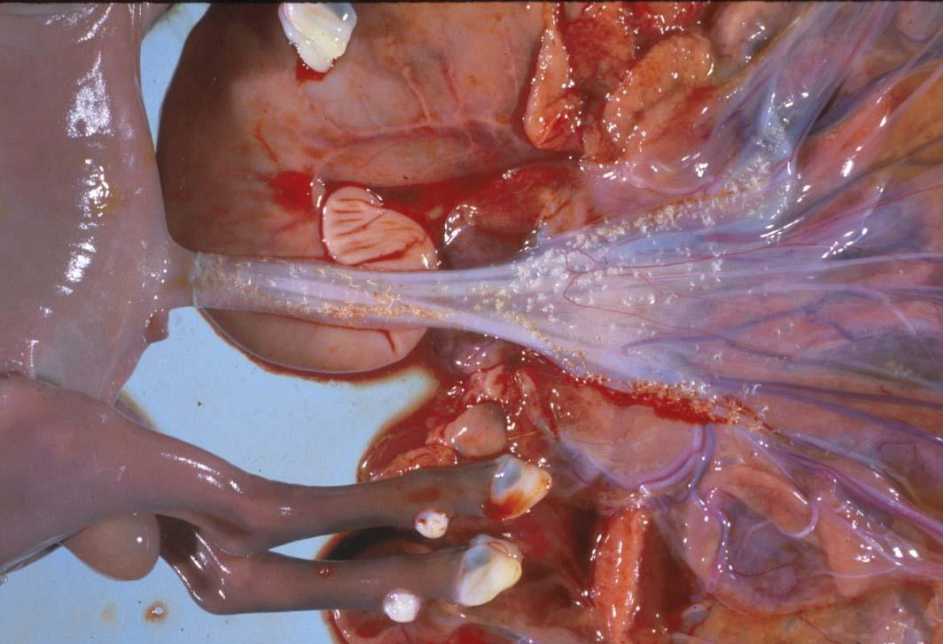
Anderson, Blanchard, Barr. A survey of causes of bovine abortion occurring in the San Joaquin Valley, CA. *Journal of Veterinary Diagnostic Investigation*. 1990 Oct; 2(4):283-7

- In 1,784 abortions, etiologic Dx was made in 44%

Kirkbride CA. Diagnoses in 1,784 ovine abortions and stillbirths. *Journal of Veterinary Diagnostic Investigation*. 1993 Jul; 5(3):398-402

Species variation

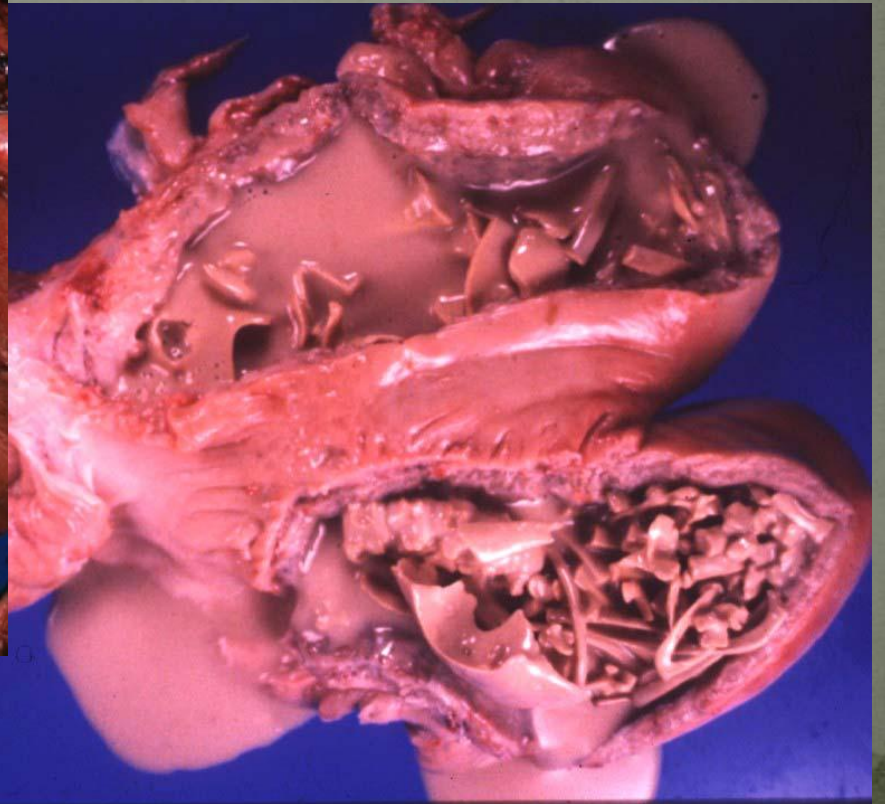
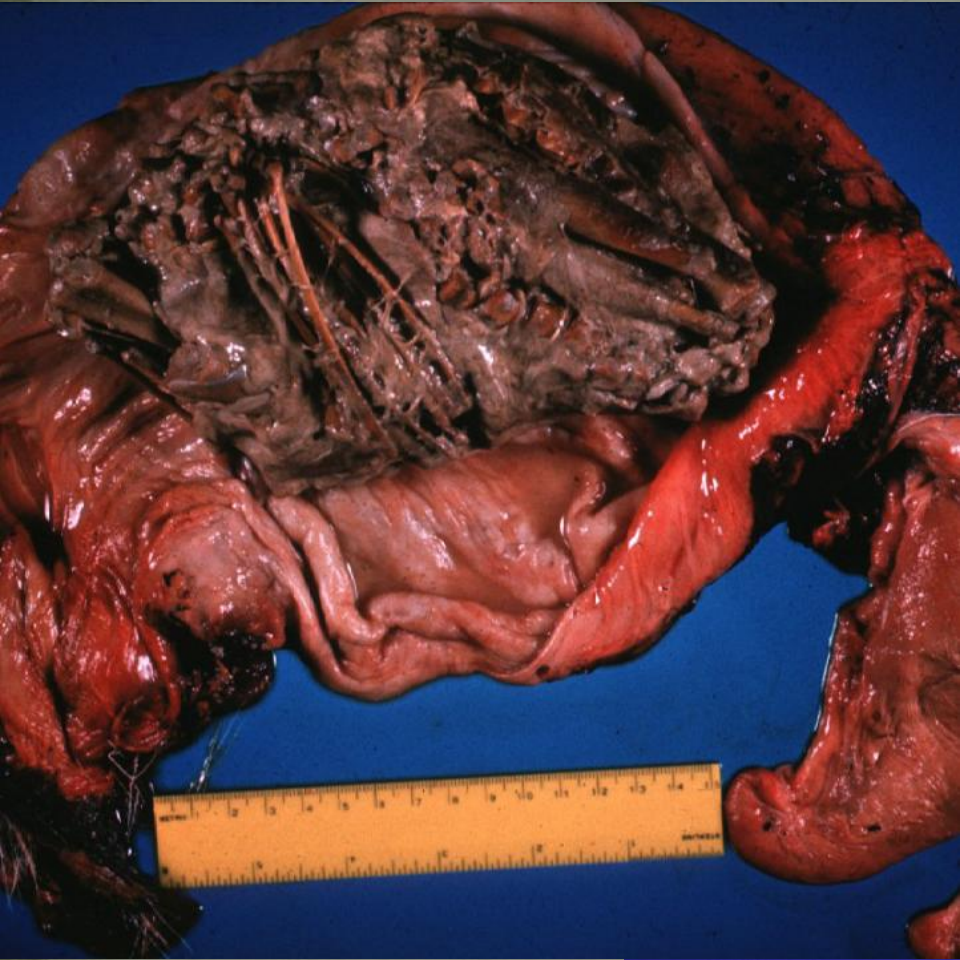
- Sheep/goats no diagnosis in approximately 55%
- Pigs 1/3 of cases have a diagnosis
- Equine occur 10-15%, with 16% idiopathic
 - Typically in 1st 40 days or late in term
 - Shoulder joints of late term fetus for hemarthrosis/fractures



Maceration vs. Mummification

- Maceration: putrefactive destruction of the fetus; assoc'd with endometritis
 - Fetid odor
 - Bacterial etiologies
 - Emphysema
- Mummification: retained fetus, progressively dehydrated; virtually sterile => no lytic organisms
 - Viral or non-infectious etiologies
 - May be held indefinitely
 - Parvovirus (porcines) => vary among piglets

Maceration => “Chewed up”



Mummification => “Dried up”

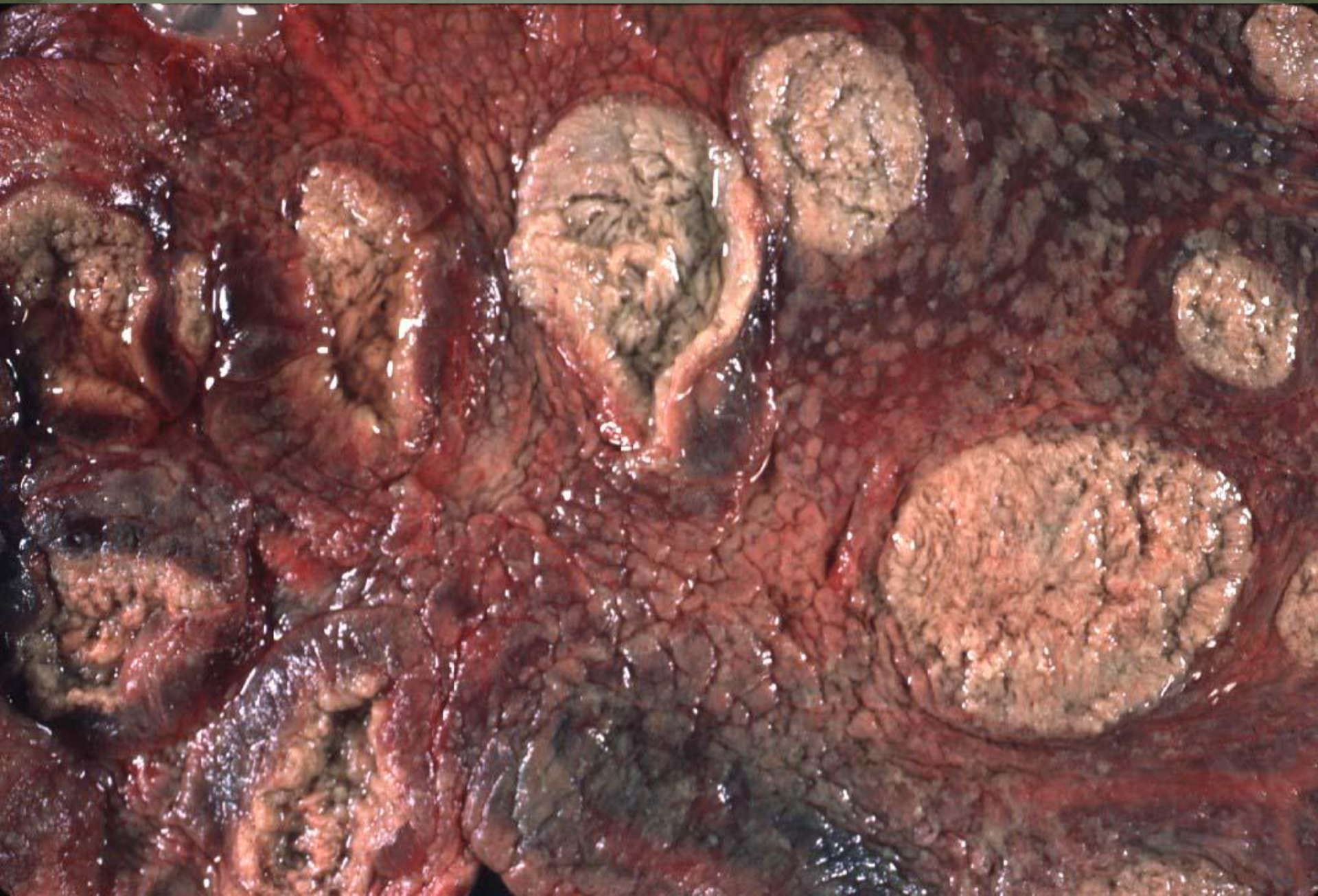


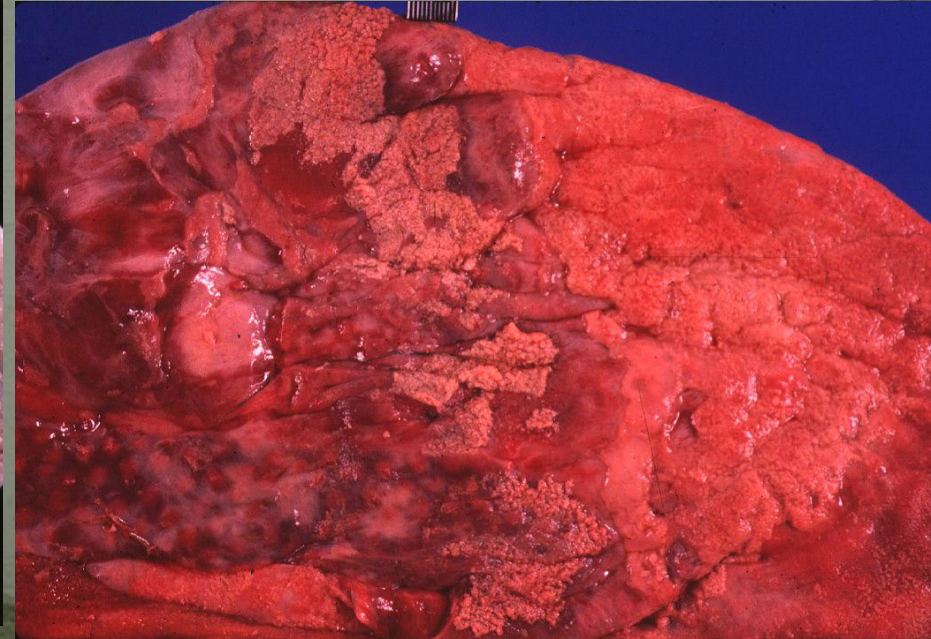
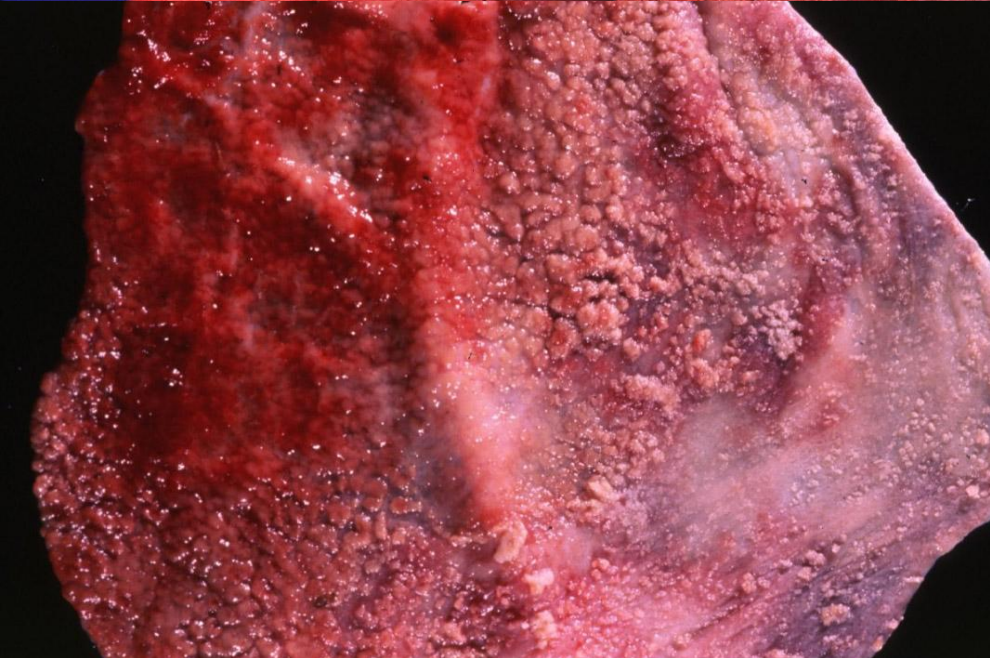
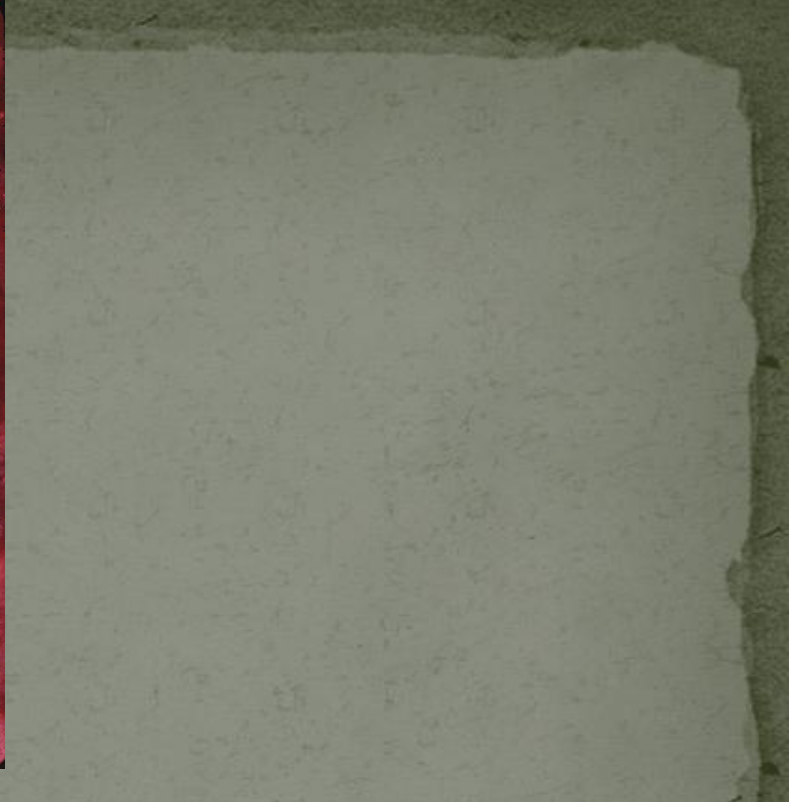
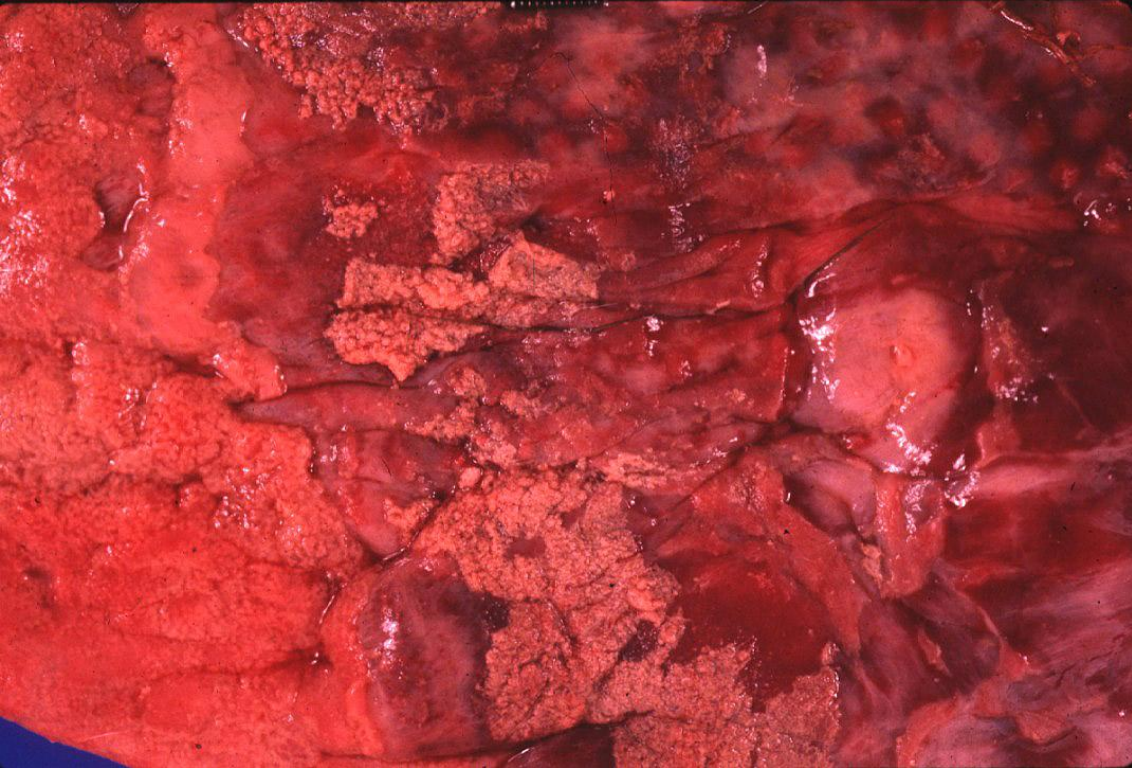
- Twinning
 - MC a problem in the mare
 - Assoc'd with Freemartinism



Bacterial Causes

- Can be nearly anything that infects the uterus and/or placenta
 - Salmonella, Pasteurella, Haemophilus, Streptococcus, E. coli, T. pyogenes, etc.
- Lesions are non-specific
 - Suppurative placentitis
 - Suppurative bronchopneumonia, fetal
 - Septicemia, fetal
- Fetal abomasal fluid is critical



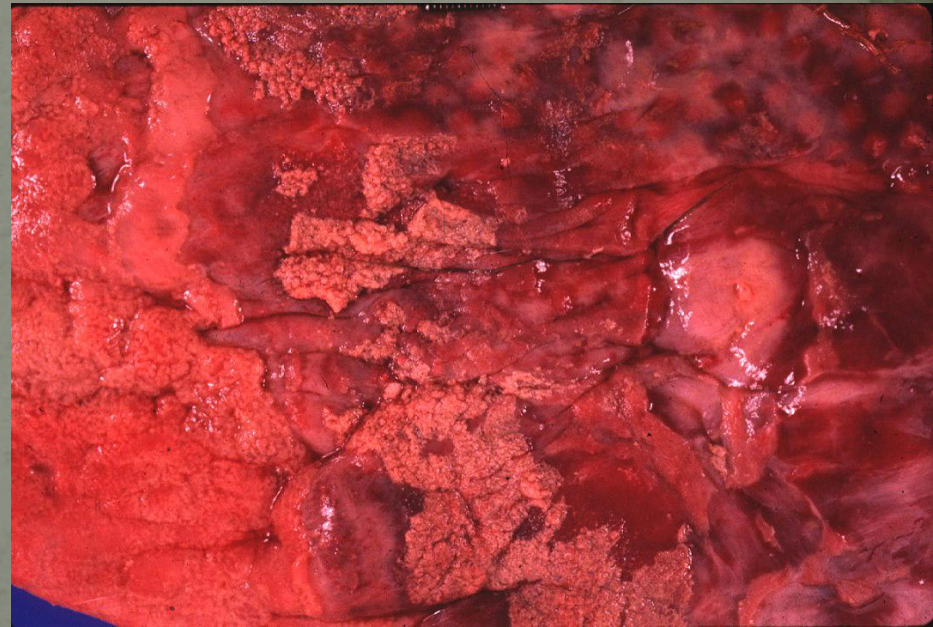


Side by side comparison

Normal



Inflamed



Campylobacter

- Campylobacter fetus var. venerealis
 - Bovine
 - Venereally transmitted from prepuce/penis
 - ED or early fetal death => irregular estrus
 - Increased resistance
- Campylobacter fetus subsp. fetus and jejuni
 - Ovine => develop metritis => death
 - Late term abortions => abortion storms
 - Hepatic necrosis, fetus

Brucella => ZOONOTIC!!!

- Brucella abortus
 - Bovine => ingestion => systemic
 - May infect trophoblast cells
- Brucella canis
 - Ingestion or venereal => head/neck lymphadenitis
 - Fetus: endocarditis, pneumonia, hepatitis
- Brucella ovis / melitensis (goats)
 - Venereal
 - Shed in milk
- Brucella suis
 - Lesions in bone/joints
 - Does not require pregnancy => endometritis

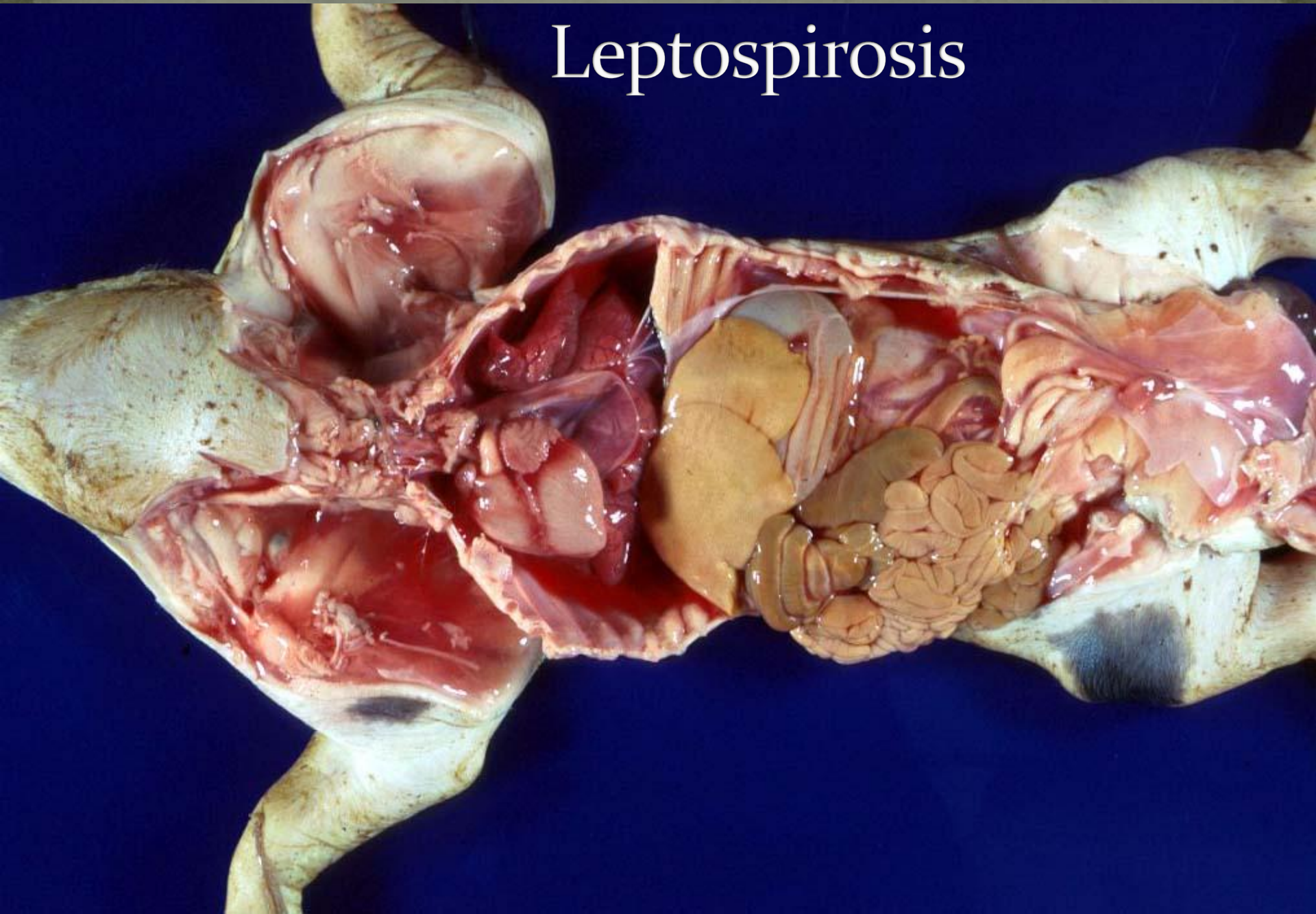
- *Coxiella burnetti* => ZOOONOTIC!!!
 - Q-fever in humans
 - Ovines and Caprines, goats MC
 - Ingestion or inhalation
 - Shed in vaginal discharge or milk, Giemsa stain
 - Intercotyledonary chorioallantois
 - Thick yellow, covered with exudate
- *Chlamydophila abortus* (ovine)
 - Late term abortion, fetal autolysis
 - Oral transmission
 - Immune to re-infection
 - Intercotyledonary chorioallantois

Intercotyledonary Chorioallantois



- **Leptospira => ZOONOTIC!!!**
 - Largely bovine and porcine
 - *L. interrogans* serovar hardjo and serovar pomona
 - Often no c/s => localize in the kidneys
 - Abortion weeks after septicemic phase, in last trimester
 - Placental edema with fetal ascites and peritonitis
 - Advanced fetal autolysis
- **Flexispira rappini**
 - Similar to *Campylobacter*, liver necrosis, Giemsa +
- **Foothill abortion**
 - In CA and adjacent states
 - Cows new to the territory
 - Lesion
 - Petechiation of conjunctiva and tongue

Leptospirosis

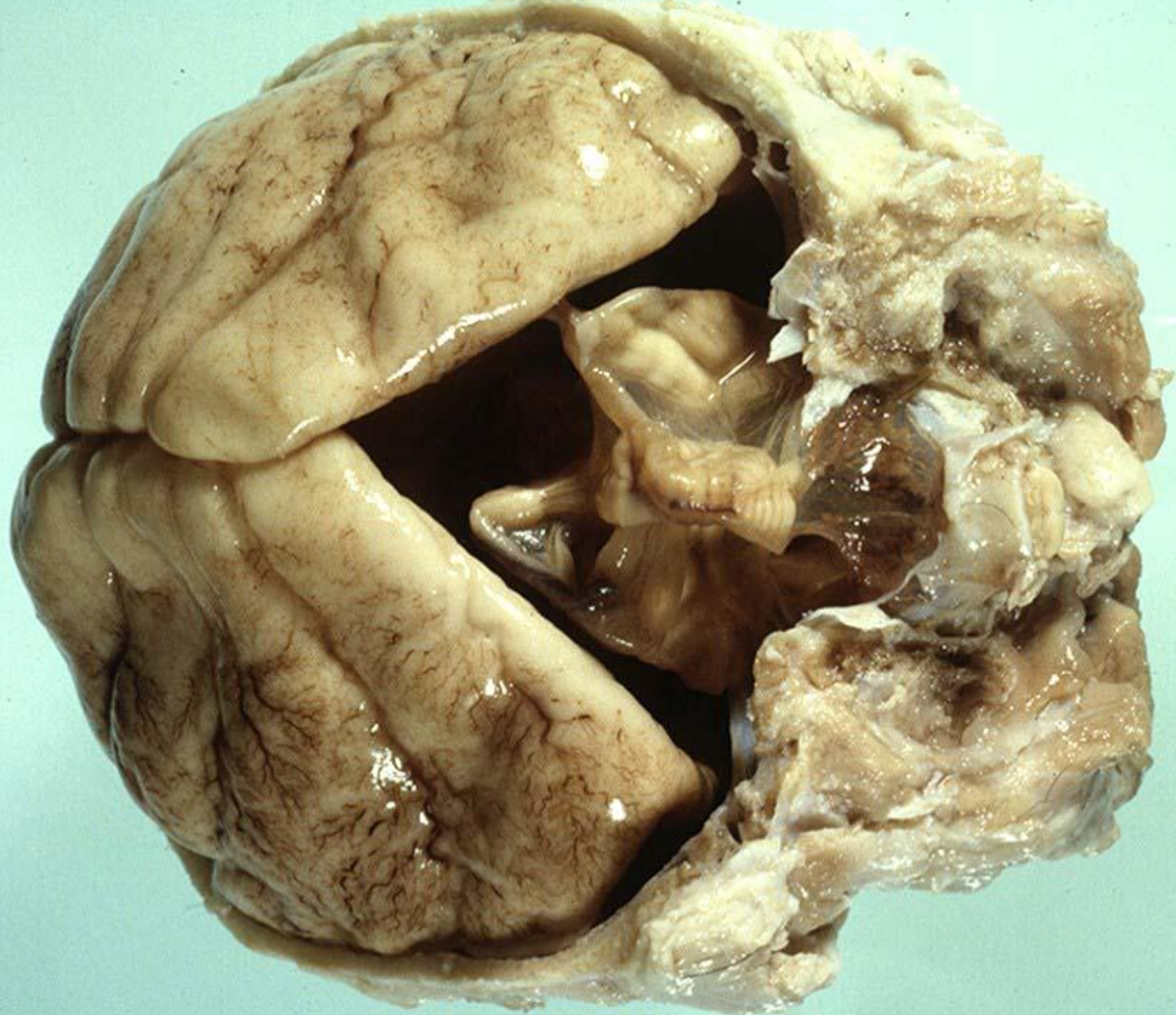


Listeria monocytogenes => ZOONOTIC

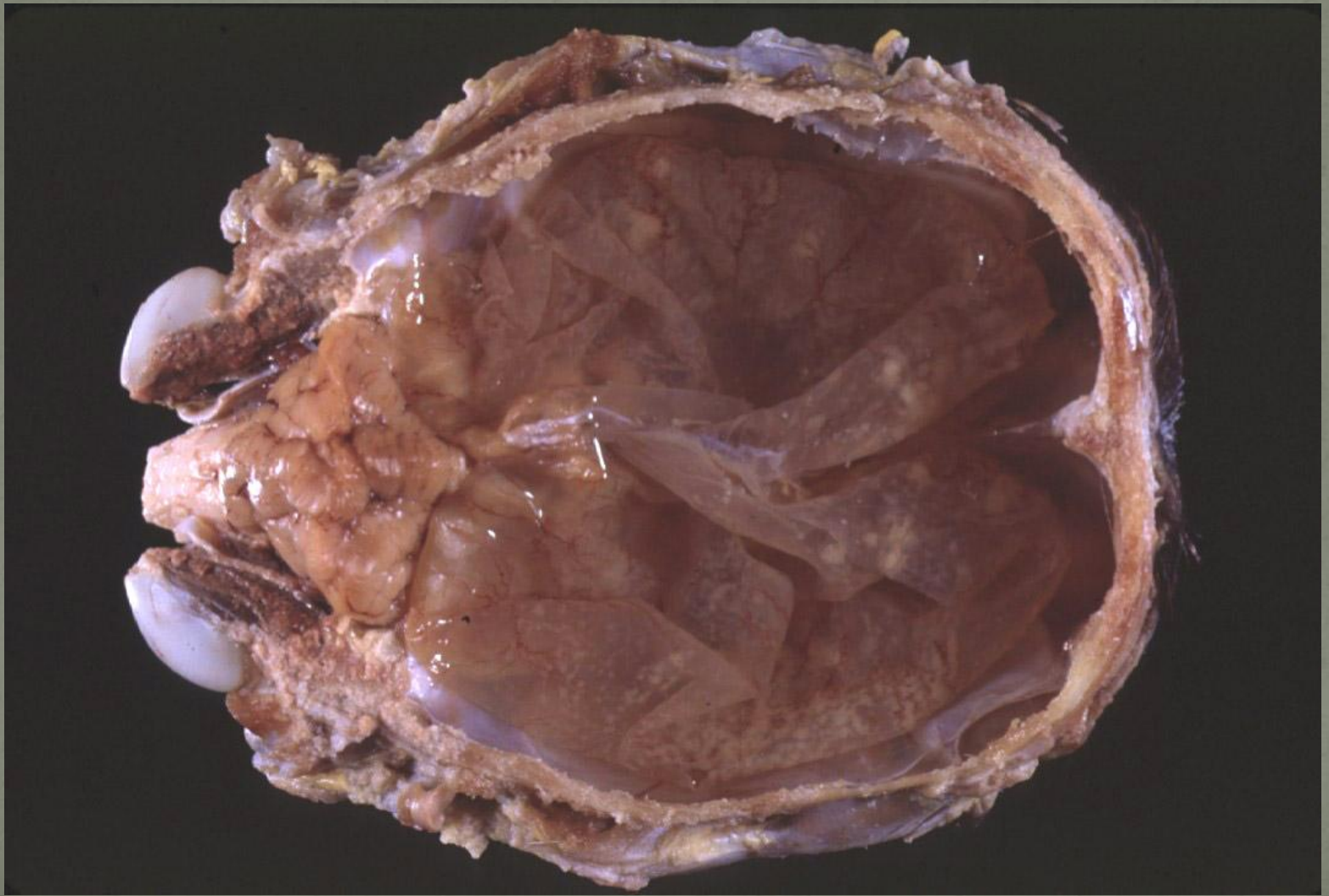
- Bovine, ovine, and caprine
- Last trimester
- Lesions
 - Suppurative hepatitis
 - Fibrin in body cavities
 - Suppurative placentitis
- Lesion in the fetus/calf?

Viral Causes

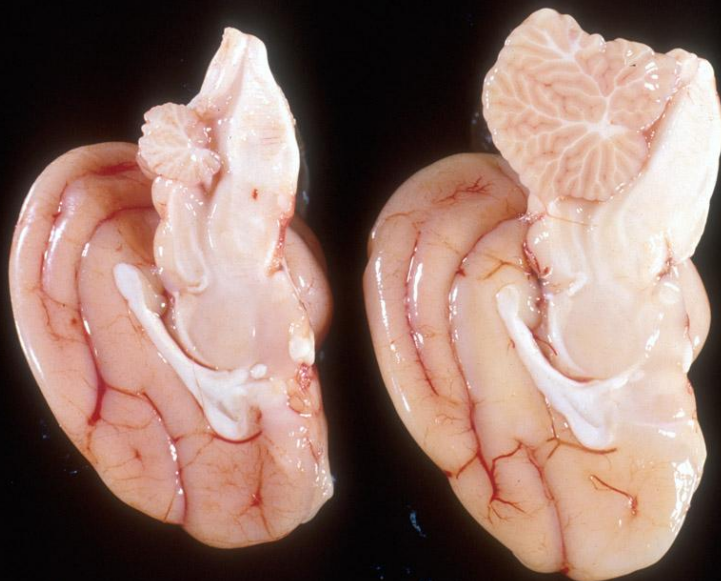
- Multiple etiologies
 - “Herpesvirus hates babies!”
- Fetal mummification
- Developmental anomalies
- Akabane and Cache Valley (Bunyaviridae)
 - Ovines and other ruminants
 - Nervous malformation
 - Arthrogryposis
- Bluetongue (orbiviridae) => Summer/Early Fall
 - MC in ovine
 - Nervous malformation: encephalitis and retinitis
 - Arthrogryposis
 - Exposed prior to day 100, may clear the virus => neg PCR



Equine



Feline



Arthrogryposis



- Herpesvirus

- Lymphoid necrosis spleen/thymus
- Hepatic necrosis, multifocal
- Pulmonary necrosis, multifocal (equine)
 - Fibrin plaques in lung & trachea => characteristic

- Pestivirus

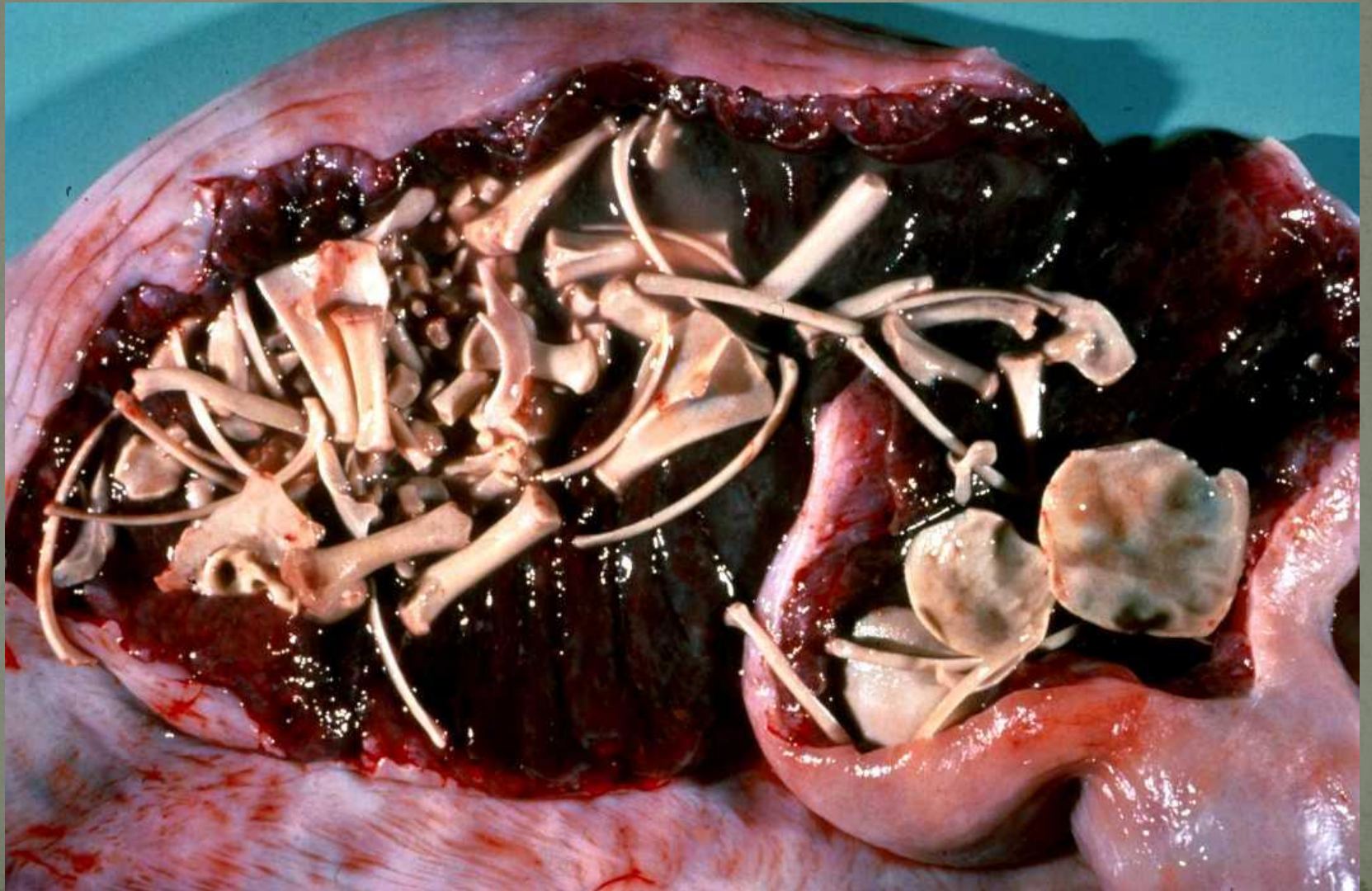
- BVD (bov); Border Dz (ovi); Hog Cholera (por)
- Fetal death or malformation
- Persistently infected BVD calves, day 120
- Persistently infected kids, b/f day 60-80
- “Hairy Shakers” => sheep, thick haircoat, pigmented
- Targets oligodendrocytes => hypomyelinogenesis

SMEDI (78% in pigs)

- Porcine parvovirus (environmental)
 - Embryonic and early fetal loss
 - Mummification
- PRRS (Arteriviridae), 60% of porcine abortions
 - Hemorrhage in umbilical cords
 - Affects 50% of fetuses in litter
 - Interstitial pneumonia in live littermates
- Porcine Circovirus => myocardium and lymphoid
- CSF/Pseudorabies => Feral pig reservoir
- Sow Infertility Syndrome (Virus X)



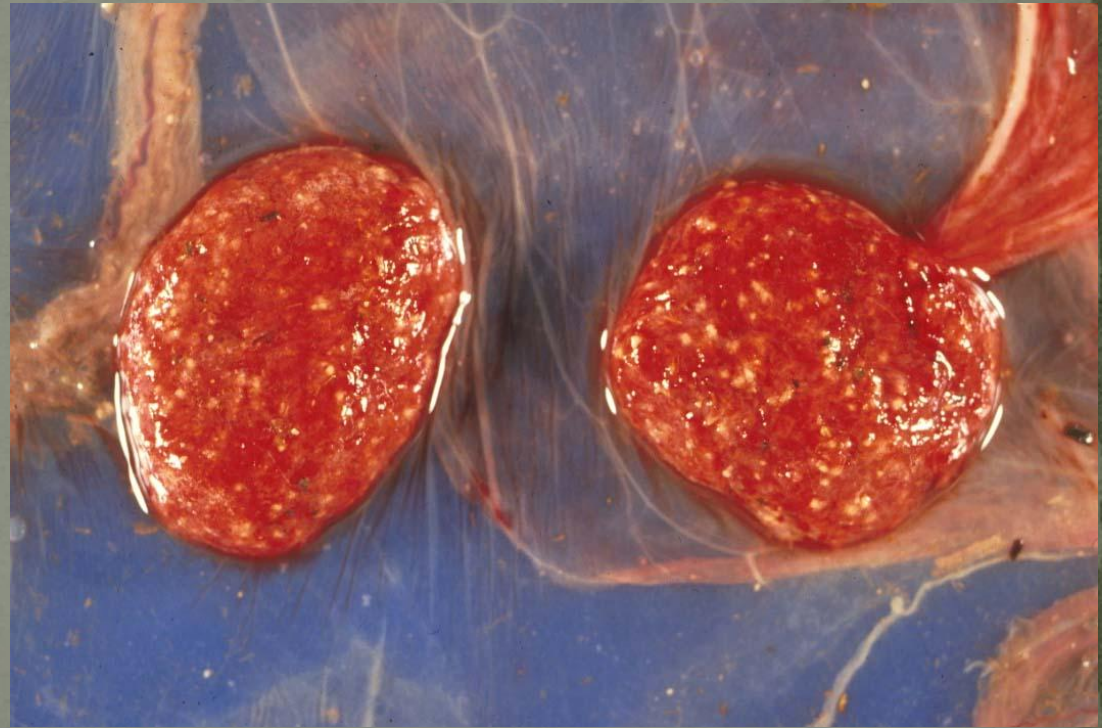
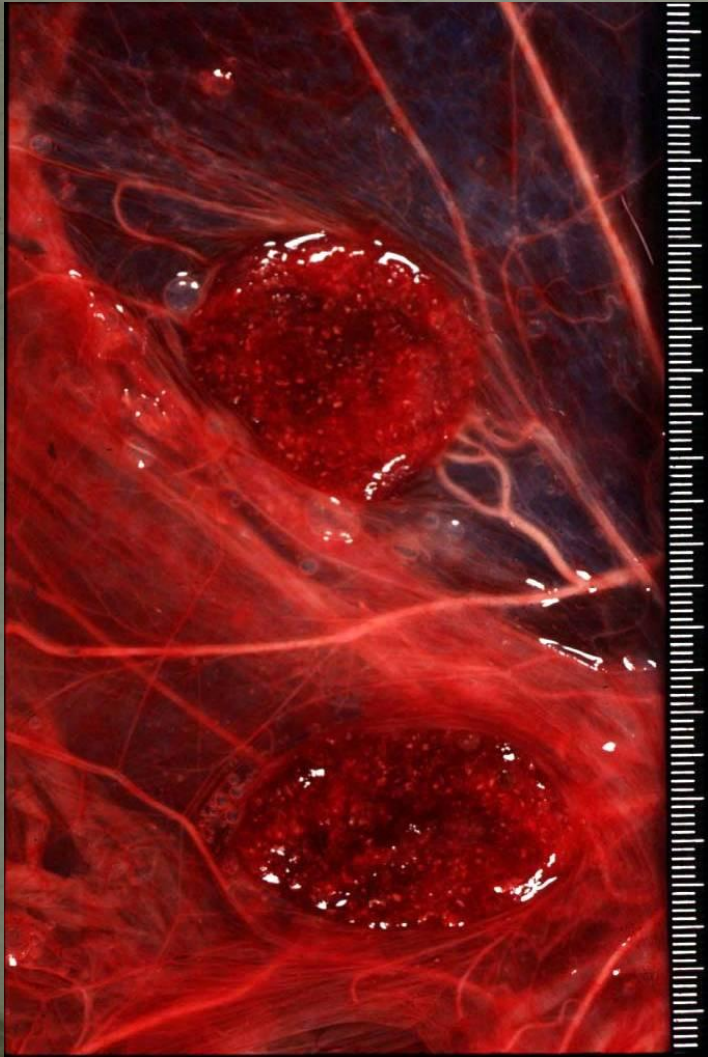
Porcine Maceration



Protozoal Etiologies

- *Toxoplasma gondii* (ovine)
 - Ingestion
 - Necrotic, “rice grain” on cotyledons
 - Leukoencephalomalacia, fetus
 - Placentitis
- *Neospora caninum* (bovine)
 - Abort in 2nd trimester, few lesions
 - Necrosis in the brain and heart with cysts
 - Vertical transmission
 - Variable pathogenicity
- *Tritrichomonas foetus* (bovine)
 - Mild placentitis, may have severe endometritis => pyometra
 - No fetal lesions
 - Protozoa within abomasal fluids, smegma, or vaginal swab
 - Giemsa highlights organism in placenta, lung, and abomasum

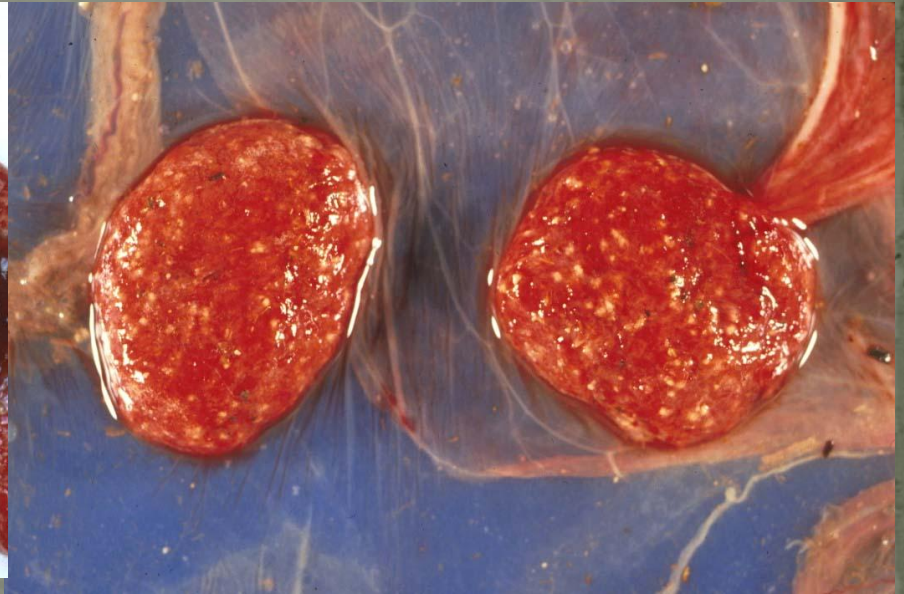
Toxoplasmosis gondii



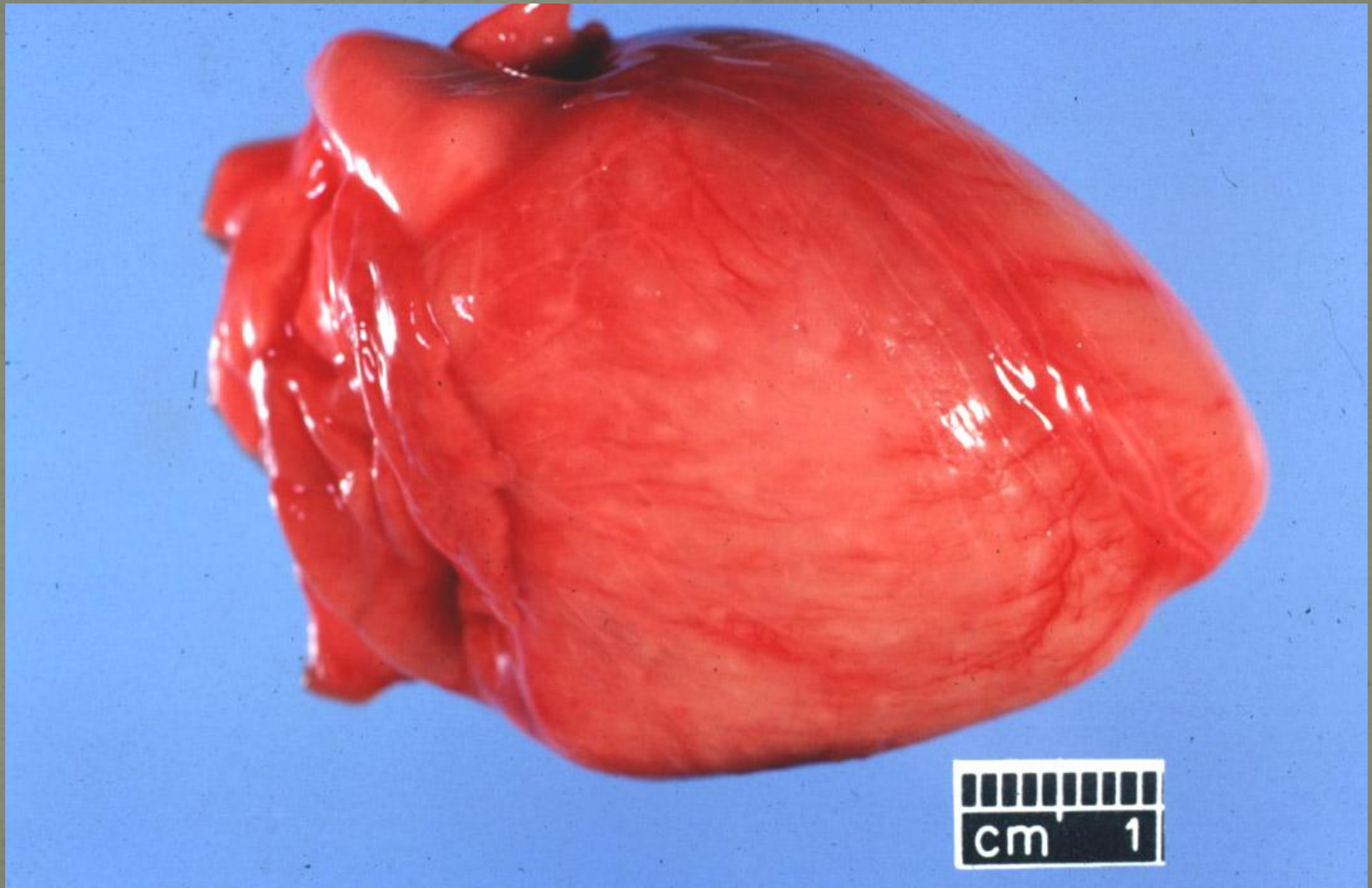
Chlamydophila vs. Toxoplasma

Intercotyledonary

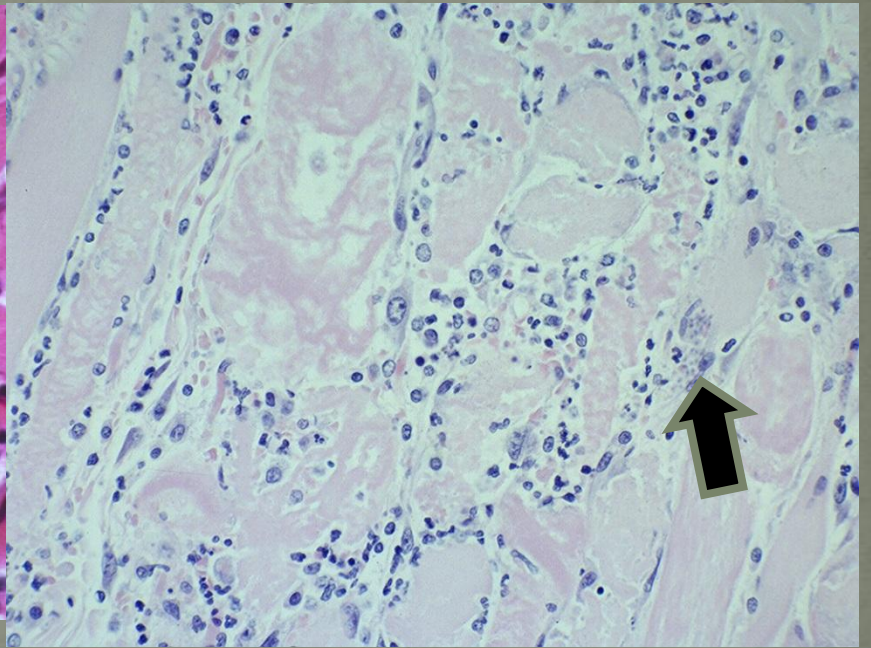
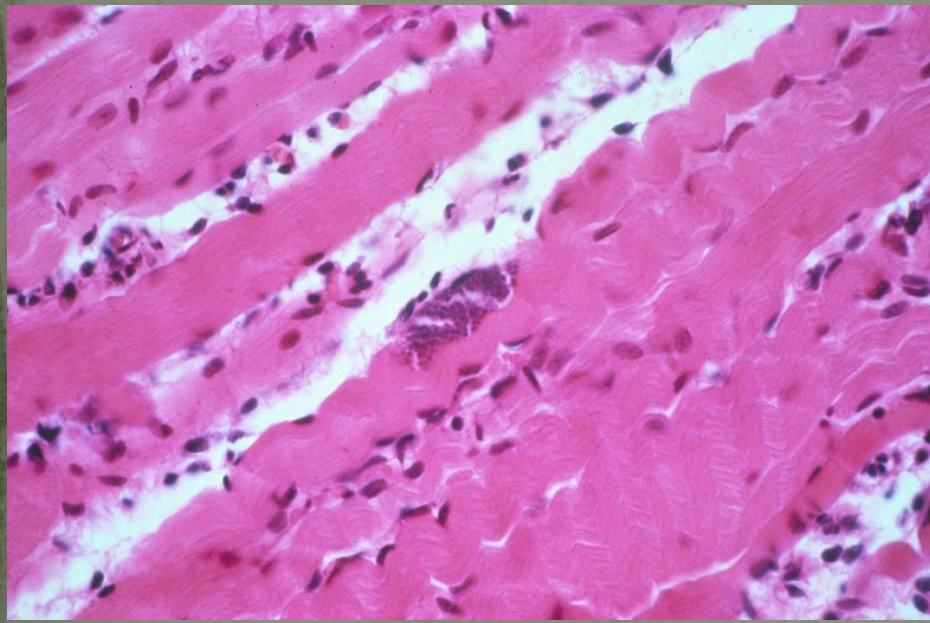
Cotyledonary



Neospora



Neospora



Fungal abortions

- MC assoc'd with plaques on the skin
- MC cause of abortion *Aspergillus* sp.
 - Others: *Mucor*, *Rhizopus*, *Absidia*, *Candida*
- MC in bovine & equine
 - Bovine => hematogenous
 - Equine => cervix
- RARE in porcine, approximately 0.3% fungal
- Fibrinous placentitis => identical to bacterial



Canine & Feline

- Virus
 - Herpesvirus
 - Canine Parvovirus type 1 / Panleukopenia
 - Necrotizing enteritis w/ eos i/b, no crypt necrosis
 - Adenovirus type 1
- Bacteria
 - Brucella, E. coli, Staphylococcus aureus, Beta hemolytic Streptococcus spp.
- Other
 - Feline: Antifungal drugs =>teratogenic effects
 - NSAIDS, glucocorticoids, tetracyclines, chloramphenicol

Other causes

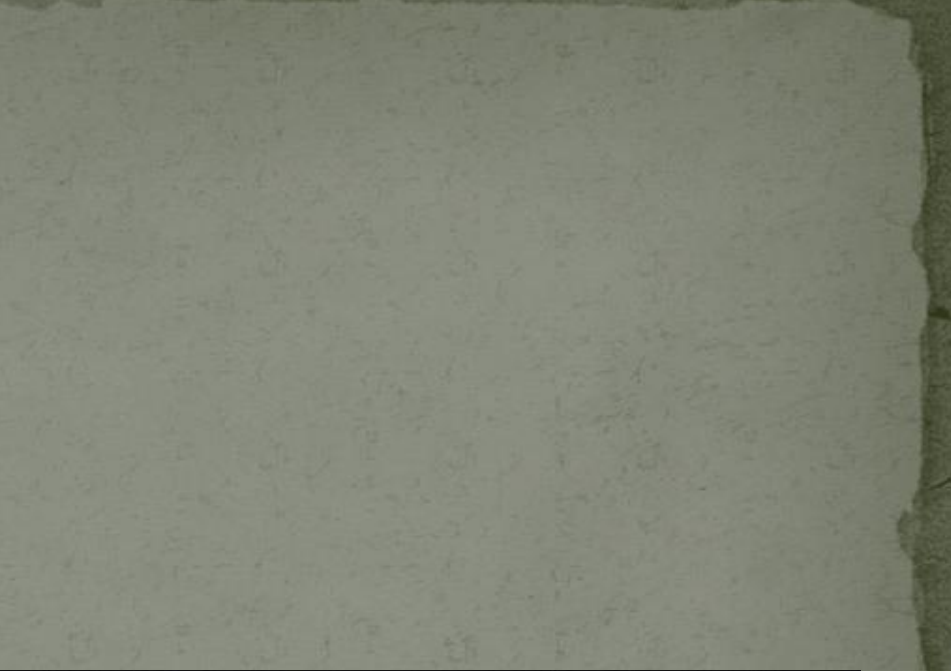
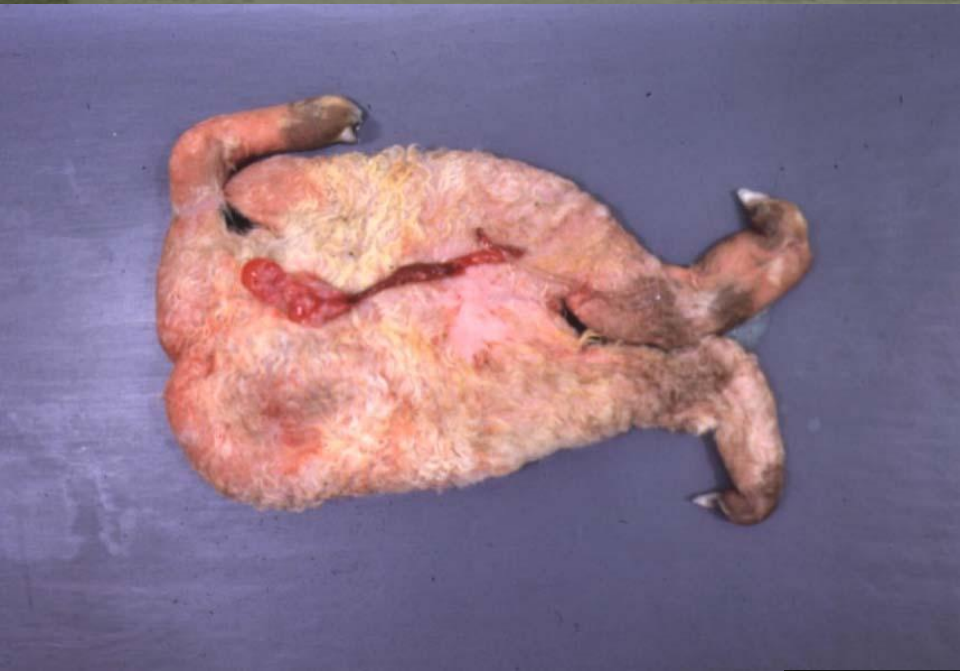
- Nitrate Toxicosis
 - Consumption of plants high in nitrates or contaminated water (nitrogen fertilizers)
 - Chocolate brown blood, no lesions
 - Test levels of nitrate in aqueous humor
- CO in porcine (b/t 120 and 260 pppm)
 - Dx with 5-10 mL of thoracic fluid
 - Carboxyhemoglobin levels >2% are diagnostic
- Variable Toxicity Teratogens
 - Pine needles, broomweed, swainsonine, Sweet pea,
 - Arthrogryposis
 - Lupine, Tobacco, Poison Hemlock, Locoweed
 - Clover => Estrogen => Infertility

Fetal anomalies

- Synophthalmia (cyclopia) in ovines
 - *Veratrum californicum*, day 13-15
- *Schistosomas reflexus*
- Amorphous globosus
- Spider Lamb Dz = > Suffolk
- Torsion of the umbilical cord
 - Equines
 - XS twisting compromises umbilical vessels



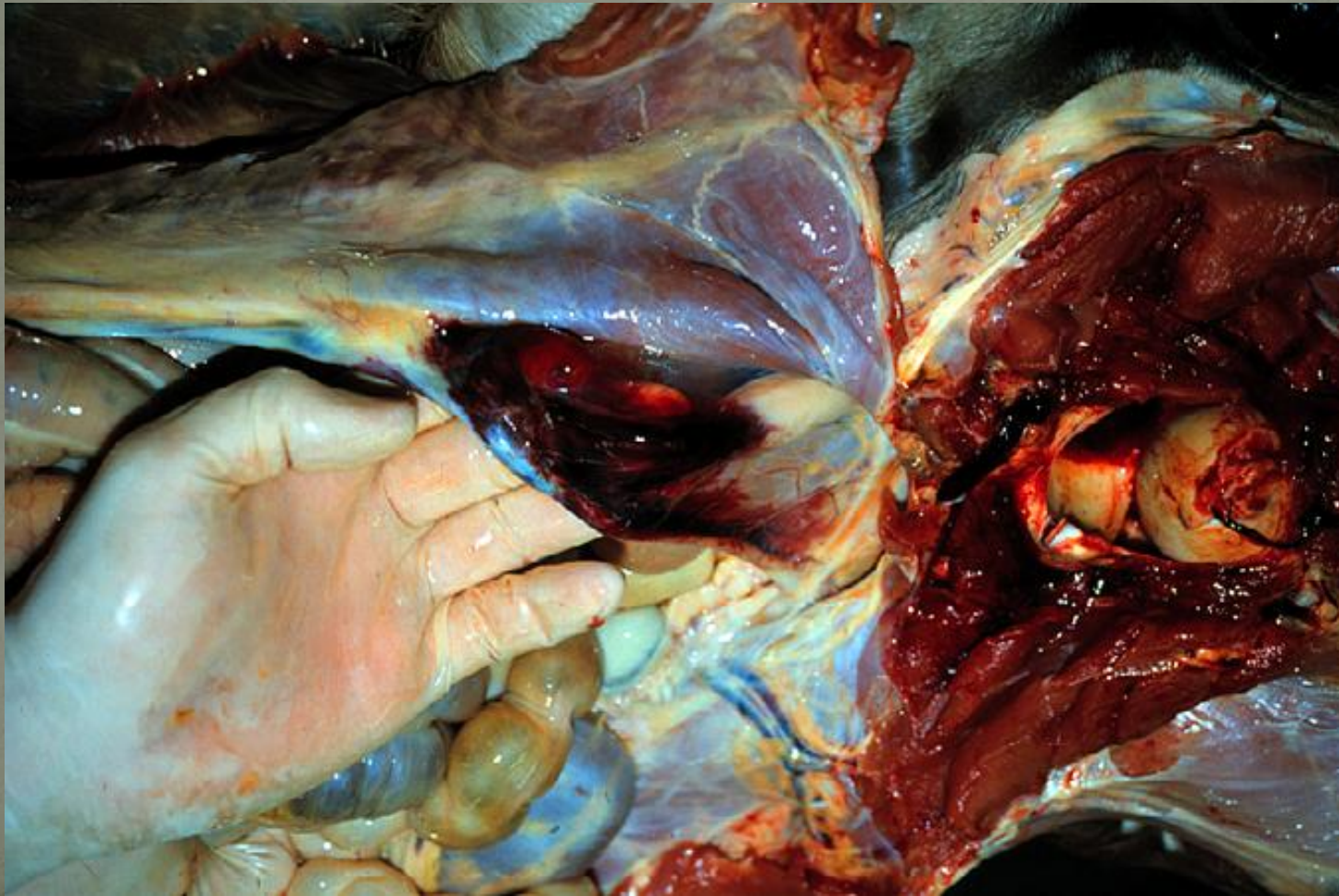




Fetal Necropsy Protocol

- Determination of Fetal Age
 - CR length AND body weight
 - Developmental features
- Timing of Fetal Death
 - Lungs, eponychium, colostrum in the stomach/abomasum, umbilical hematoma
- Tissue collection
 - Bacterial
 - Lungs, Abomasal/stomach fluid, brain, placenta, liver
 - Viral
 - Lymphoid tissues, placenta

Umbilical Hematoma



Fetal Nx (cont'd)

- **Serology**
 - Fetal fluids
 - Interpretation: What is normal?
- **Toxicology**
 - Ocular fluid/eyes in bovines => Nitrates
- **Cytology**
 - Impression smears
- **Histopathology**
 - GI tract can be largely ignored

Questions?

