

Respiratory Diseases of the Dog and Cat

Respiratory Diseases

- Noninfectious Disease
 - Congenital
 - Degenerative
 - Immune-mediated
 - Toxic
- Infectious Diseases
 - Viral
 - Bacterial
 - Mycotic
 - Parasitic
- Proliferative/neoplastic

Nasal Passages

Non-Infectious Inflammatory Diseases

- Trauma/Foreign body – grass seed, twig, etc
- Immune- mediated rhinitis
 - Acute rhinitis and conjunctivitis – edema, eosinophils, neutrophils, and macrophages
 - Chronic
 - Lymphoplasmacytic infiltrates
 - Resolves with steroid treatment
- Toxic
 - Smoke inhalation, other gases

Epistaxis Differentials

- Trauma
- Foreign body
- Invasive intranasal lesion
 - *Aspergillus* sp
 - Neoplasia
- Bleeding disorder
 - Genetic
 - Warfarin toxicity
 - Rickettsial infection

Normal Flora of Upper Respiratory Tract

- *Pateurella multocida*
- *Bordetella bronchiseptica*
- Staph, strep, pseudomonads, coliforms
- Allows opportunistic infection following viral disease, immune suppression, toxic exposure, etc
- Pathogen infection may be reactivated with stress and/or pathogens shed
- Stress can activate/reactivate latent herpes viral infection

Infectious Rhinitis and Sinusitis

- Viral – none specifically affecting this area
- Bacterial
 - Primary infection rare, but may be secondary
 - Secondary to tooth root abscess
- Mycotic
- Parasitic

Mycotic Rhinitis and Sinusitis

■ Mycotic Agents

- *Aspergillus* sp (often dogs – nasal passages)
- *Penicillium* sp (as *Aspergillus* sp)
- *Cryptococcus neoformans* (often cats - sinuses), *C. gatti*

■ *Rhinosporidium seeberi* (may cause nasal polyps)

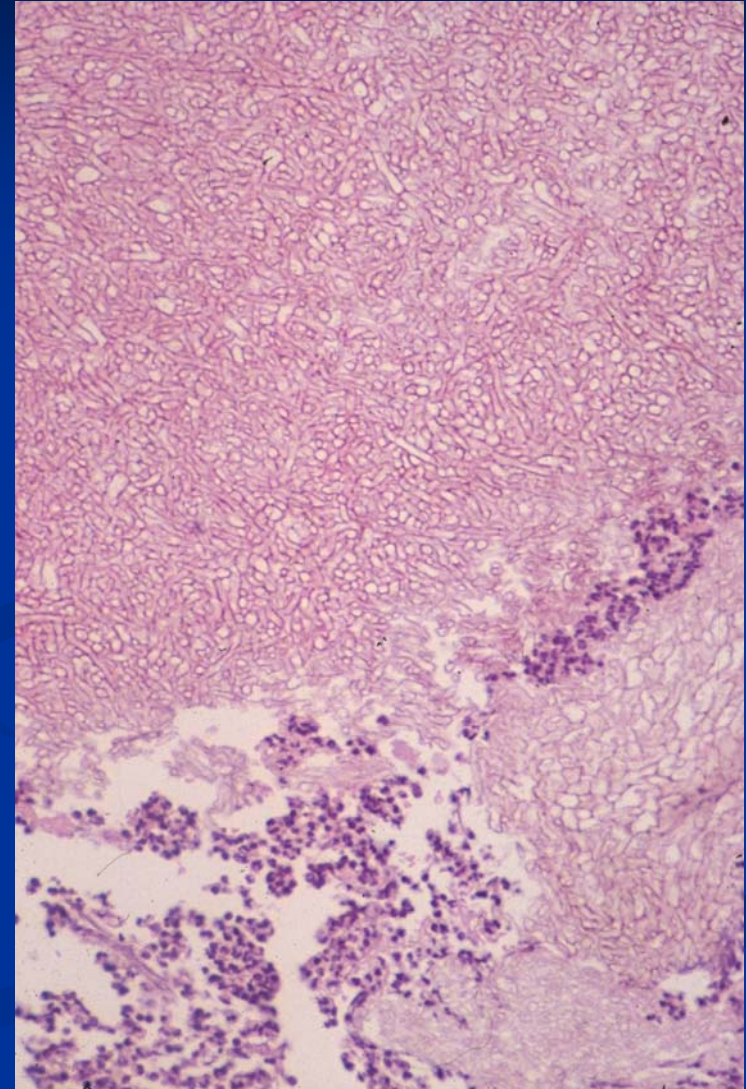
■ Clinical signs

- Mucopurulent discharge

■ Pathology

- Granulomatous inflammation
- Can be invasive, into bone

Nasal Aspergillosis - Dog



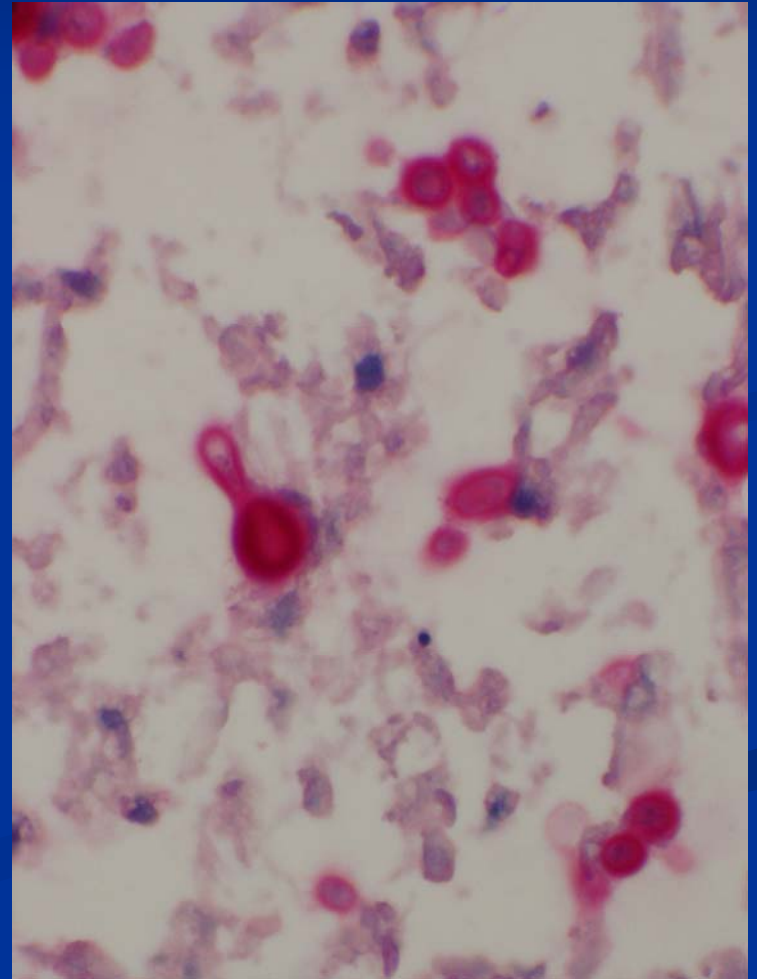
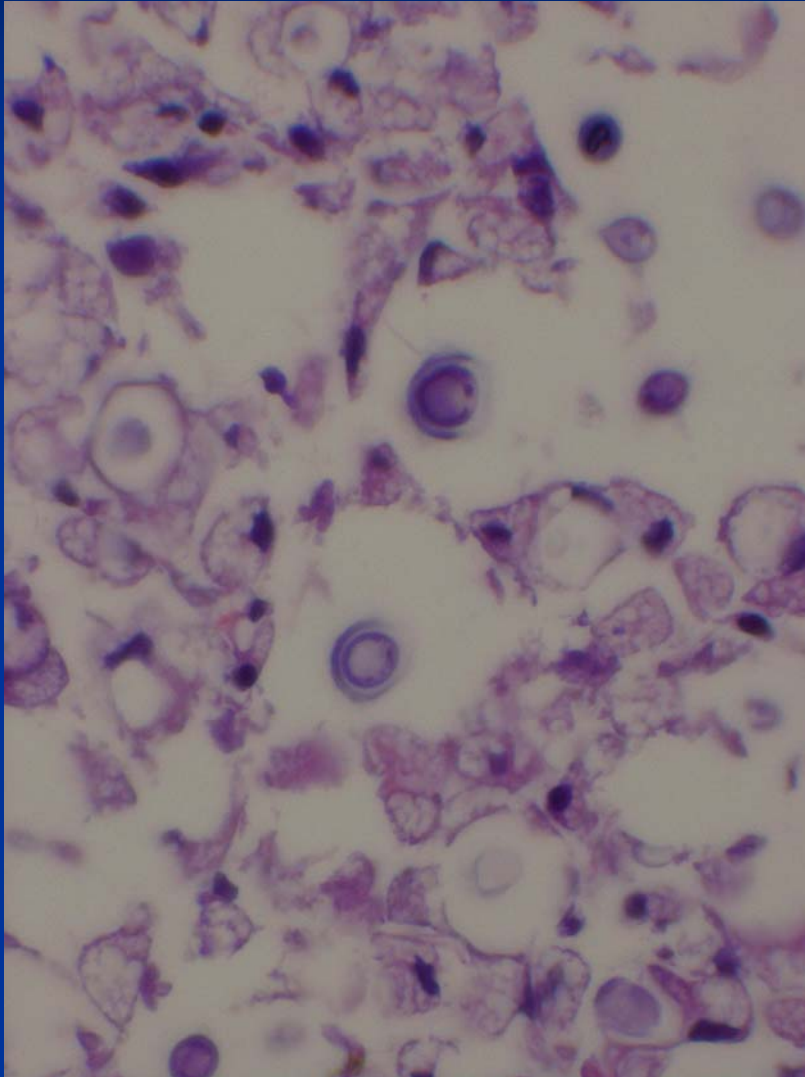
Cryptococcus sp.

- Species: primarily cat, also dog (also marsupials)
- Pathology
 - Granulomatous nodules
 - Mucopurulent inflammation
- Affects nasal mucosa, sinuses, lung
 - May also affect skin, brain
- Subcutaneous nodules on nose of cats

Cryptococcosis - Cat



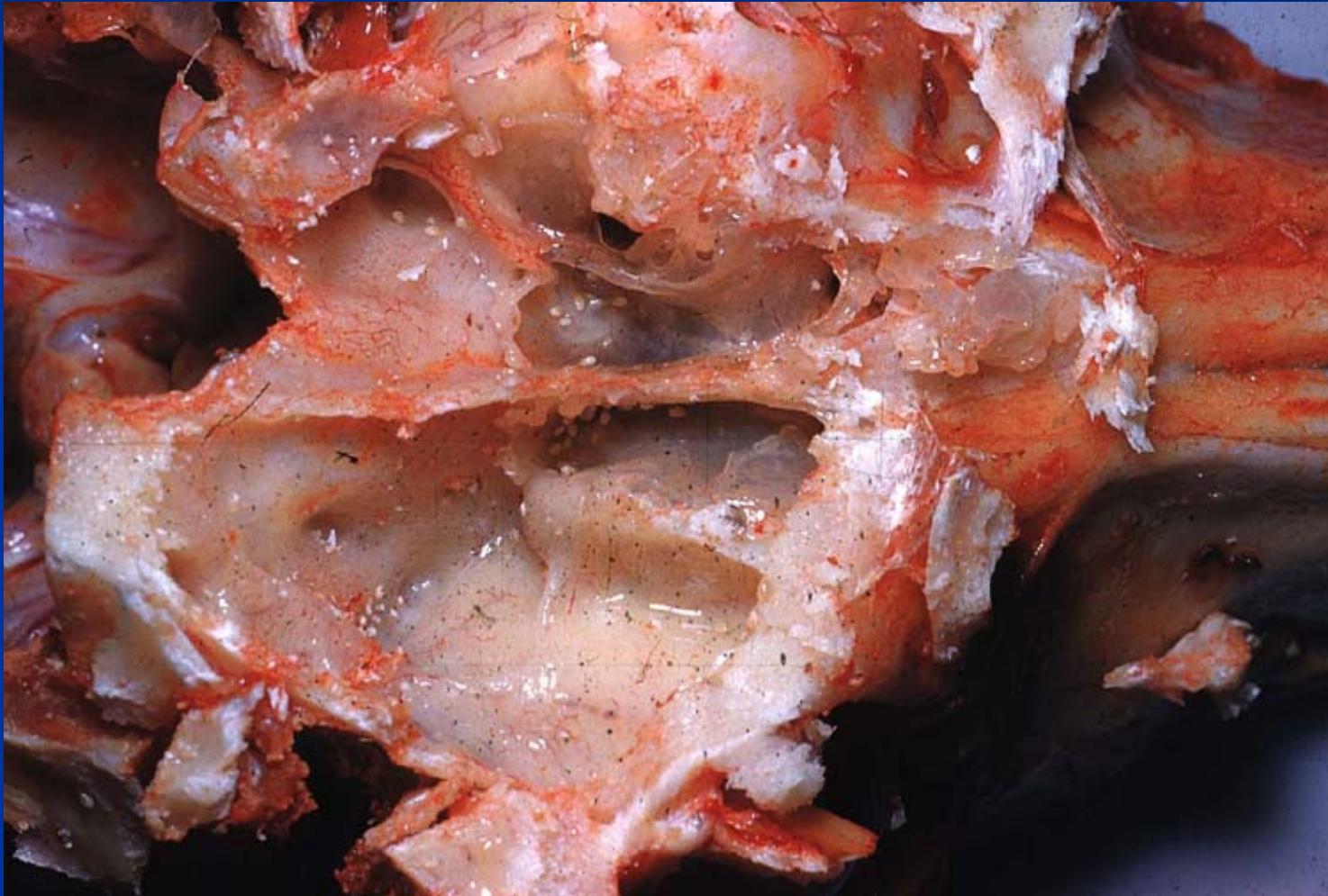
Cryptococcus spp - Special Stain- Mucicarmine



Parasitic Rhinitis

- *Pneumonyssoides caninum*
 - Nasal mites, occur worldwide in dogs
- *Cuterebra* sp. larvae - cats
- *Capillaria aerophila*
 - Occasionally in nose and sinuses
 - Generally in trachea and bronchi
- *Linguatula serrata*
 - Pentastomid, rare
 - Ingestion of uncooked ruminant meat
 - Nose, sometimes sinuses and middle ear

Pneumonyssoides caninum



Proliferative Lesions

Nasopharyngeal Polyps of Cats

- Exophytic, often pedunculated masses
- Nasopharynx and eustachian tubes
- Histopathology: inflammatory polyps



Neoplasia - Nasal Passages and Sinuses

■ General

- Invasive, epistaxis frequent, neurologic signs possible
- Frequently secondarily infected
- Carcinomas most common, then sarcomas

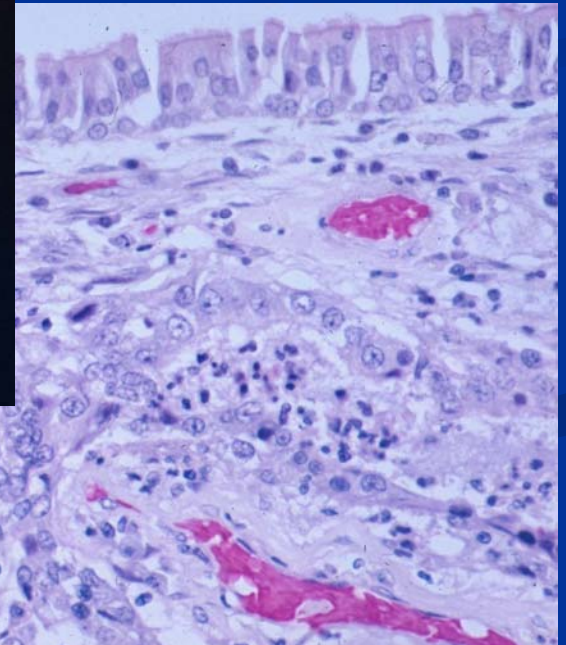
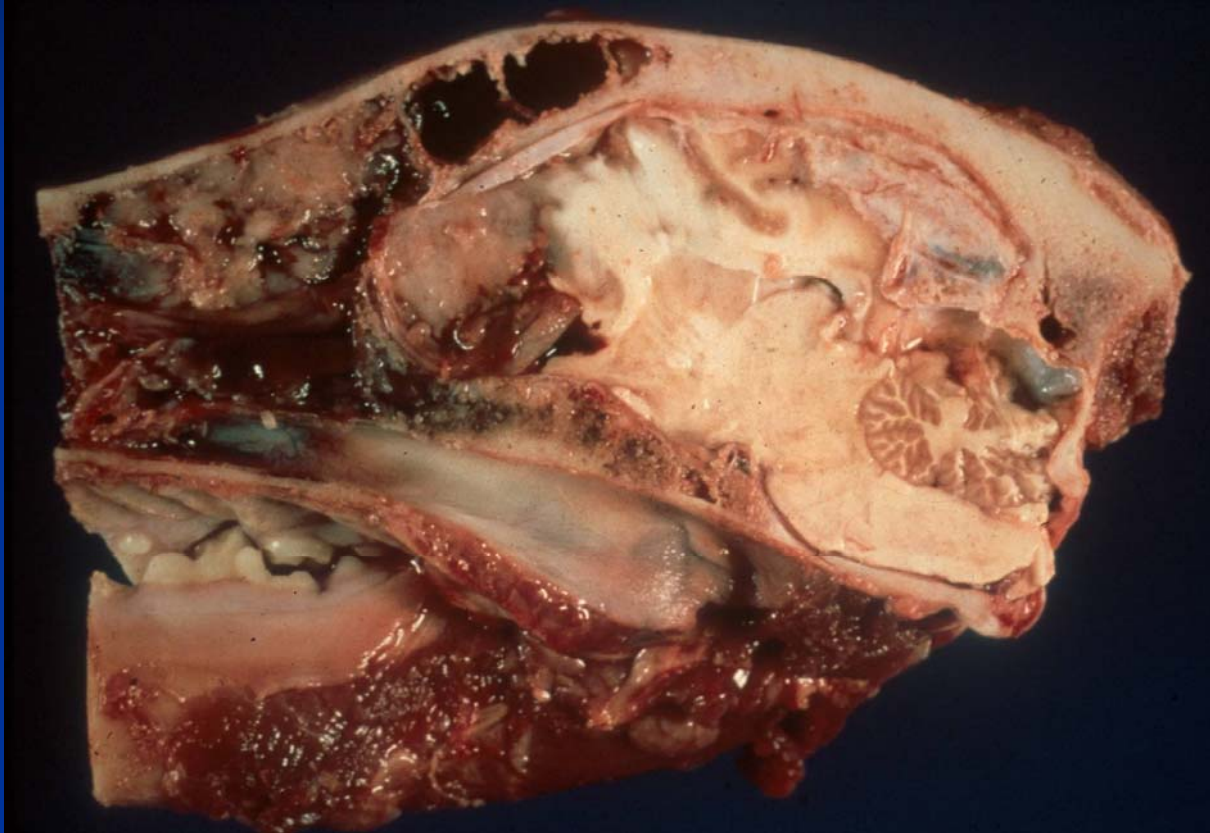
■ Dogs

- Transitional carcinoma most common, then adenocarcinoma
- Breed predisposition: Collies, Airedale terrier, basset hound, German Shepherd (Alsation)
- Location: nasal passages and sinuses
- Occasionally sarcoma

■ Cats

- Less commonly affected
- Squamous cell carcinoma most common

Neoplasia of the Nasal Passages



Airway Diseases

- Noninfectious – mainly dogs
 - Brachycephalic airway syndrome
 - Laryngeal paralysis/stenosis
 - Laryngeal edema
 - Tracheal hypoplasia, stenosis
 - Tracheal collapse
 - Bronchial dysplasia
 - Primary ciliary dyskinesia
 - Feline asthma
- Infectious
 - Canine infectious tracheobronchitis
 - Parasitic

Brachycephalic Airway Syndrome

- Brachycephalic dog breeds: e.g. bulldogs, boxers, Boston terriers, pugs, Pekingese
- Respiratory impairment due to stenotic external nostrils and excessive soft palate leading to obstruction of airflow
- Laryngeal and nasal edema can result
- Anesthesia risk
- Predisposes to heat stress

Laryngeal Edema

- Traumatic - chain/lead in dogs
- Brachycephalic airway syndrome
- Systemic anaphylaxis in cats
- Iatrogenic in both cats and dogs

Laryngeal Stenosis - Dog



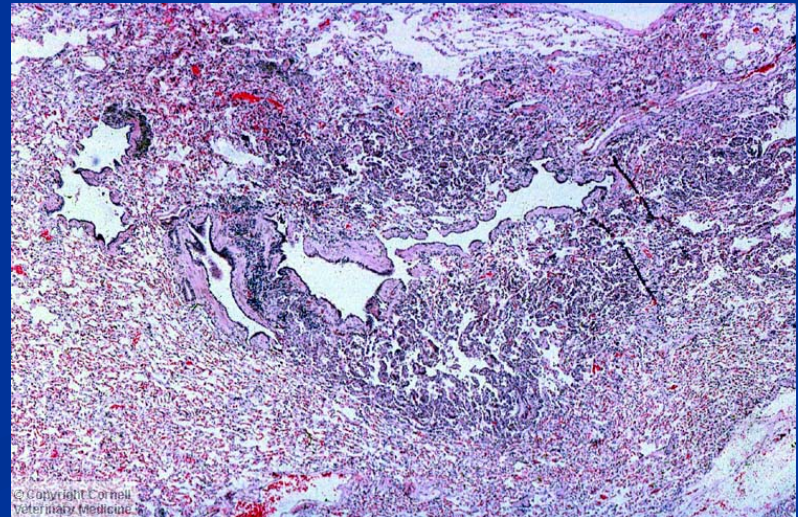
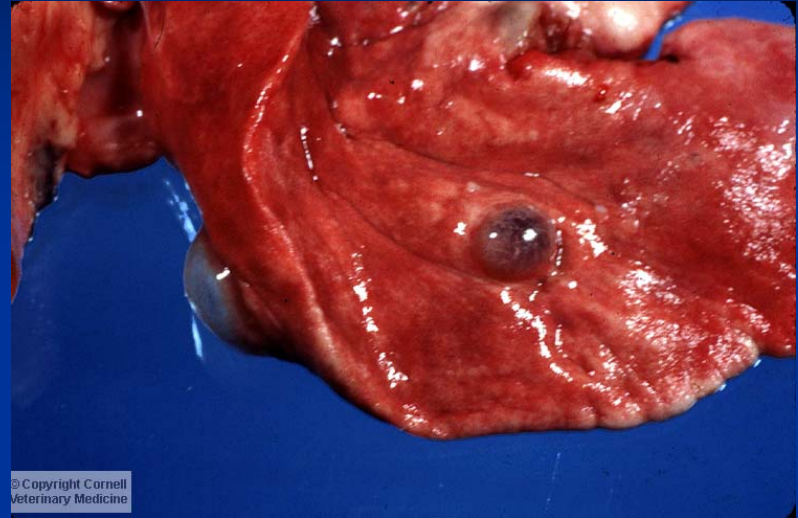
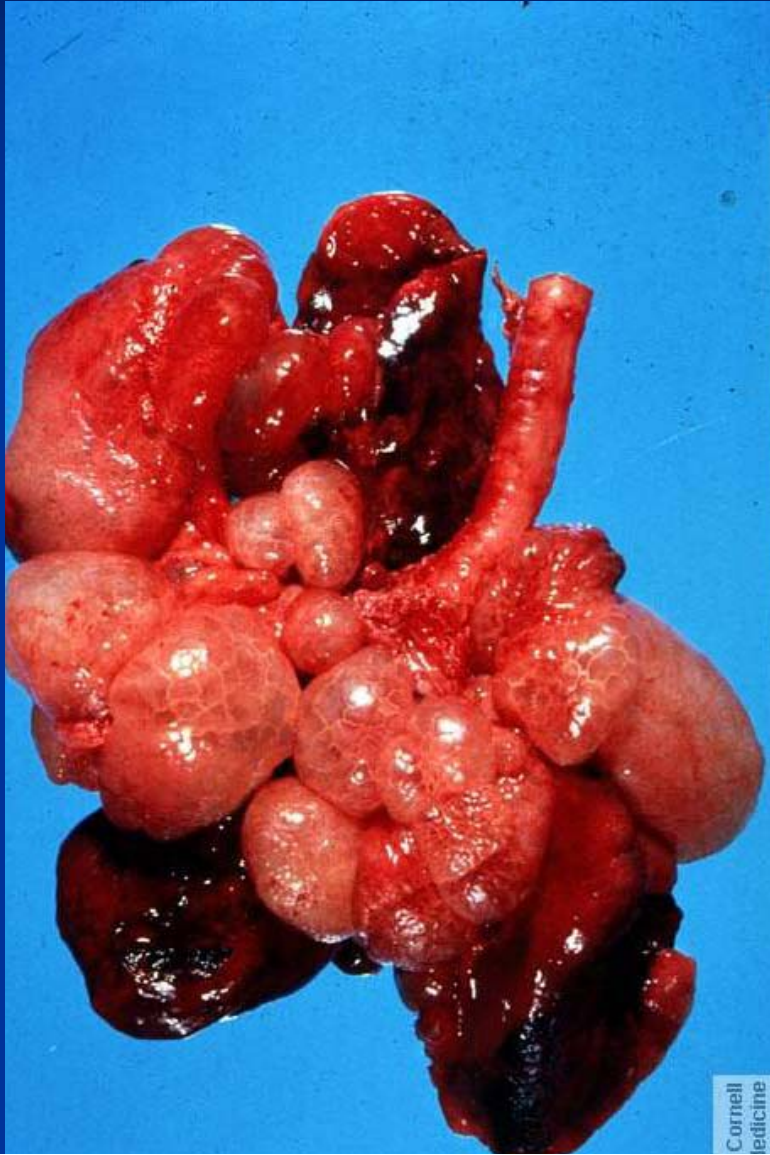
Tracheal Lesions in Dogs

- Tracheal hypoplasia – English bulldog and Boston terrier
- Tracheal/tracheobronchial collapse
 - Toy and miniature breeds
 - Dorsoventral flattening of the whole trachea with widening of dorsal tracheal membrane which can collapse
- Segmental tracheal collapse resulting in stenosis
 - Congenital or acquired

Tracheal Collapse - Dog



Bronchial Dysplasia –Afghan Hound



Primary Ciliary Dyskinesia in Dogs

- Immotile cilia syndrome
- Kartagener's syndrome has *situs inversus*
- Decreased mucociliary clearance leads to chronic infections – rhinitis, sinusitis, pneumonia - and bronchiectasis
- Also infertility due to sperm immotility
- Diagnosis by ultrastructural examination of ciliated epithelium (eg nasal biopsy)

Bronchiectasis Secondary to Primary Ciliary Dyskinesia

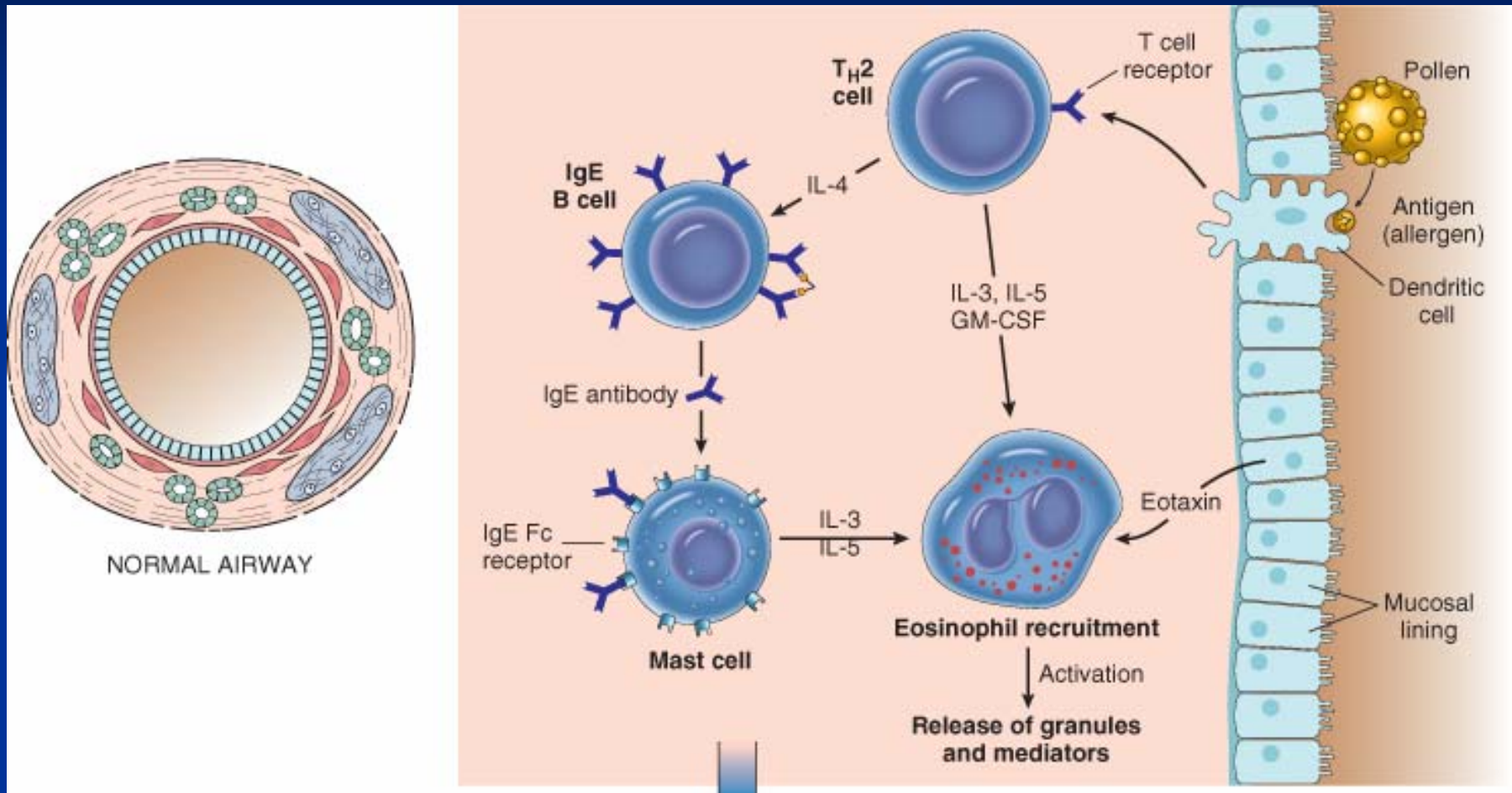


Feline Asthma

(Feline Allergic Bronchitis)

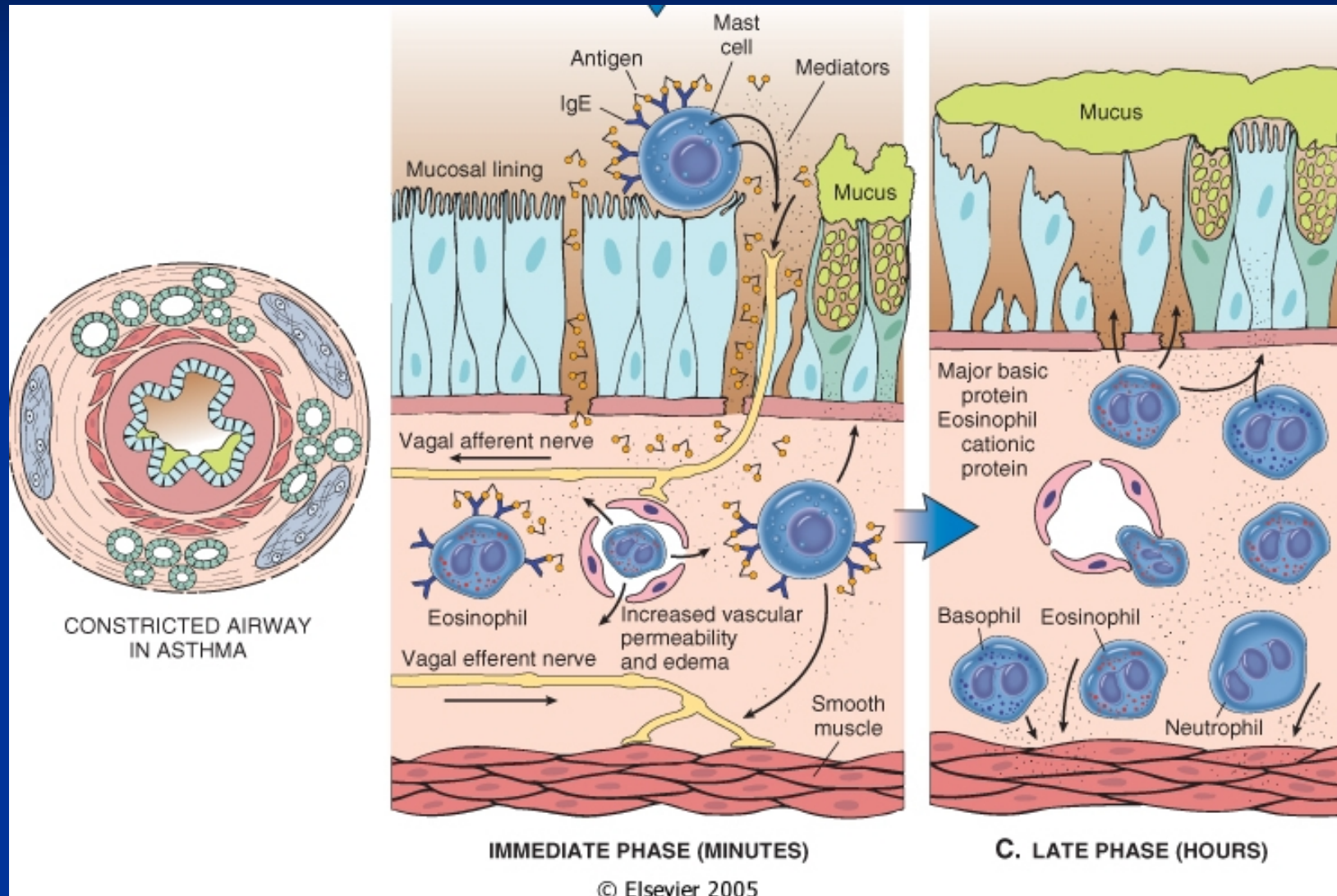
- Pathogenesis
 - Extrinsic -Type I hypersensitivity
 - ? Intrinsic
- Etiology: inhaled allergens, irritants, e.g. parasite proteins, cigarette smoke
- Leads to hyperreactivity
- Clinical signs
 - Recurrent cough and/or dyspnea
 - Wheezing due to reversible broncho-constriction
 - Generally well controlled with steroids, may need to remove from allergens

Sensitization to Allergen



From Kumar et al, 2005

Allergen-Triggered Asthma



Feline Asthma

- BAL cytology
 - Large number of eosinophils
 - Differentiate from parasitic migration (look for larvae at low magnification)
- Do dogs get this disease?

Feline Asthma

■ Pathology

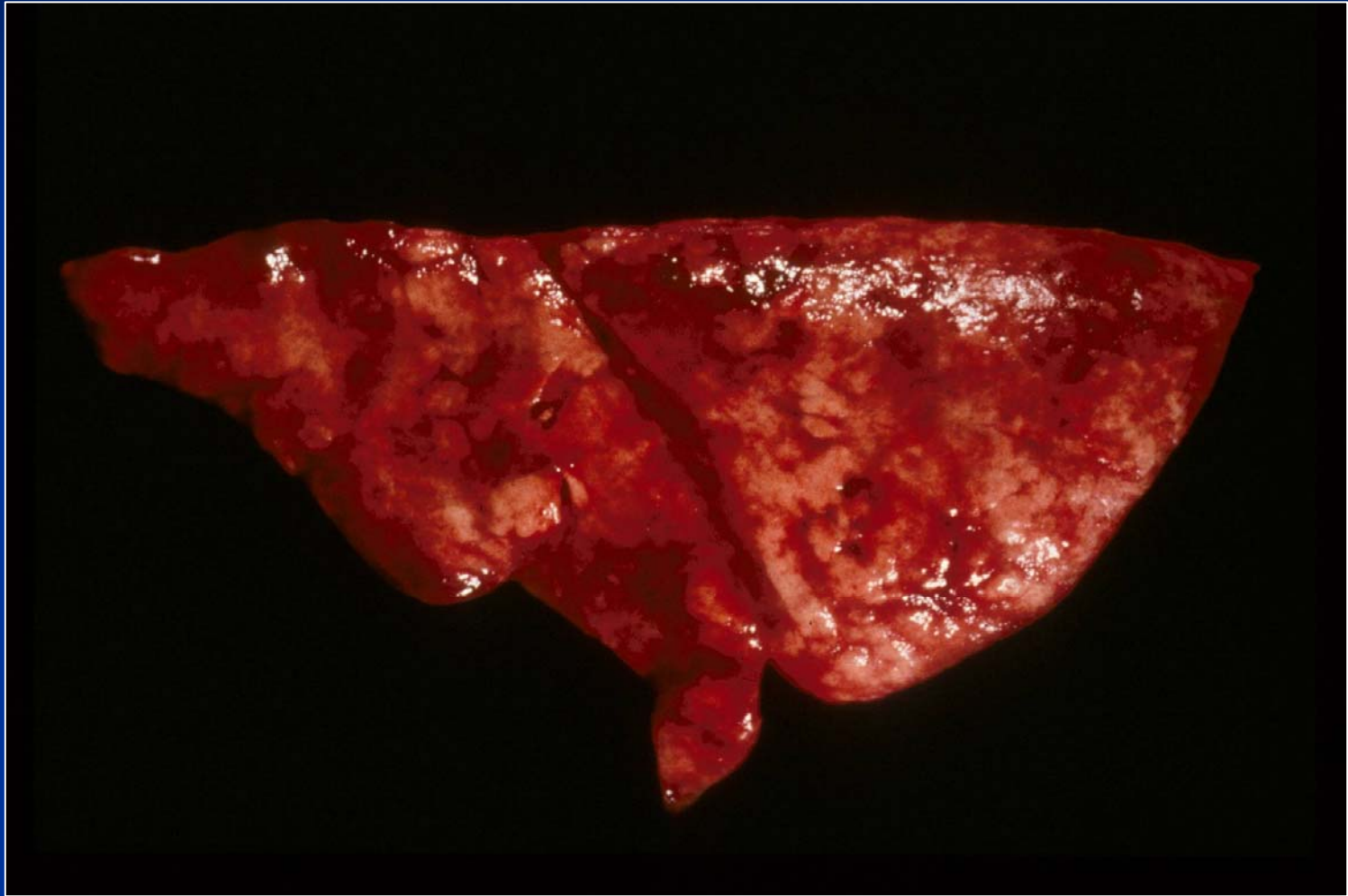
■ Gross

- Lungs do not collapse due to air trapping
- Mottled appearance

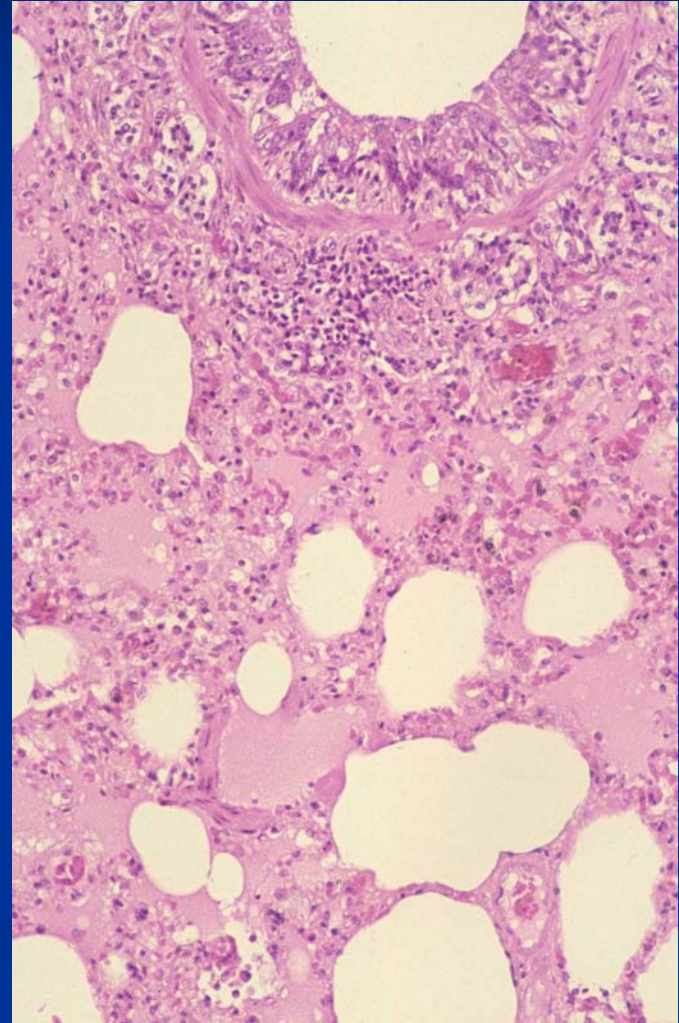
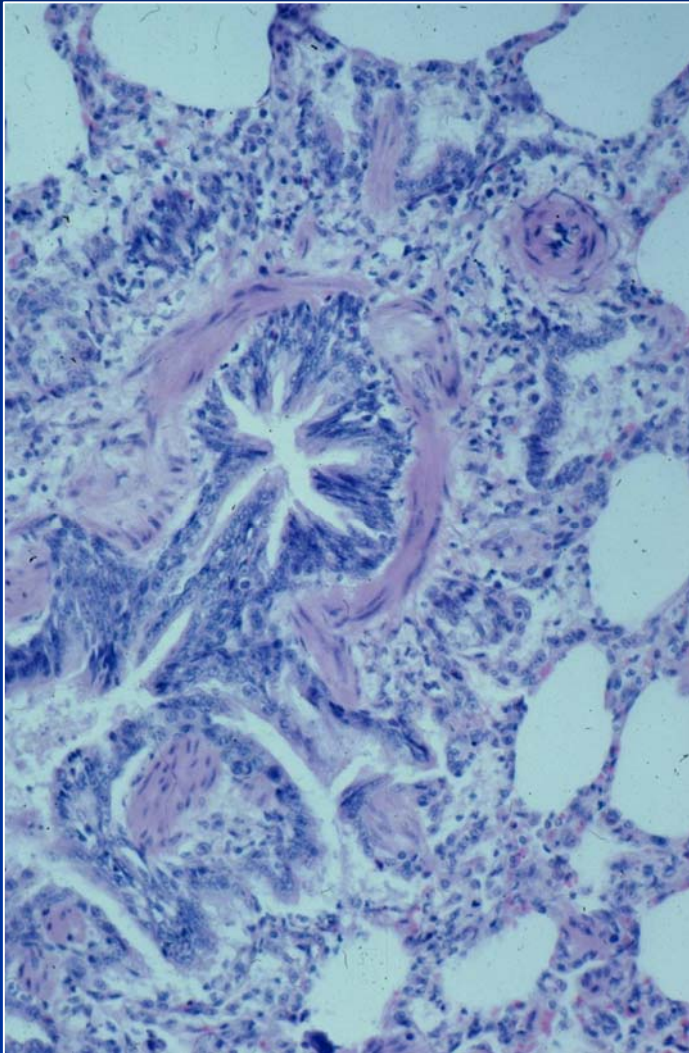
■ Histopathology

- Tissue eosinophilia, sometimes also blood eosinophilia
- Smooth muscle hyperplasia
- Bronchitis with excess mucus
- Edema

Feline Asthma



Feline Asthma



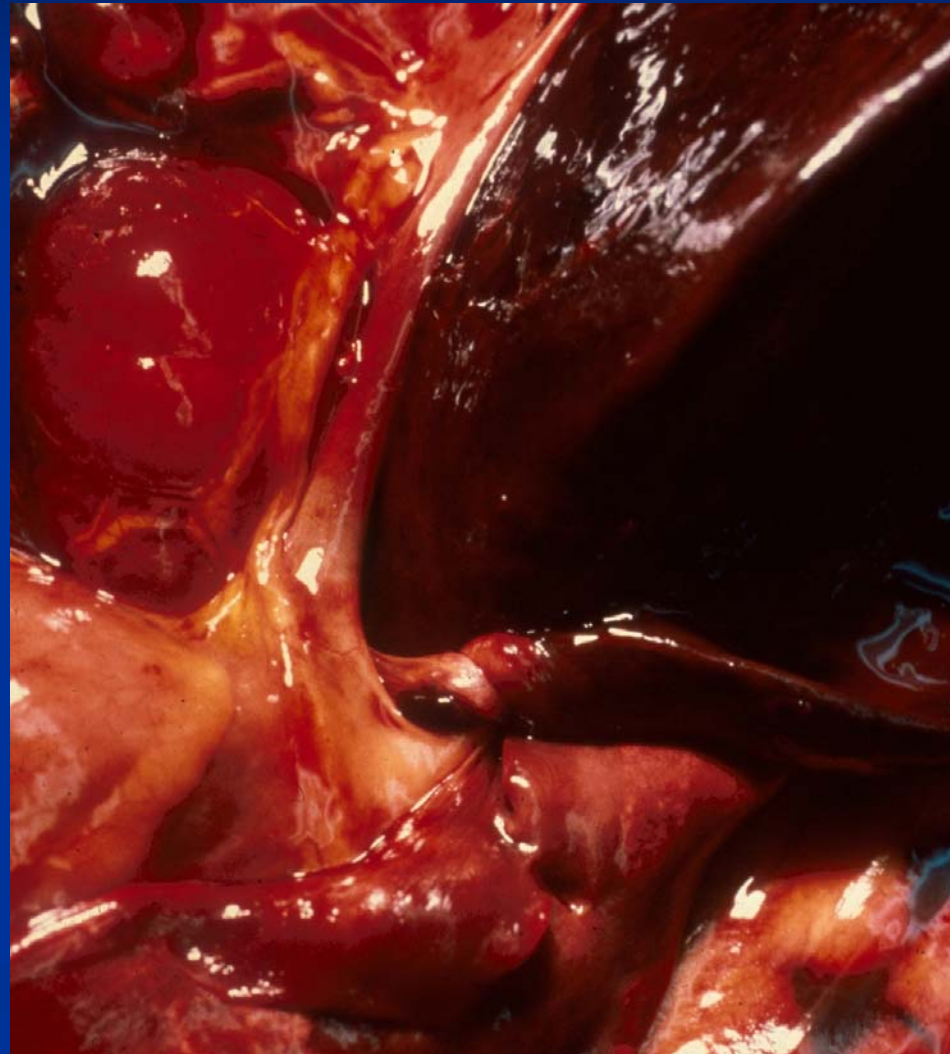
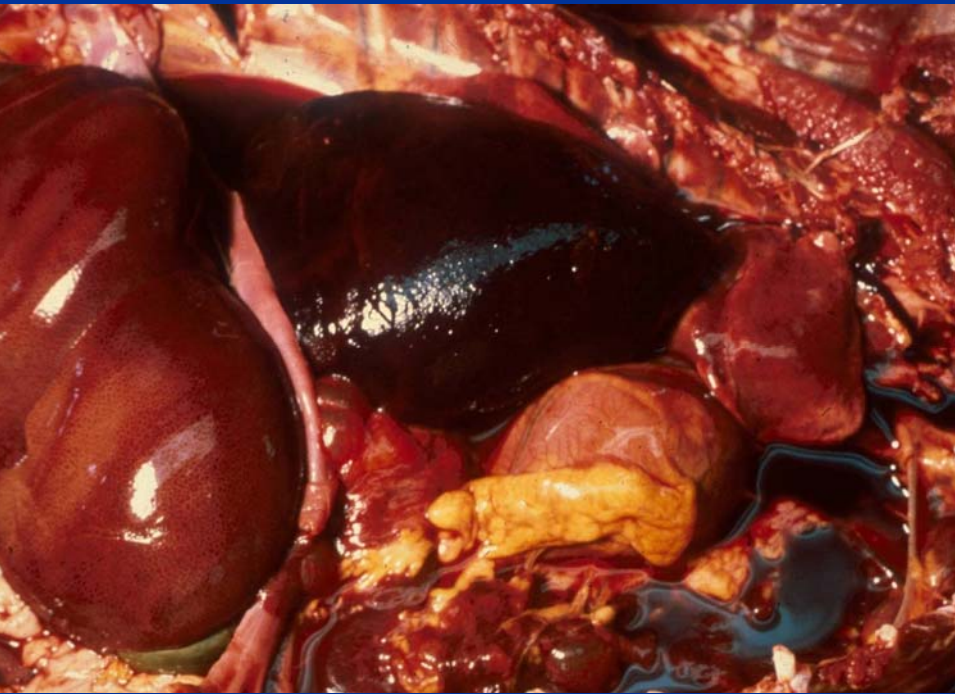
Lung Diseases

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Noninflammatory Lung Diseases

- Developmental anomalies
- Lung torsion
- Atelectasis
- Vascular lesions
- Pulmonary edema
- Mineralization

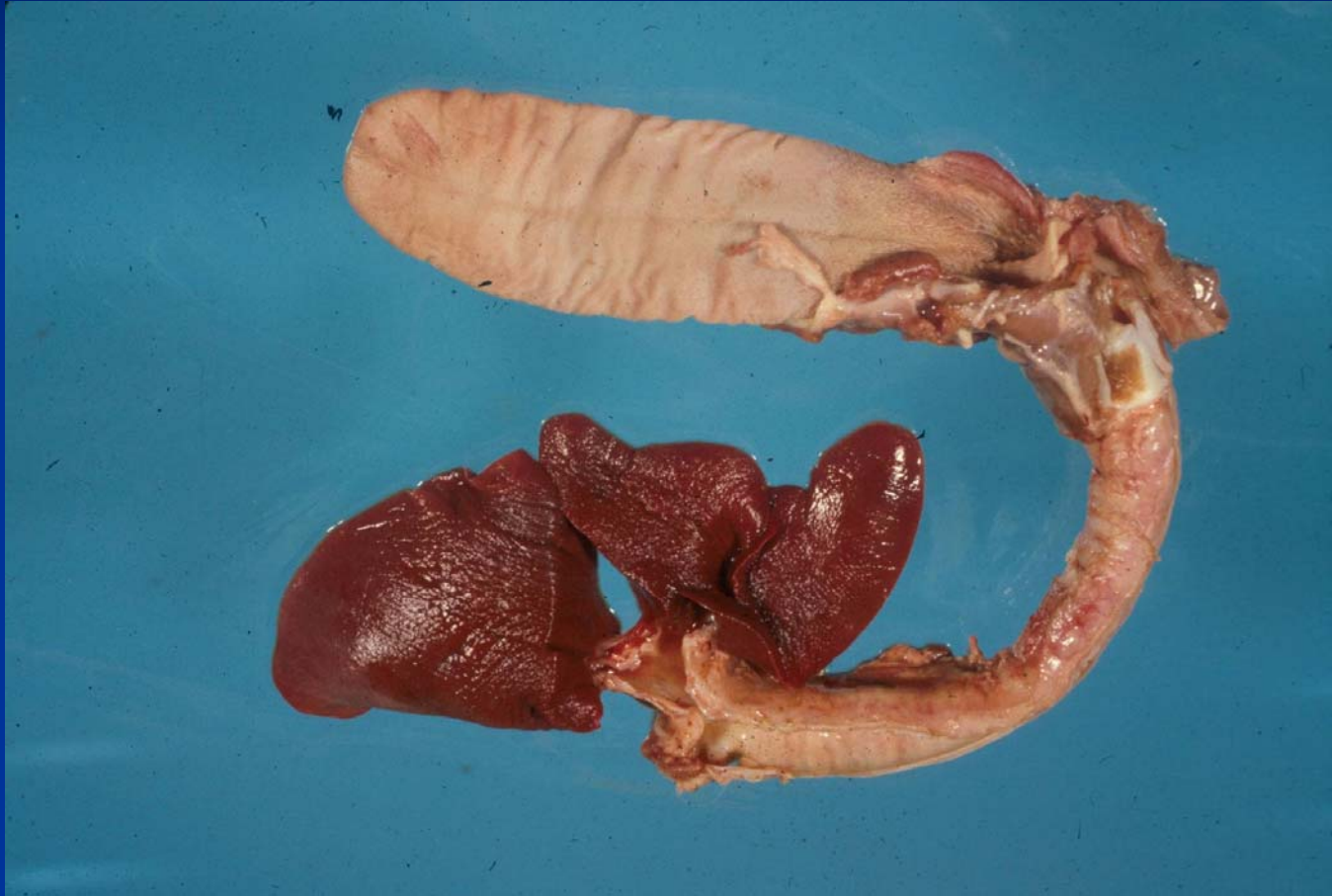
Lung Torsion in Dogs



Acquired Atelectasis

- Pneumothorax
- Prolonged anesthesia
- Hydro- or pyo- thorax
- Space occupying thoracic mass

Atelactasis - Dog



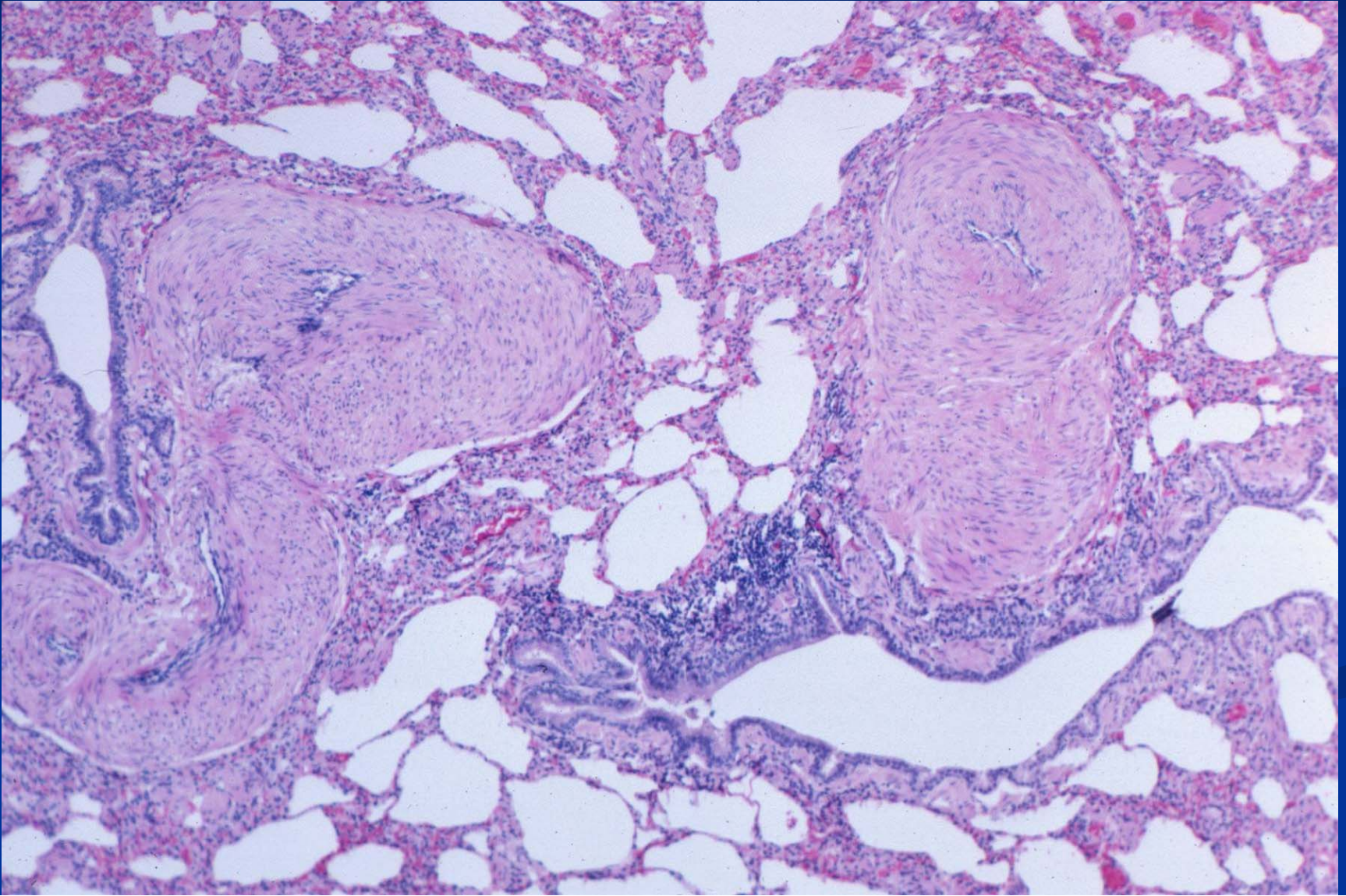
Vascular Lesions

- Thromboembolism
 - Hyperadrenocorticalism, hypothyroidism
 - Amyloidosis
 - Hypercoagulable states
 - Parasitic
- Infarction - rare
 - Secondary to dirofilariasis
 - Endarteritis and intimal hypertrophy
- Feline pulmonary arterial medial hypertrophy and hyperplasia

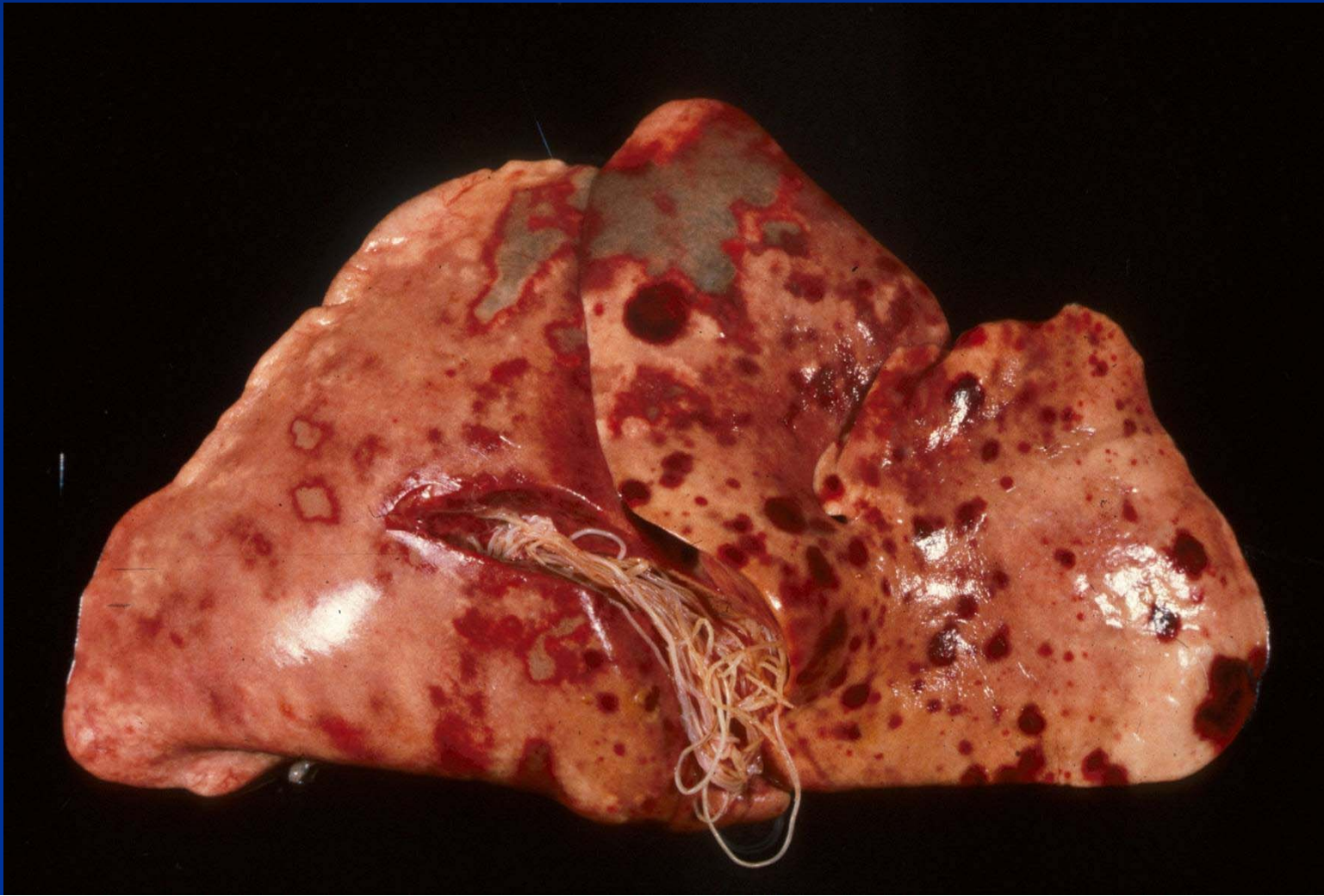
Feline Pulmonary Arterial Medial Hypertrophy and Hyperplasia

- Well recognized in the cat
- *Toxacara cati*
- *Aelurostrongylus abstrusus*
- Pathogen-free cats
- Pathogenesis
 - Migration of eosinophils
 - Pulmonary hypertension
 - Parasitic secretory or excretory products???

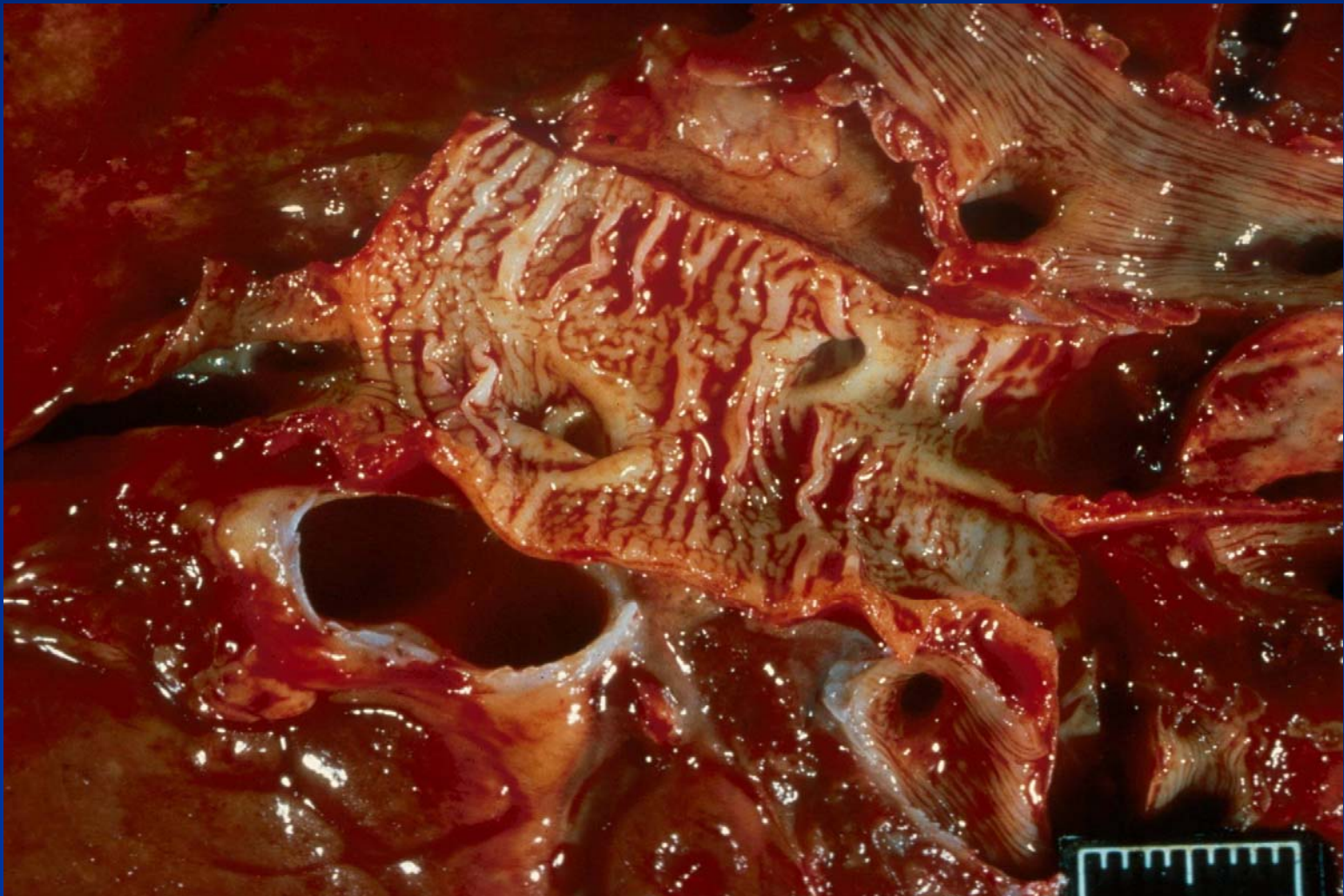
Arterial/Medial Hypertrophy in Cats



Infarcts Secondary to Dirofilariasis in the Dog



Intimal Hypertrophy Secondary to Dirofilariasis in the Dog



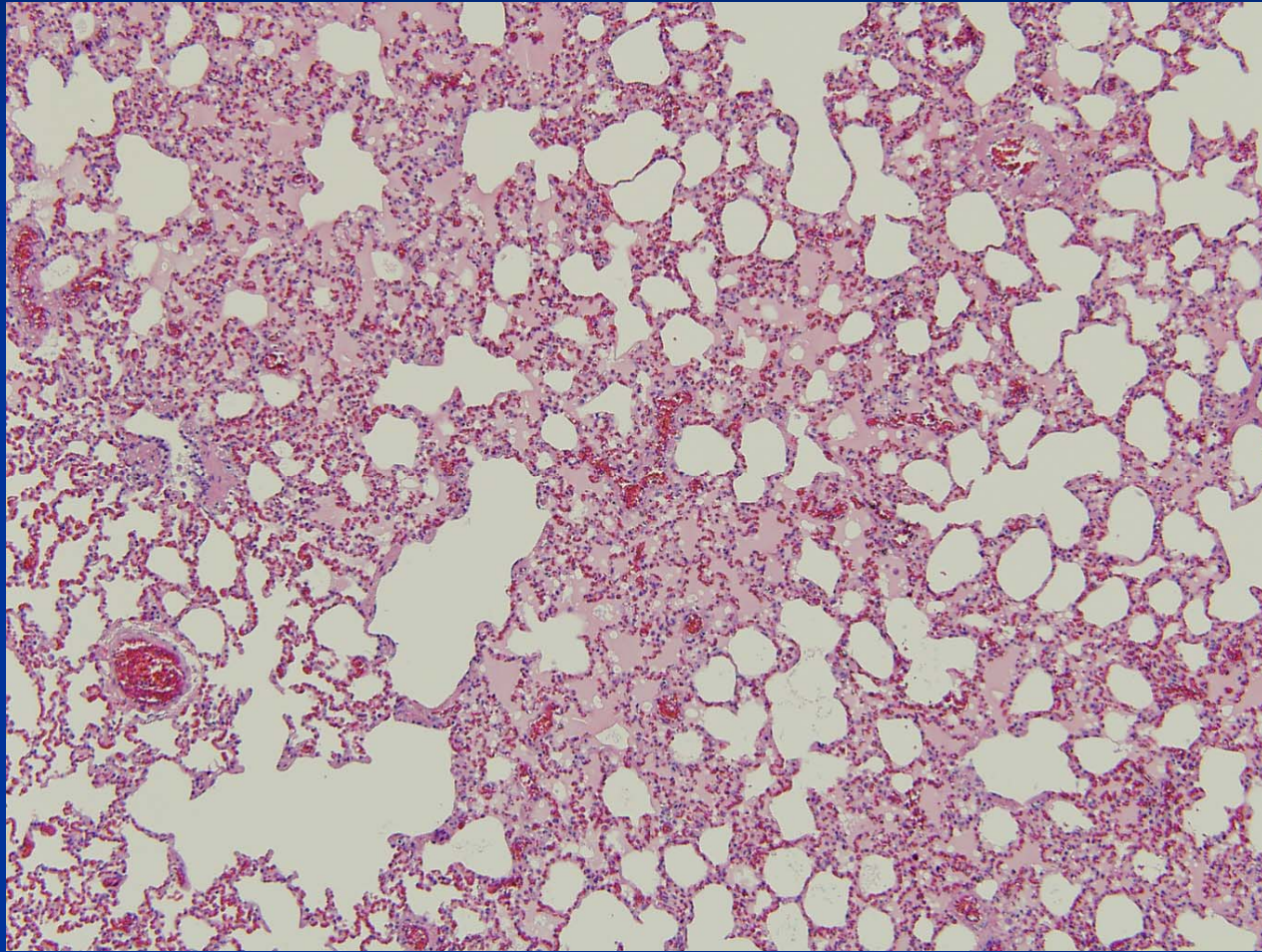
Pulmonary Edema

- Cardiogenic edema
 - Increased capillary hydrostatic pressure
 - Very common in both cats and dogs
- Decreased plasma oncotic pressure
 - Hepatic or renal disease
 - Protein losing enteropathy
 - Iatrogenic fluid overload

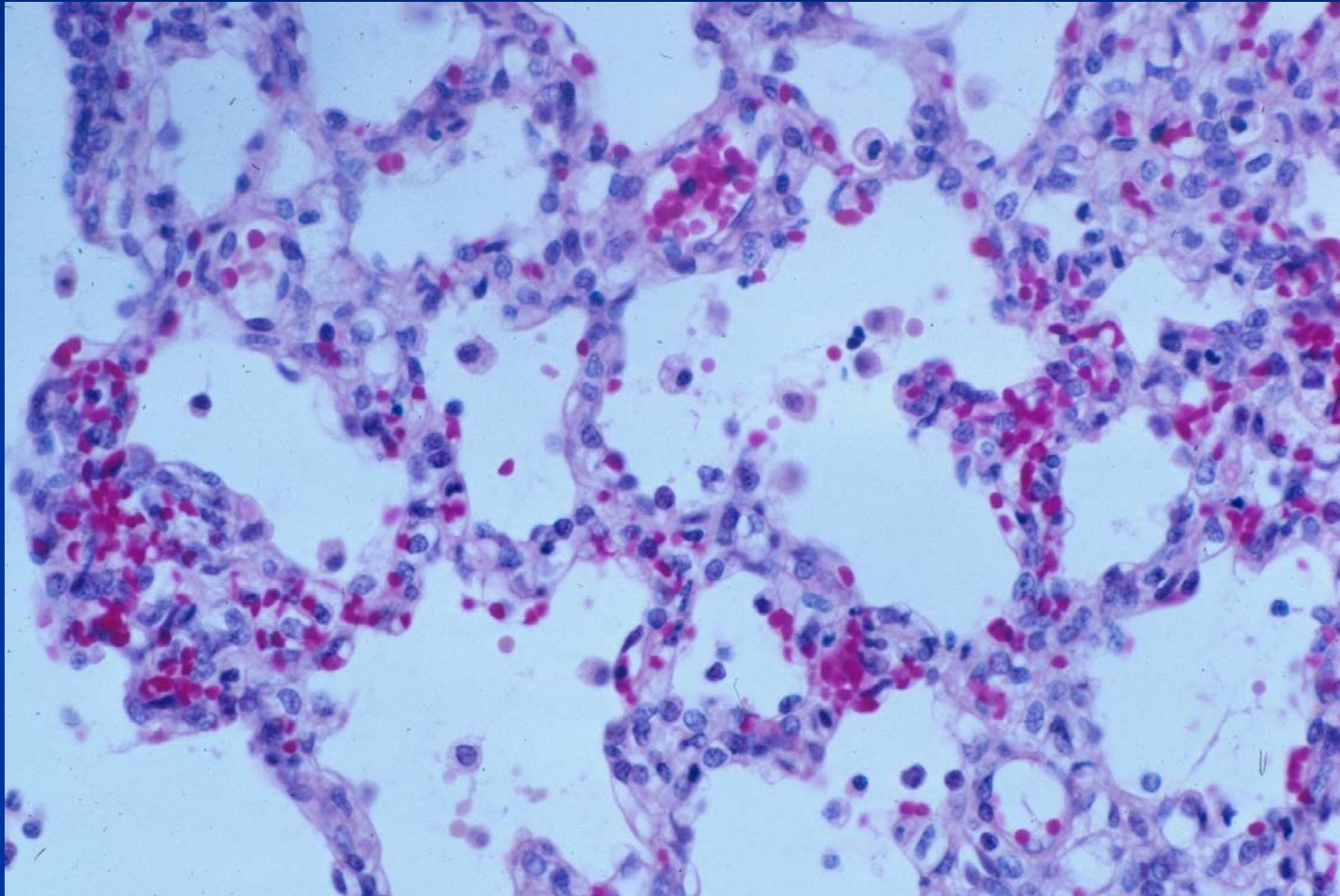
Pulmonary Edema

- Increased permeability of air-blood barrier
 - Airway obstruction
 - Infection
 - DIC
 - Toxic exposure e.g. smoke inhalation, acute paraquat

Cardiogenic Edema—Dog

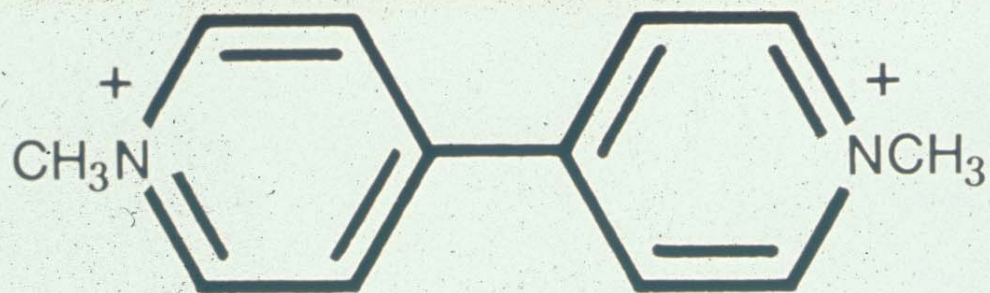


Cardiogenic Edema – Parvovirus in the Dog

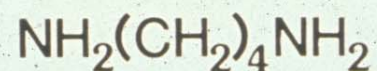


Pulmonary Toxicants

- Paraquat
 - Herbicide with selective uptake by lung
 - Edema, interstitial pneumonia (ARDS), fibrosis
- Vitamin D – mineralization
 - Cholecalciferol in rat bait
 - Excessive amounts in feed (accidental)
- Particulates – pneumoconiosis, fibrosis
- Aspirated material
- Uremia – mineralization



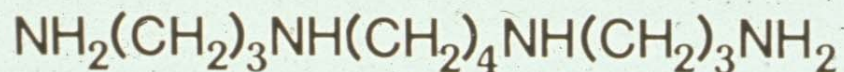
paraquat



putrescine



spermidine



spermine

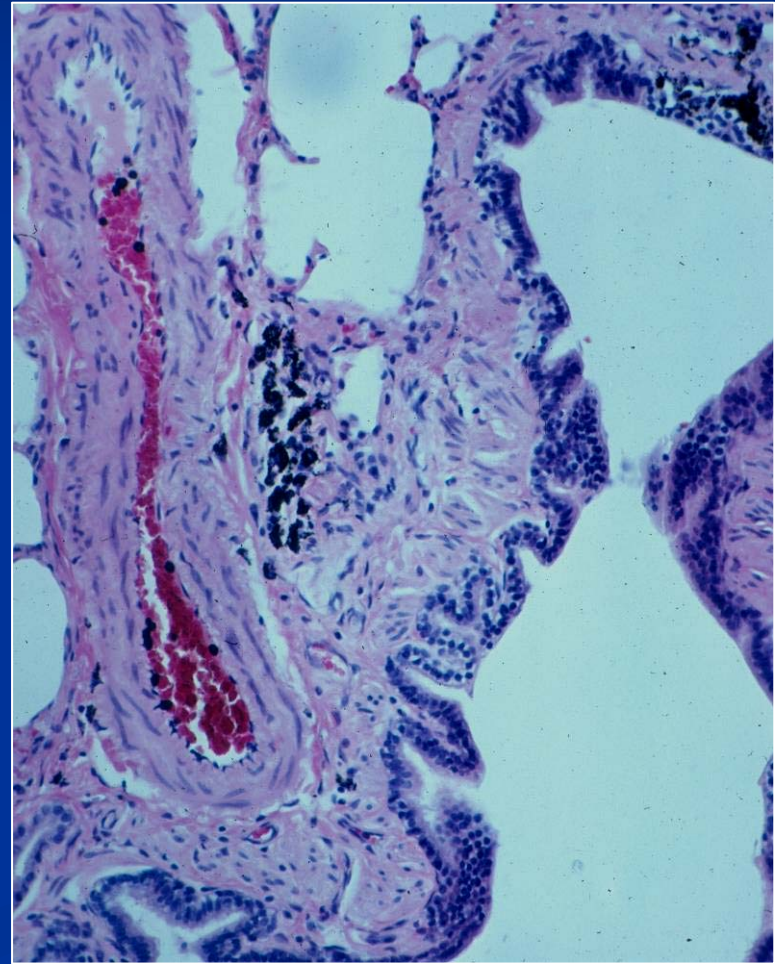
Pulmonary Mineralization

- Diffuse lesion (pumice lung)
 - Etiology
 - Uremia
 - Primary hyperparathyroidism
 - Hypercalcemia of malignancy
 - Vitamin D toxicosis
 - Cholecalciferol from rat bait
 - Excess in feed
 - Other organs affected
- Focal microlithiasis – especially aged dogs

Pneumoconiosis

- Anthracosis
 - Species: e.g. dogs, humans living in cities
 - Disease: benign accumulation of carbon
- Silicosis in carnivores in zoo exhibits

Anthracosis - Dog



Pleural Mineralization - Uremia in the Cat



Pulmonary Fibrosis

■ Etiology

■ Genetic

- Interstitial lung disease in West Highland White Terriers (WHWT) – new disease

■ Toxic

- Paraquat toxicity

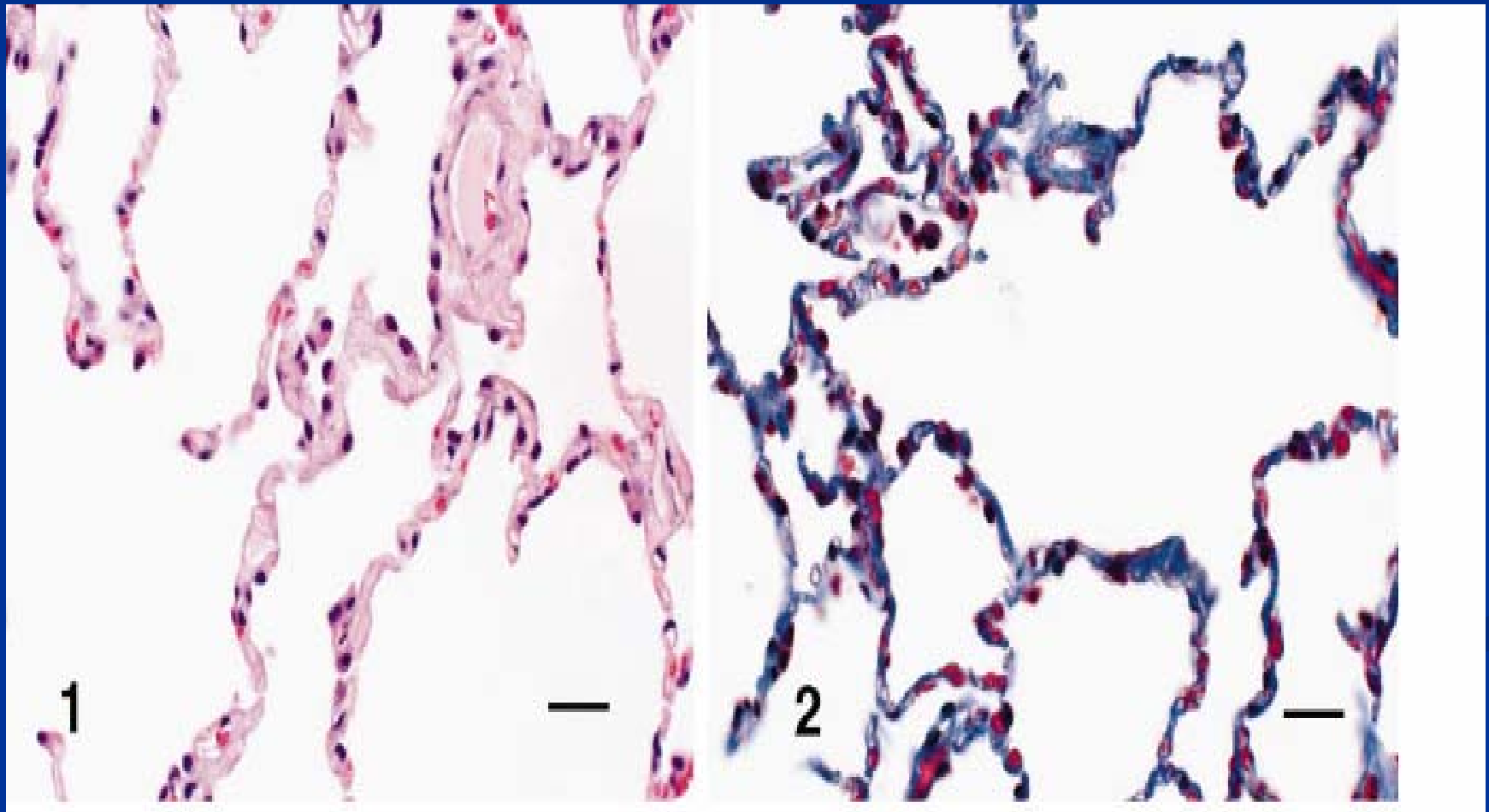
■ Idiopathic

- Spontaneous feline idiopathic pulmonary fibrosis – new disease

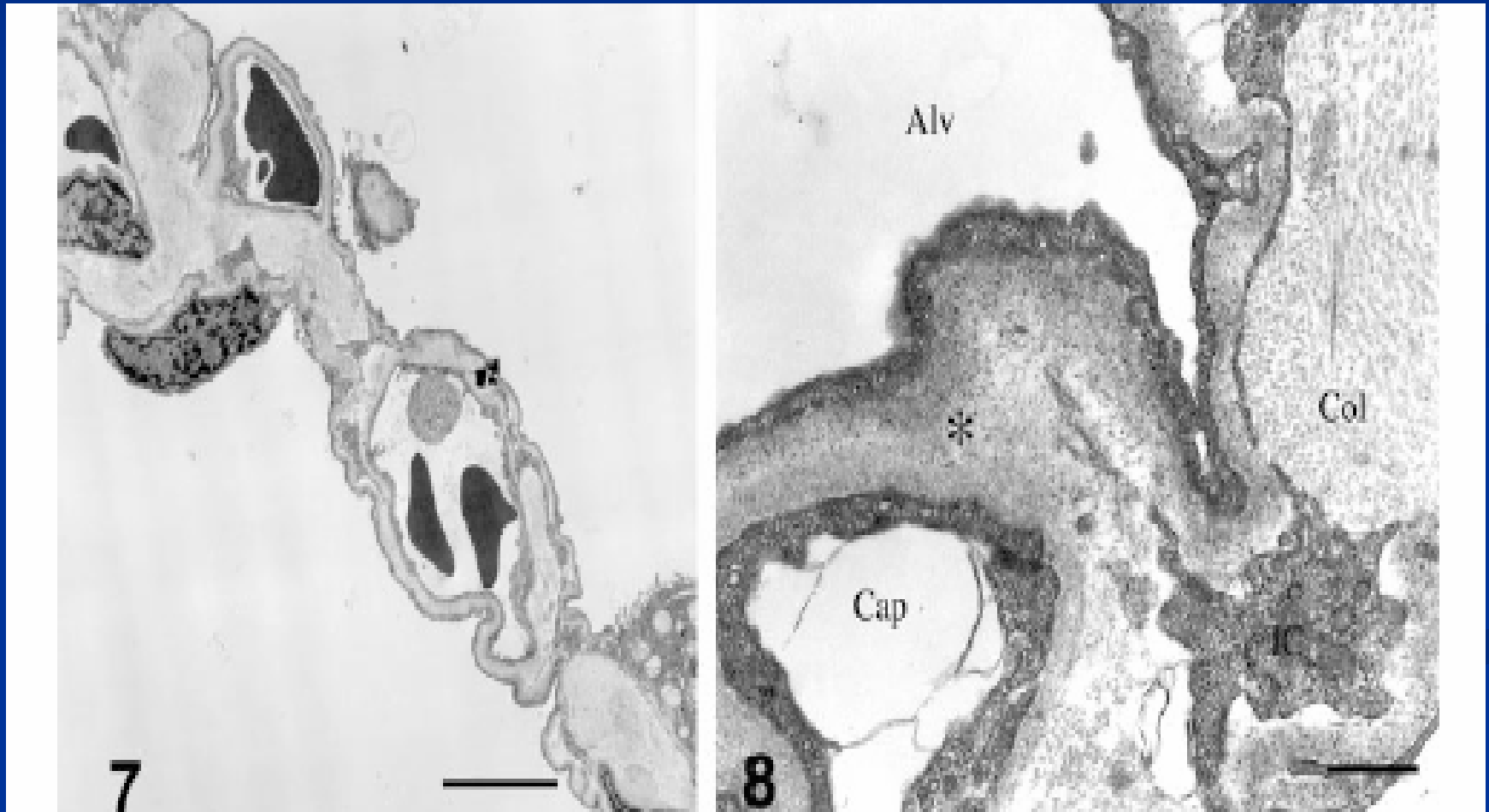
Interstitial Lung Disease of West Highland White Terriers

- Reported in > 6 yr WHWTs
- Interstitial fibrosis and increased basement membrane in alveolar walls
- Increase in type III collagen
- Mild mononuclear cell infiltration
- Norris et al., 2005. Vet Pathol 42: 35-41
- Proposed genetic disease

Interstitial Lung Disease of West Highland White Terriers (Norris et al, 2005)



Interstitial Lung Disease of West Highland White Terriers (Norris et al, 2005)



Spontaneous Feline Idiopathic Pulmonary Fibrosis (Williams et al., 2006)

- Proposed animal model of human idiopathic pulmonary fibrosis (16 cases, 2-13 yr old)
- Similar pathology to humans
- Interstitial fibrosis with fibroblast/myofibroblast foci
- Honeycombing with type II cell proliferation
- Alveolar interstitial smooth muscle metaplasia
- Possible defect in type II pneumocyte biology based on ultrastructure of lamellar bodies

Noninfectious Pneumonias of Cats

- Aspiration, especially hand fed kittens
- Exogenous lipid pneumonia
 - Mineral oil administration
- Endogenous lipid (lipoid) pneumonia – foam cell foci

Noninfectious Pneumonias of Cats (cont)

- Endogenous lipid (lipoid) pneumonia
 - Idiopathic
 - Gross: multiple firm white foci
 - Histo: accumulation of foamy lipid laden macrophages
 - Common in wild Felidae, Tasmanian devils

Endogenous
Lipid
Pneumonia —
Ferret

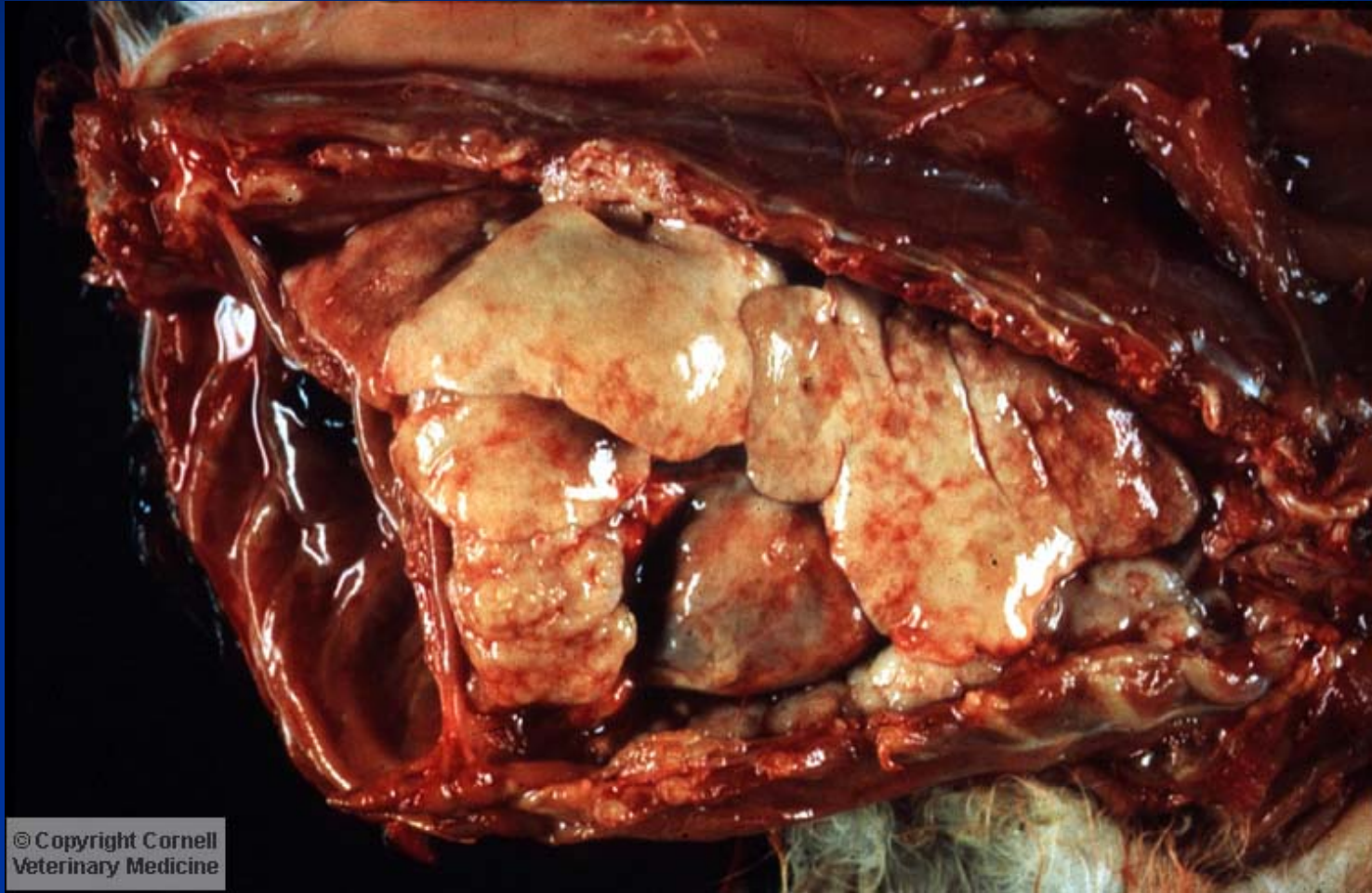


Aspiration Pneumonia

Dogs and Cats

- Low pH of gastric contents
- Etiology/predisposing factors
 - Improper force feeding - common in kittens
 - Megaesophagus - mainly in dogs
 - Cleft palate
 - Kerosine ingestion
 - Anesthesia
 - Iatrogenic

Exogenous Lipid Pneumonia—Cat



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Veterinary Medicine

Viral Rhinotracheitis

■ Dog

- None exclusively affecting nasal cavity or sinuses
- Mostly part of generalized respiratory disease e.g. distemper, adenovirus, influenza, canine herpes virus 1 (CHV-1)

■ Cat

- Feline Respiratory Disease Complex
- Secondary to immunosuppressive effects of feline retroviruses, FLV and FIV

Canine Infectious Tracheobronchitis

- Disease – common, contagious
 - Coughing exacerbated by exercise
 - High morbidity
- Etiology – often combination
 - Environmental factors
 - Viruses – esp. CAV-1 and -2, CPV
 - Bacteria – esp. *Bordetella bronchiseptica*
- Possible sequella
 - Predisposition to bronchopneumonia

Infectious Respiratory Disease in Dogs

■ Viral

- Canine herpesvirus I
- Canine distemper virus - morbillivirus
- Adenovirus
- Influenza A – mutation from equine strain

■ Bacterial

- *Bordetella bronchiseptica*

■ Mycotic

- Blastomycoses

■ Protozoal

- Toxoplasmosis

Feline Respiratory Disease Complex

- High morbidity, URT signs and conjunctivitis
- Predispose to secondary bacterial pneumonia
- Feline viral rhinotracheitis – herpes virus
- Feline calicivirus

Other agents that can cause mild bronchointerstitial pneumonia, occasionally

Feline chlamydiosis -
Chlamydophila felis (psittaci)
Mycoplasma felis



Viral Respiratory Diseases of Cats

- Feline viral rhinotracheitis – herpes virus
- Feline calicivirus
- Feline infectious peritonitis (FIP) – vasculitis, pleuritis
- Avian influenza – domestic and wild felids
- Cats very susceptible to experimental infection with Hendra virus
- Nippah virus

Feline Viral Rhinotracheitis

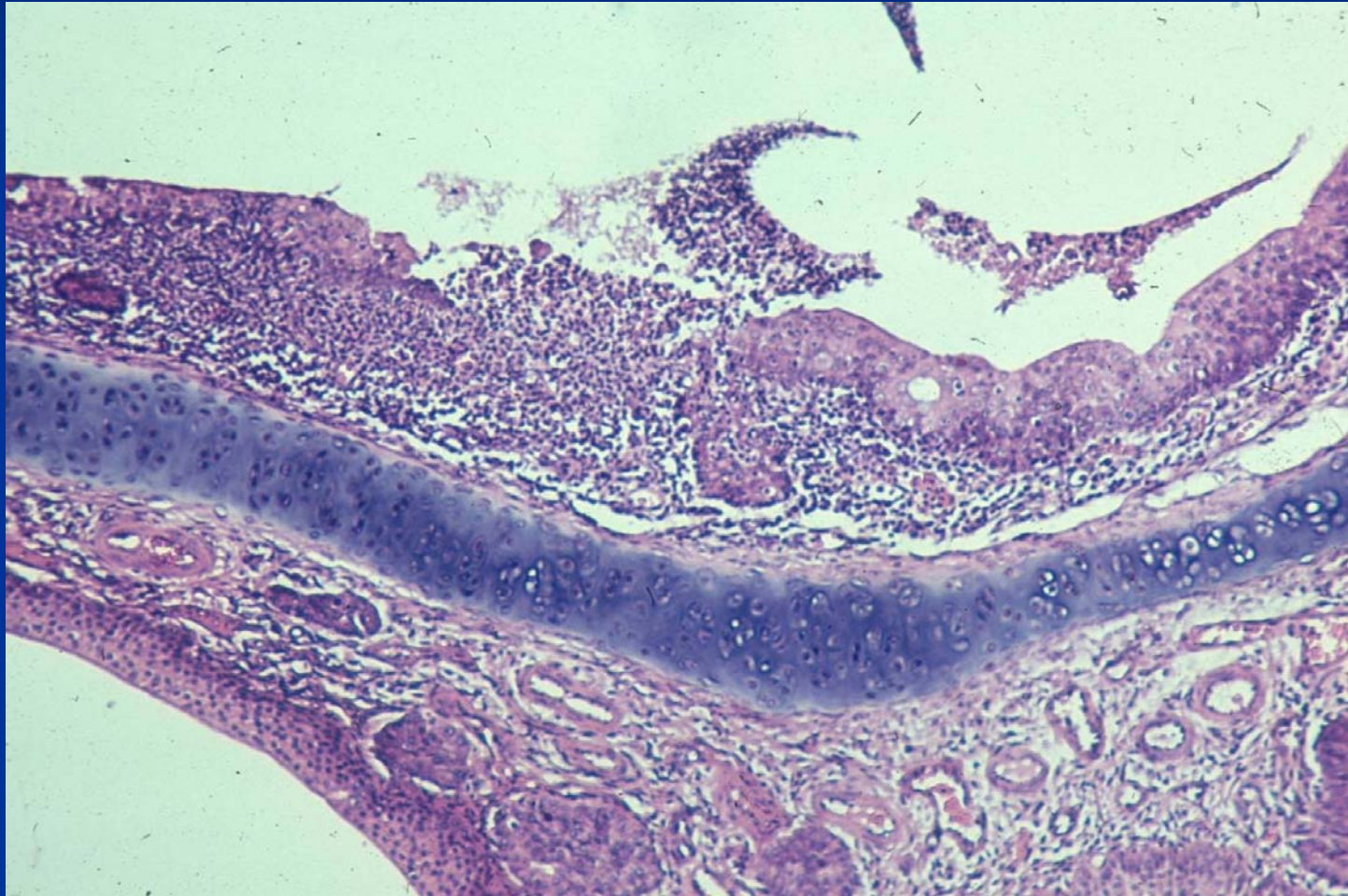
- Feline herpesvirus 1 (FHV-1)
- Common, worldwide disease
- Domestic and exotic felids
- Age – mainly kittens
- Clinical signs
 - Typical URT signs
 - Fever
 - Conjunctival discharge
- Lesions are reversible
- Predisposes to secondary bacterial pneumonia

Feline Viral Rhinotracheitis

■ Lesions

- Ulcerative rhinitis, conjunctivitis and pharyngitis
- Rarely see INIB
- Secondary bacterial infection and pneumonia
- Ulcerative keratitis, hepatic necrosis, emaciation
- Abortion and stillbirths
- Proliferative and ulcerative dermatitis of nose and front legs with INIB – domestic cats and cheetahs

Feline Viral Rhinotracheitis



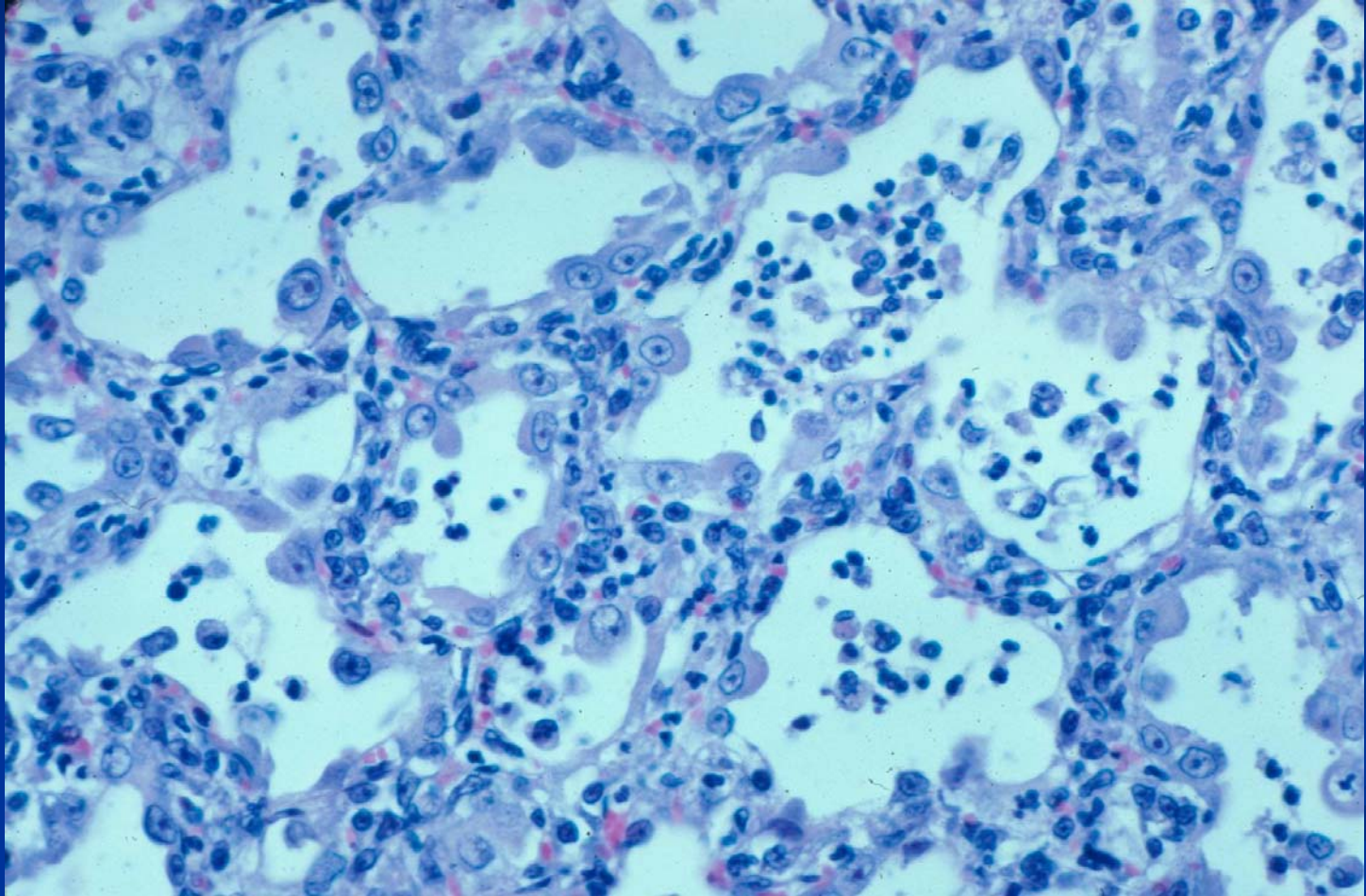
Herpes Virus Pneumonia—Cat



Feline Calicivirus

- Virulence varies by strain
- Domestic and exotic felids
- Oral ulceration in addition to URT signs
- Can have high mortality e.g. up to 50% with febrile hemorrhagic syndrome
- Pathology
 - Necrotizing bronchiolitis
 - Interstitial pneumonia
 - Secondary bacterial pneumonia

Feline Calicivirus



Viral Respiratory Disease in Dogs

- Canine herpesvirus I
- Canine distemper virus - morbillivirus
- Canine adenovirus 1 and 2
- Influenza A – mutation from equine strain
- Avian influenza

Canine Herpesvirus

- Canine herpesvirus 1 (CHV-1)
- Newborns (“fading puppy syndrome”)
 - Hypothermia
 - Generalized disease with renal hemorrhage
- Adults (rarely clinical disease)
 - Necrotizing rhinotracheitis
 - Secondary bronchopneumonia
 - Reactivation with placental transmission resulting in abortion and stillbirths

Canine Distemper Virus (CDV)

- Canidae, foxes, wild Felidae, Mustelidae (mink, ferret), Procyonidae (raccoons)
- Morbillivirus (Family Paramyxoviridae)
- Inhaled – lymph node proliferative - viremia
- Pantropic, mainly epithelial cells with immune suppression (down regulates cytokine production)

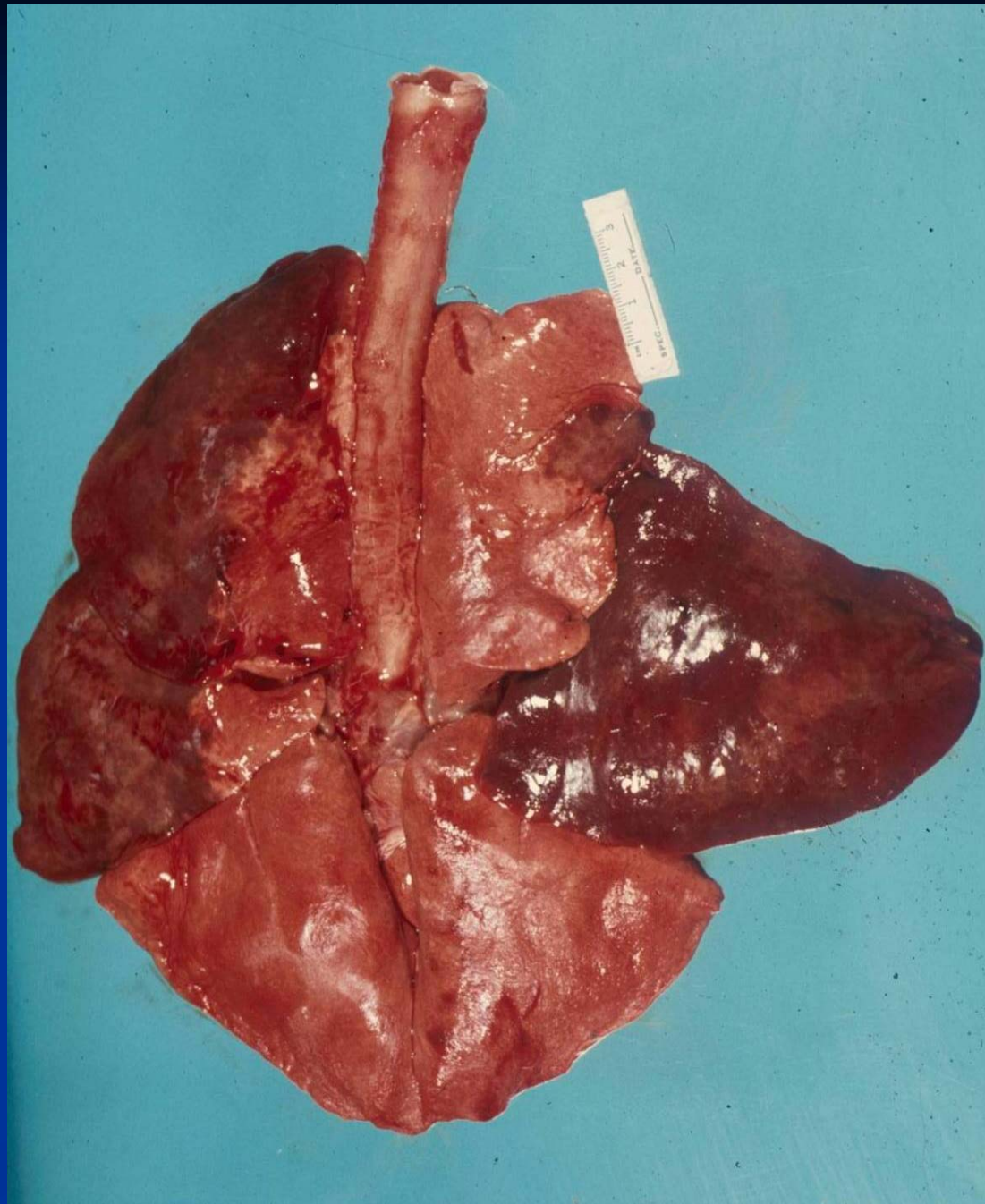
Canine Distemper Virus (CDV)

- Clinical signs in typical disease –fever, oculonasal discharge, diarrhea, skin papules, nervous signs
- Pathology
 - Mucopurulent rhinotracheitis
 - Bronchointerstitial pneumonia, secondary bronchopneumonia
 - Encephalomyelitis
 - Enamel hypoplasia (teeth)
 - Hyperkeratosis of foot pads

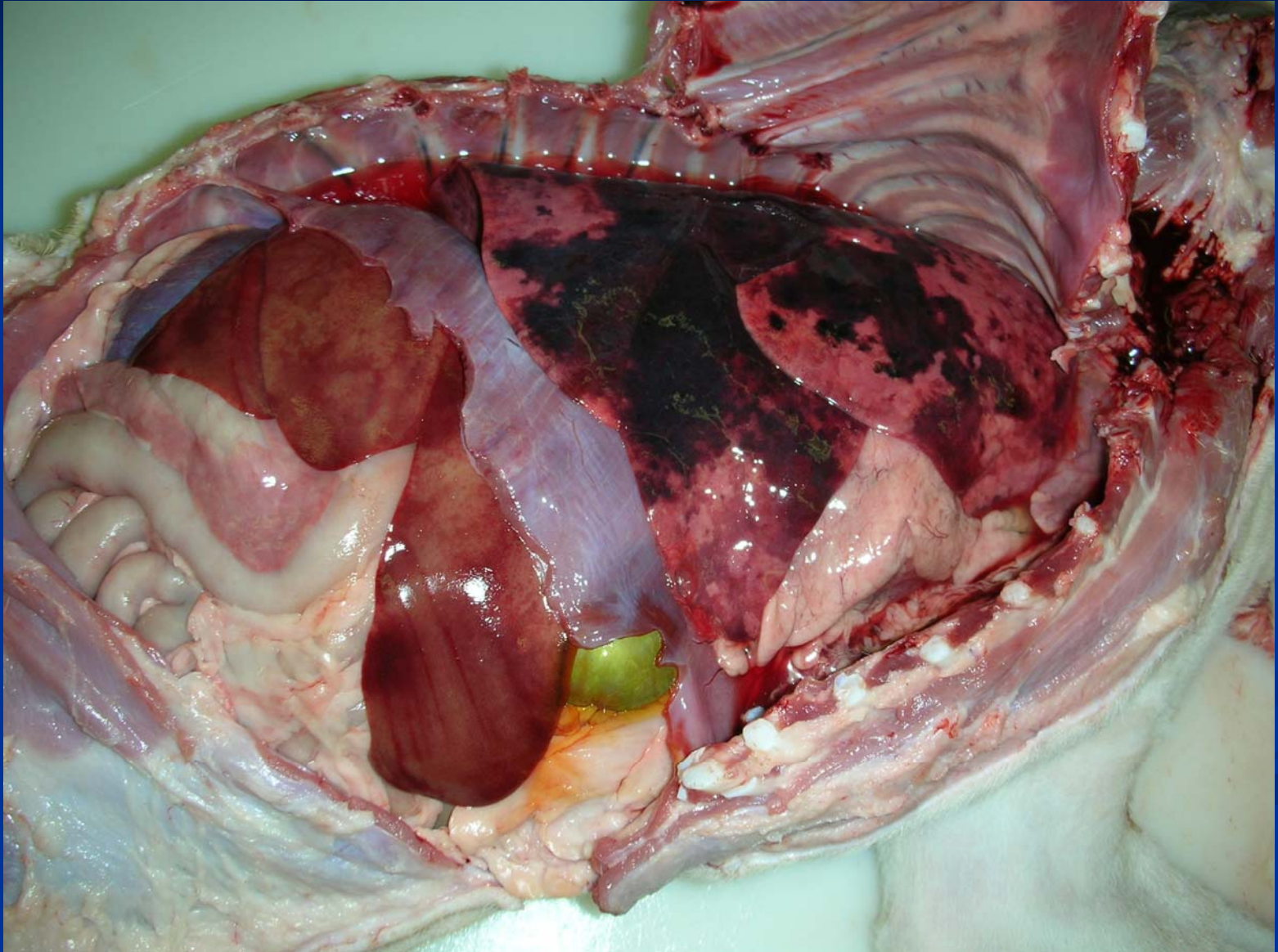
Canine Distemper Virus

- Other disease manifestations
 - Abortion, weak pups, neurologic disease in infected newborns
 - Neonatal disease
 - Thymic atrophy, necrotizing encephalitis
 - New reports of severe interstitial pneumonia with hemorrhages but no inclusion bodies

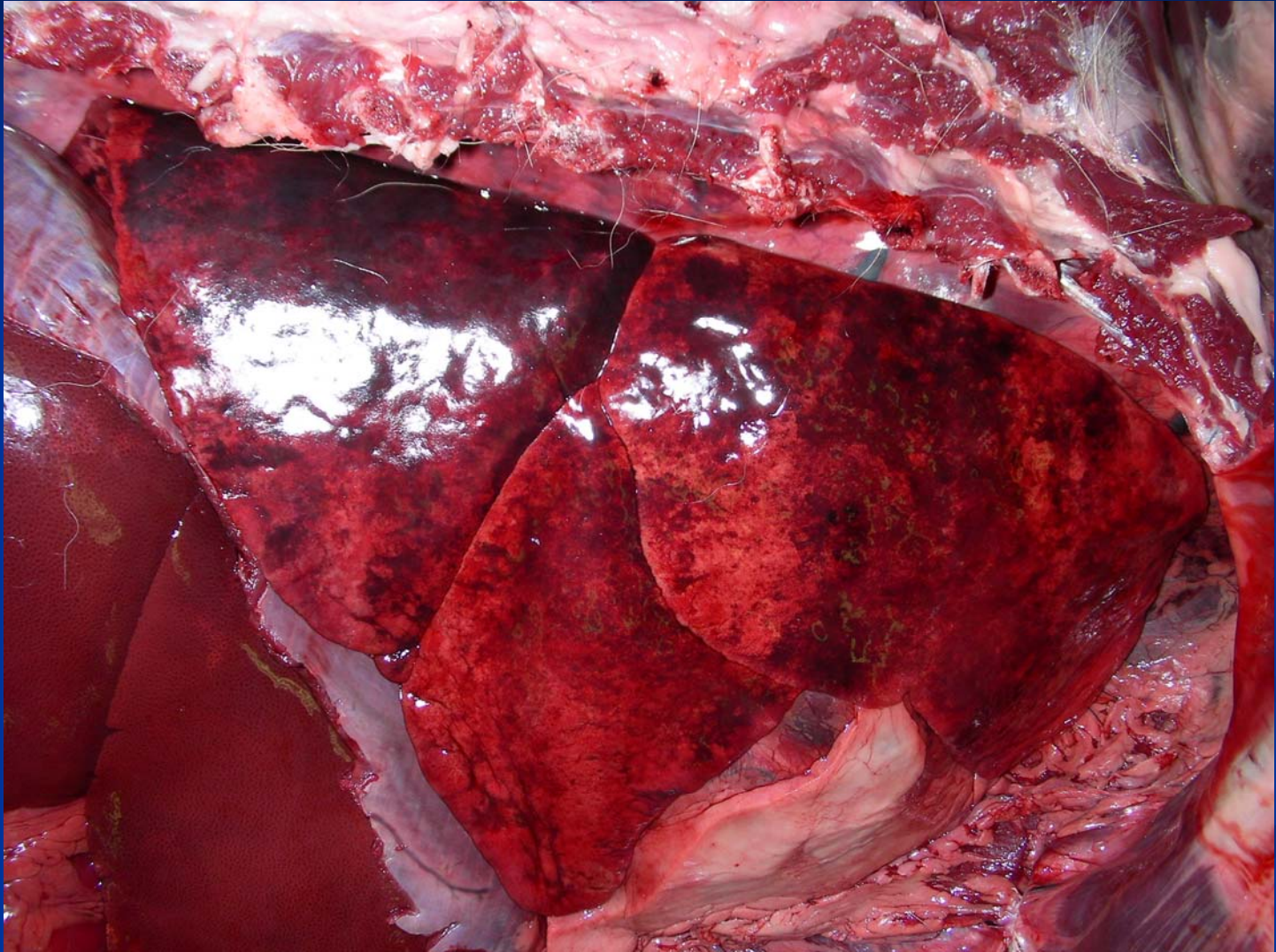
Canine
Distemper
with
Secondary
Bacterial
Infection
(anteroventral
bronchopneu-
monia)



Canine Distemper



Canine Distemper

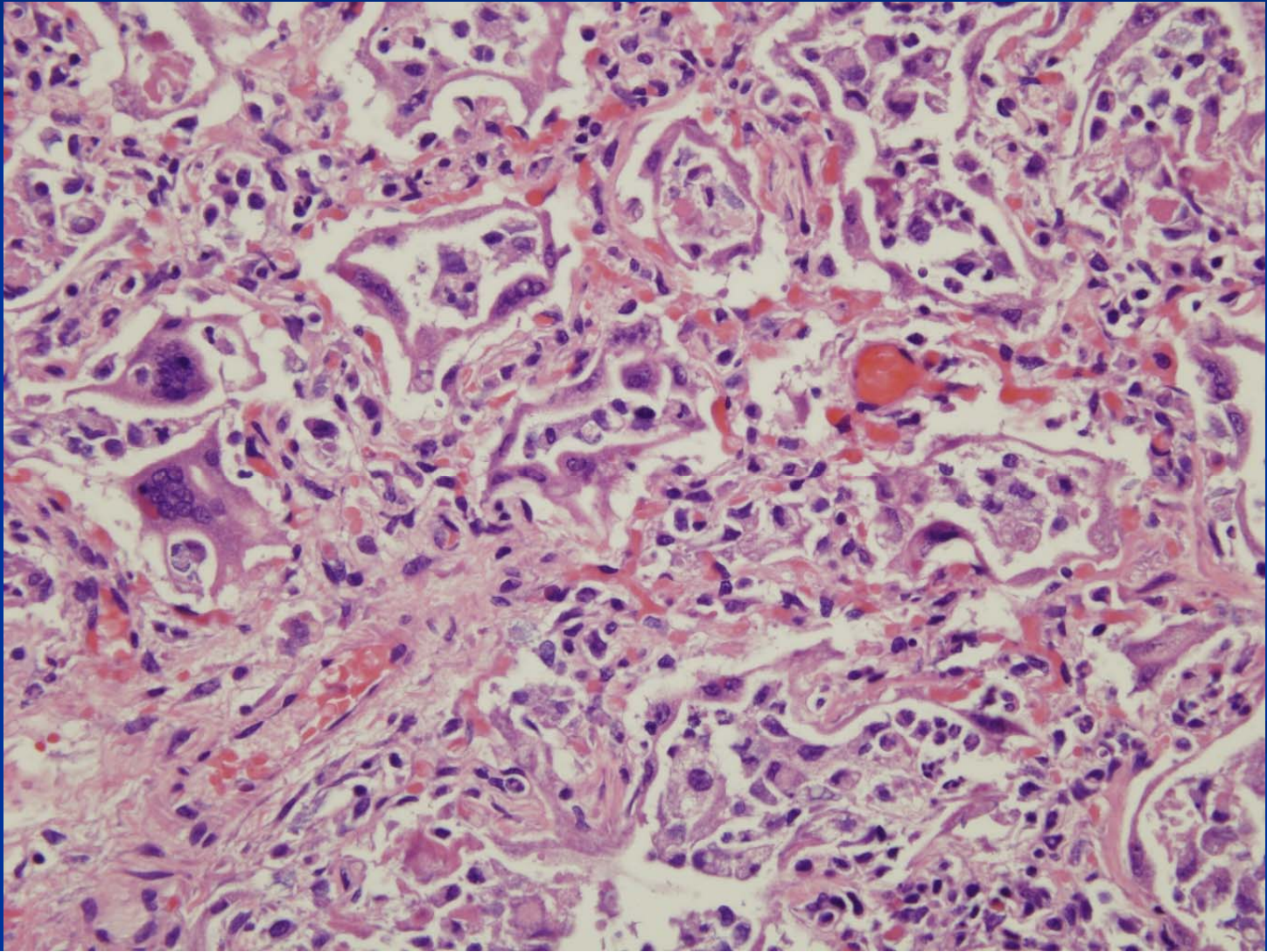


Canine Distemper Virus (CDV)

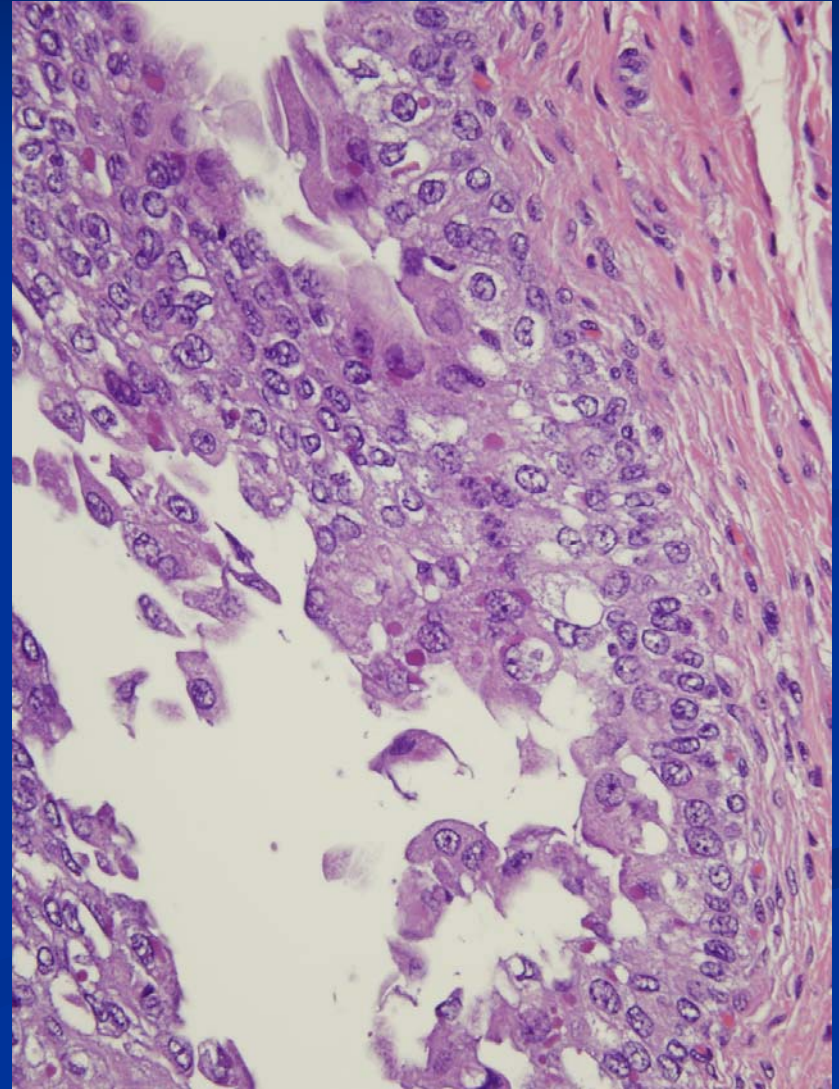
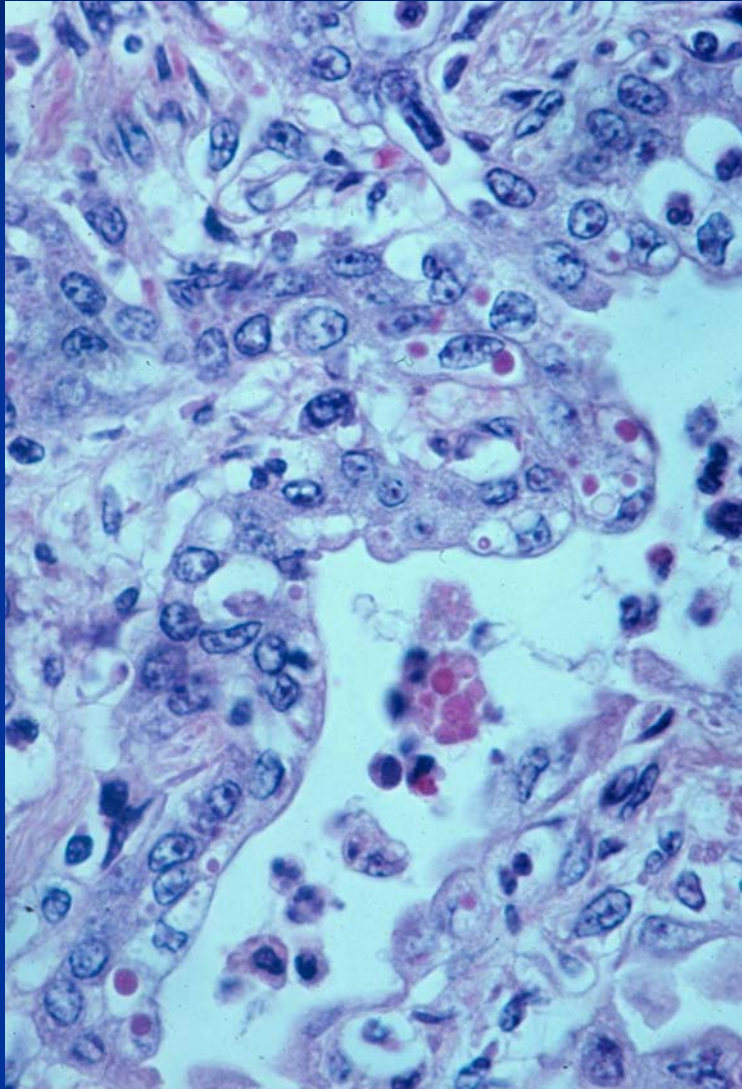
- Diagnosis
 - May see multinucleated cells in lung
 - **Inclusion bodies, intracytoplasmic and intranuclear**
(lung, renal pelvis, urinary bladder, stomach, brain)
 - IHC
 - Virus isolation
- Often secondary pulmonary infection
 - *Bordetella bronchiseptica*
 - Toxoplasmosis

Canine Distemper—Dog

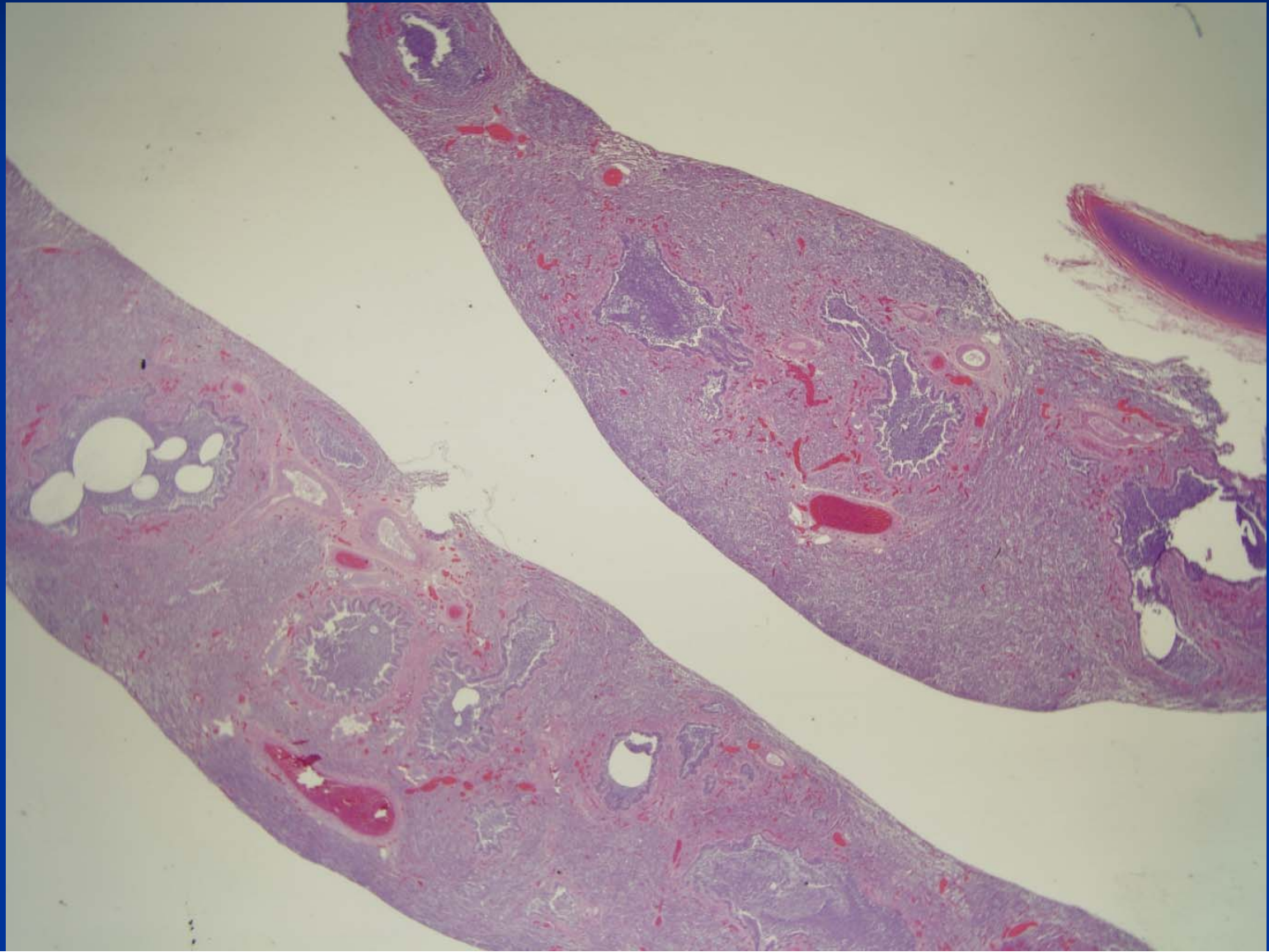
- syncytial cells



Canine Distemper Virus - Intracytoplasmic Inclusion Bodies

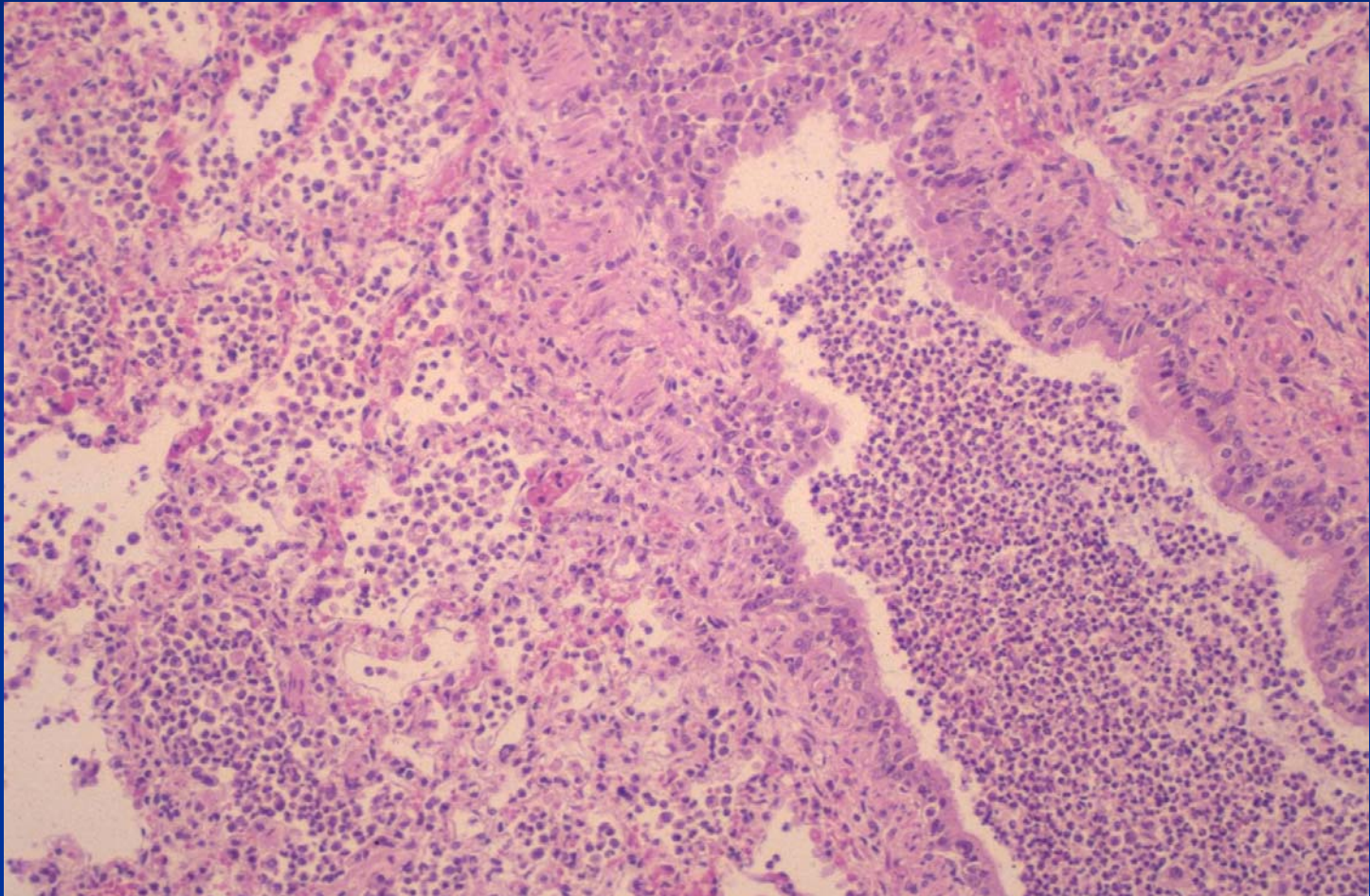


Canine Distemper—Dog Secondary Bacterial Bronchopneumonia



Canine Distemper

Secondary Bacterial Bronchopneumonia



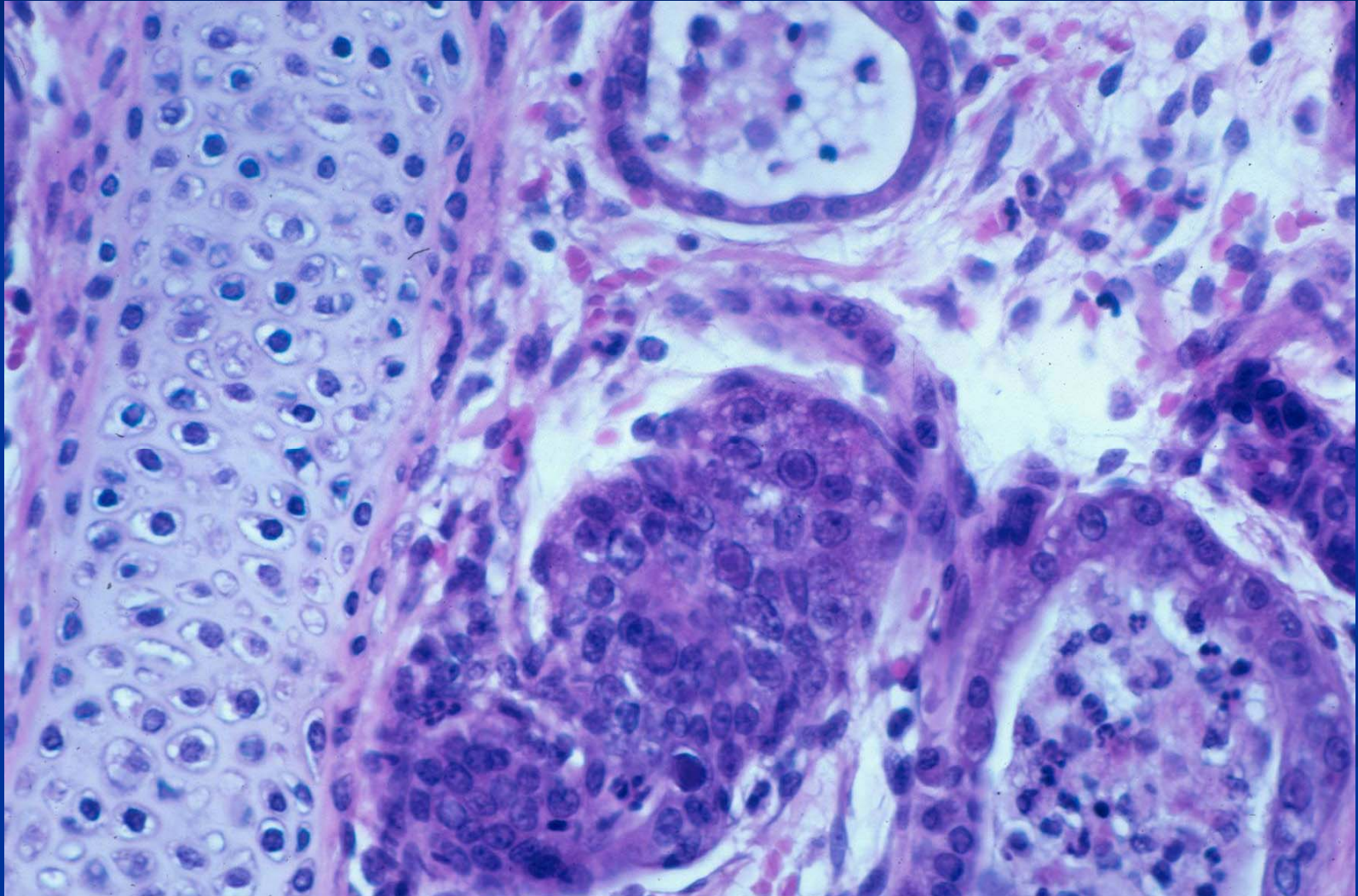
Canine Influenza (USA)

- From equine influenza A, H3N8 strain, in USA
- Racing tracks and animal shelters
- Manifest as severe cough
- High morbidity, low mortality
- Higher mortality in greyhounds
- Necrotizing bronchitis/bronchiolitis
- Pleural and pulmonary hemorrhage in greyhounds
- Secondary bacterial bronchopneumonia
- Diagnosis by IHC
- Differential for “kennel cough”

Canine Adenovirus

- Canine adenovirus type 2 (CAV-2)
- Transient mild disease unless immune suppressed/deficient
- Low morbidity, low mortality
- Pathology
 - Bronchointerstitial pneumonia
 - Intranuclear inclusion bodies
 - Often secondary bronchopneumonia

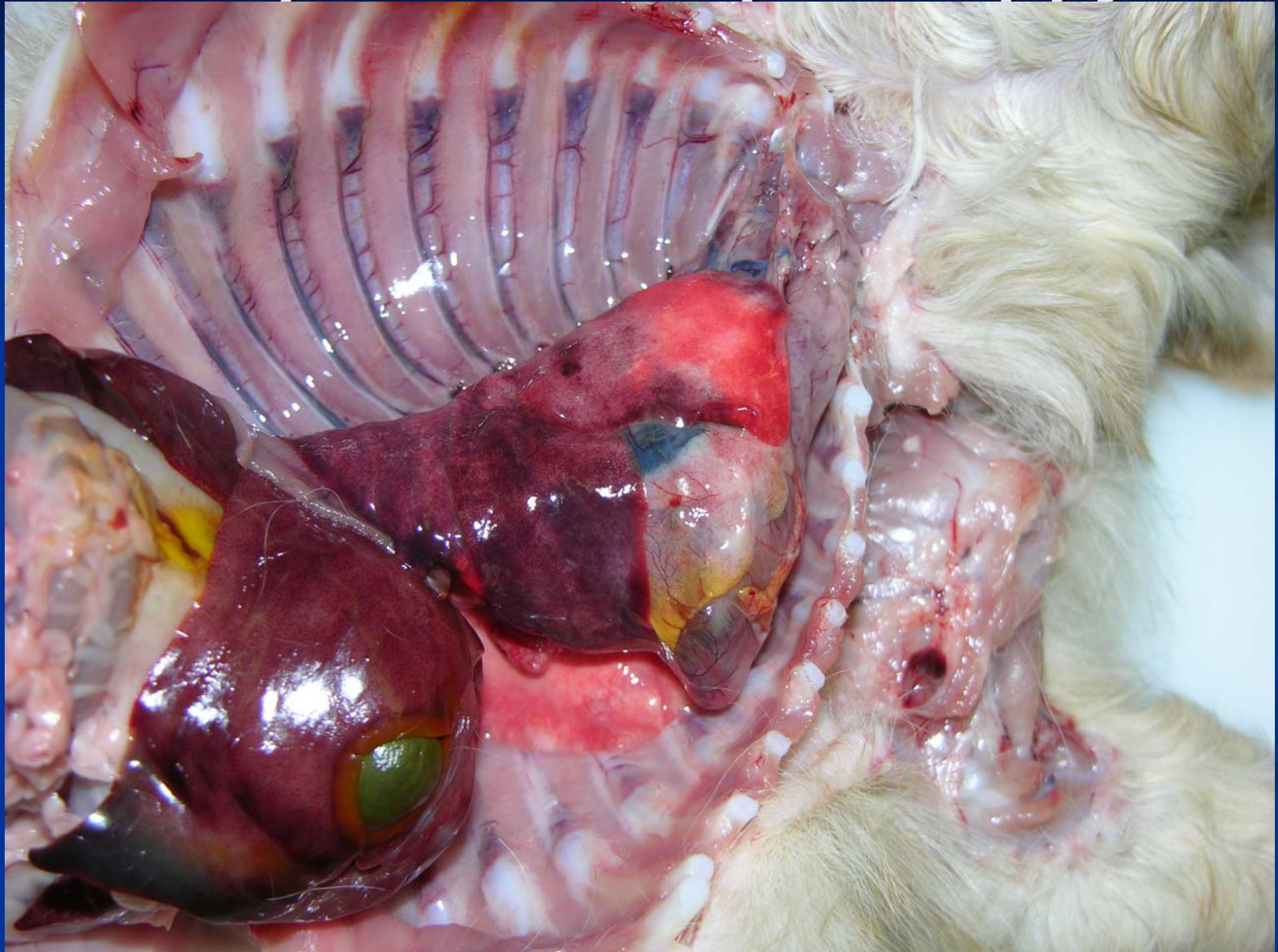
Canine Adenovirus



Bacterial Pneumonias of Dogs

- Mostly follow viral infection or aspiration
- Common agents
 - *Pasteurella multocida*
 - *Bordetella bronchiseptica*
 - *Klebsiella pneumoniae*
 - *E. coli*
 - *Streptococcus* sp
- *Streptococcus zooepidemicus* (one report secondary to dental disease)
 - Hemorrhagic pleuropneumonia
 - Death due to severe sepsis

Streptococcus sp. - Puppy



Infectious Pneumonias of Cats

- Uncommon in cats except with immunosuppression or following aspiration
- Viral
- Bacterial
 - *Chlamydophila felis* - generally mild
 - *Mycoplasma felis*
 - Occasional secondary infections
 - *Pasteurella* spp
 - *Bordetella bronchiseptica*

Other Infectious Pneumonias in Cats

■ Mycotic

- *Cryptococcus neoformans* , *C. gatti*
- *Histoplasma capsulatum*

■ Protozoal

- *Toxoplasma gondii*
- *Cytauxzoon felis* (USA only)

■ Other parasitic

Mycotic Pneumonia

- Immune compromised individuals
 - Malnutrition
 - Corticosteroid treatment
 - Cats with FIV, FLV
- Lesions
 - Multifocal granulomas to pyogranulomatous pneumonia
 - Other organs may be affected

Mycotic Pneumonias of Dogs and Cats

■ Etiologic agents

- *Histoplasma capsulatum*
- *Cryptococcus neoformans*, *C. gatti*
- *Aspergillus* spp.
- *Pneumocystis carinii*
- *Blastomycosis dermatiditis*
- *Coccidioides immitis*

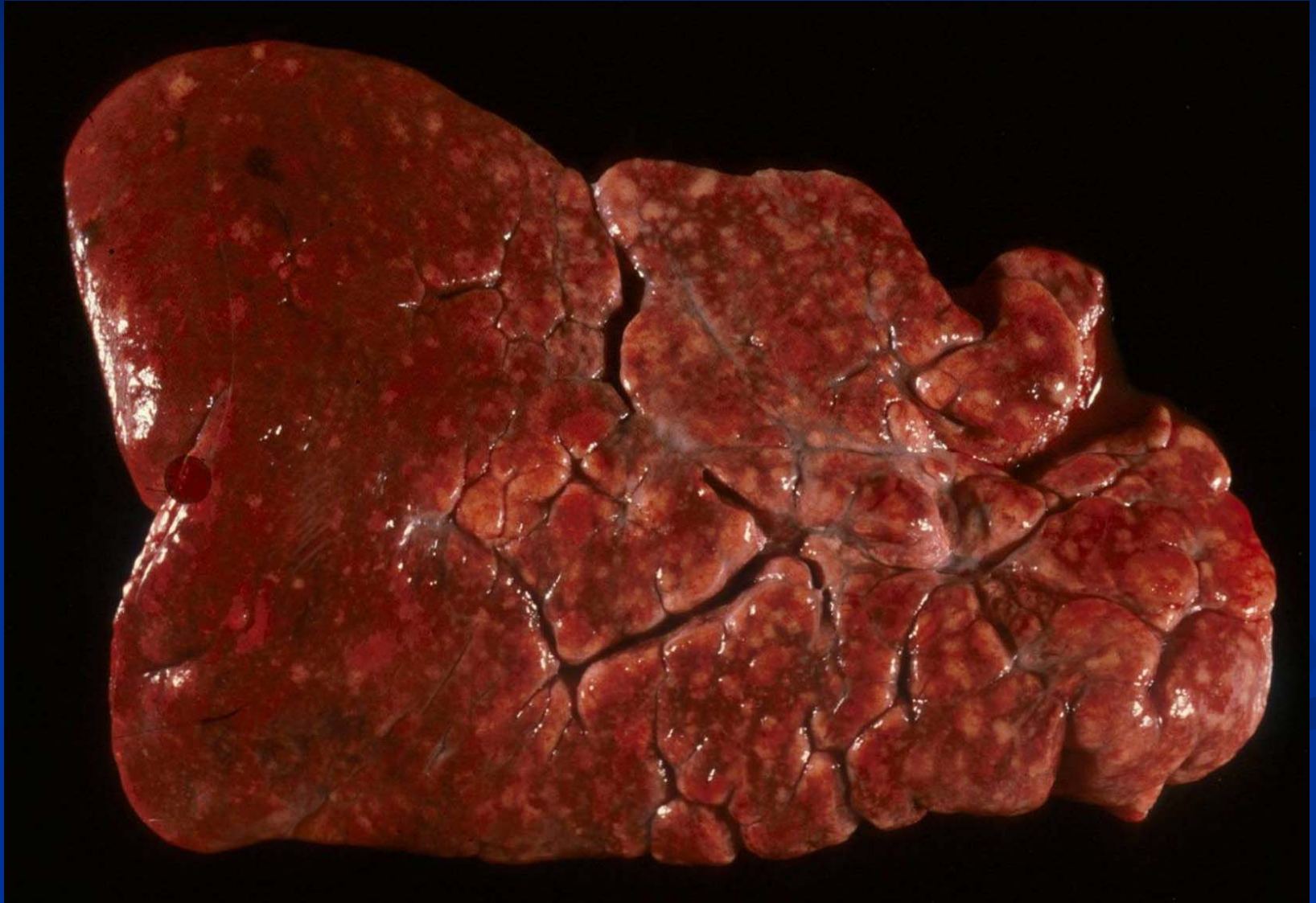
Blastomycosis

- Geographical distribution: Missouri valley in USA
- Common in dogs but rare in cats
- Disease
 - Pulmonary
 - Cutaneous
 - Disseminated
- Pyogranulomatous response

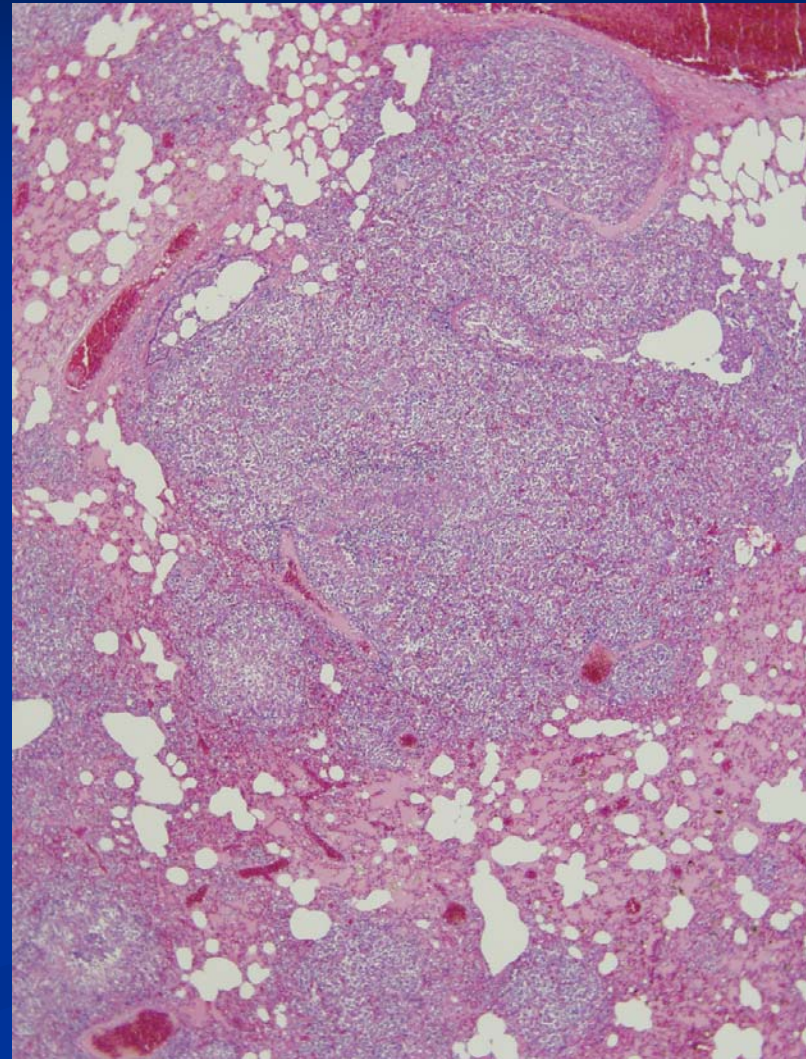
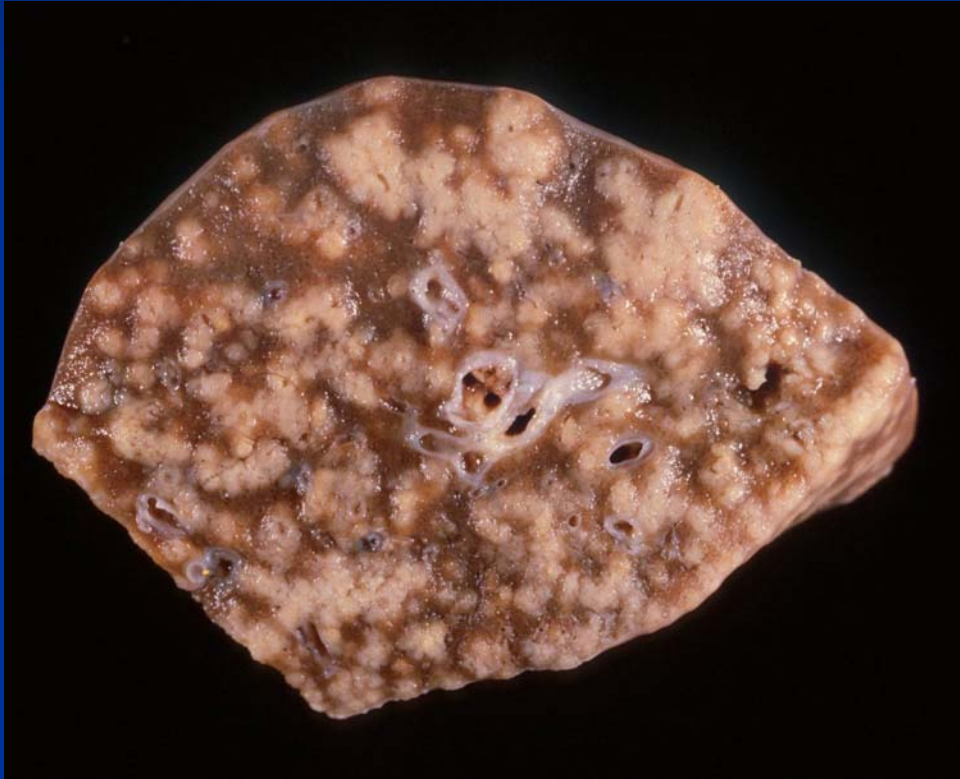
Blastomycosis



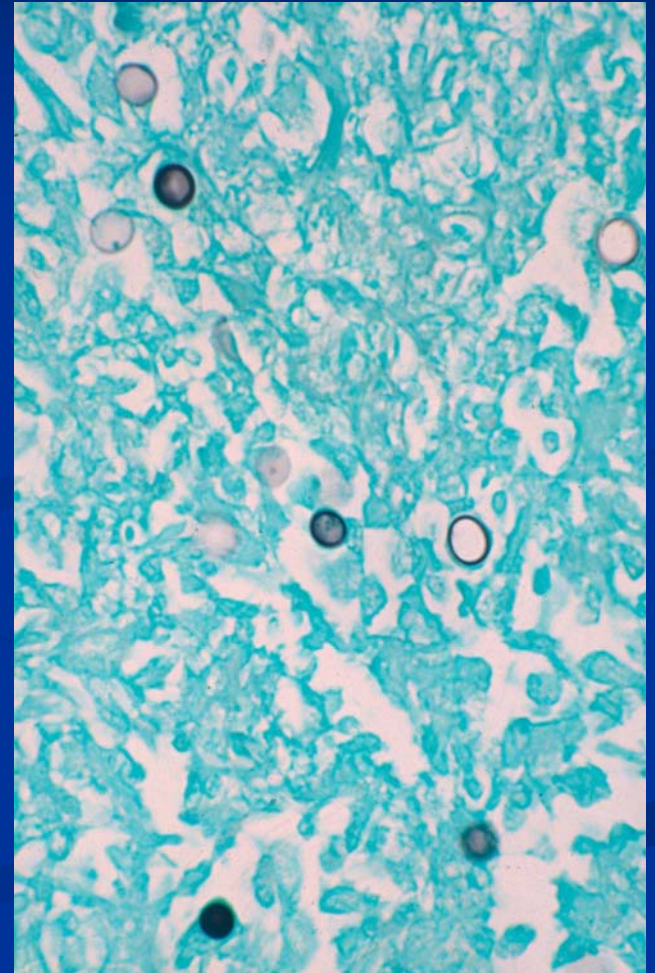
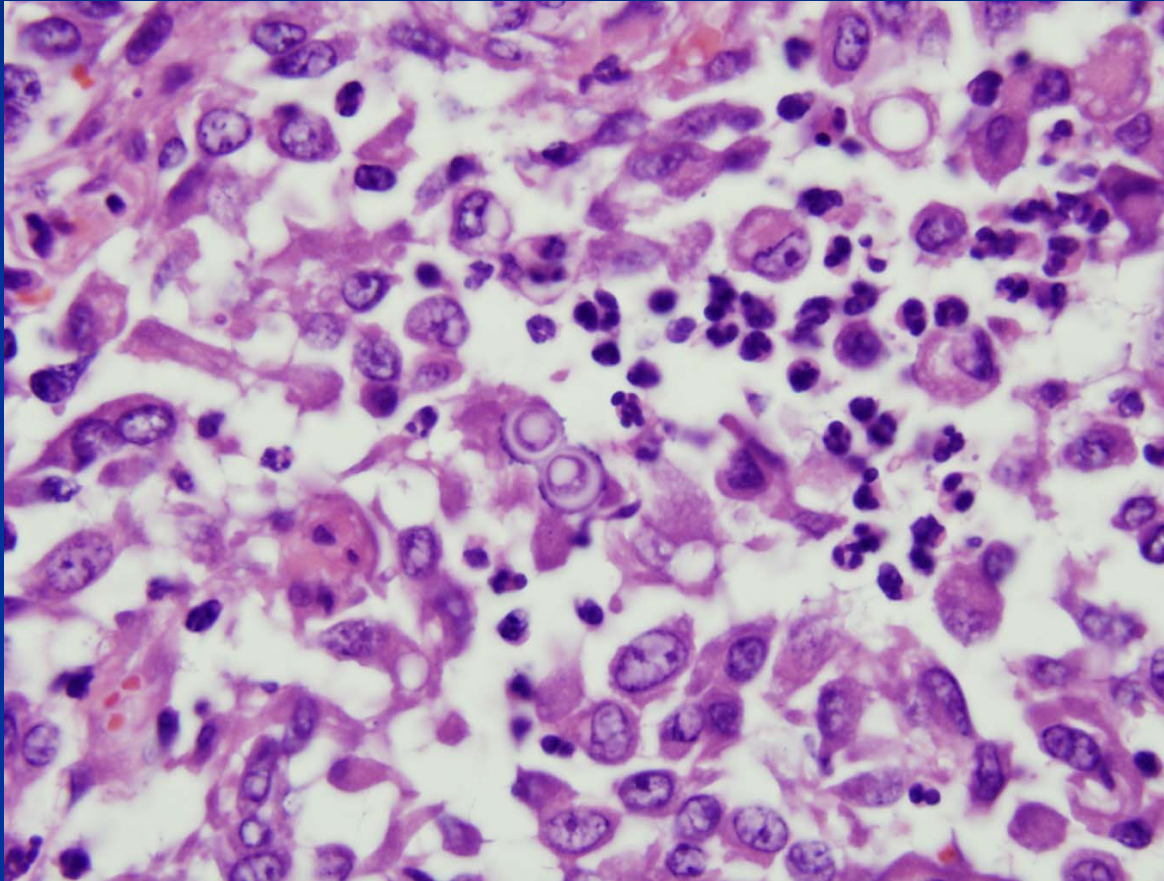
Blastomycosis - Dog



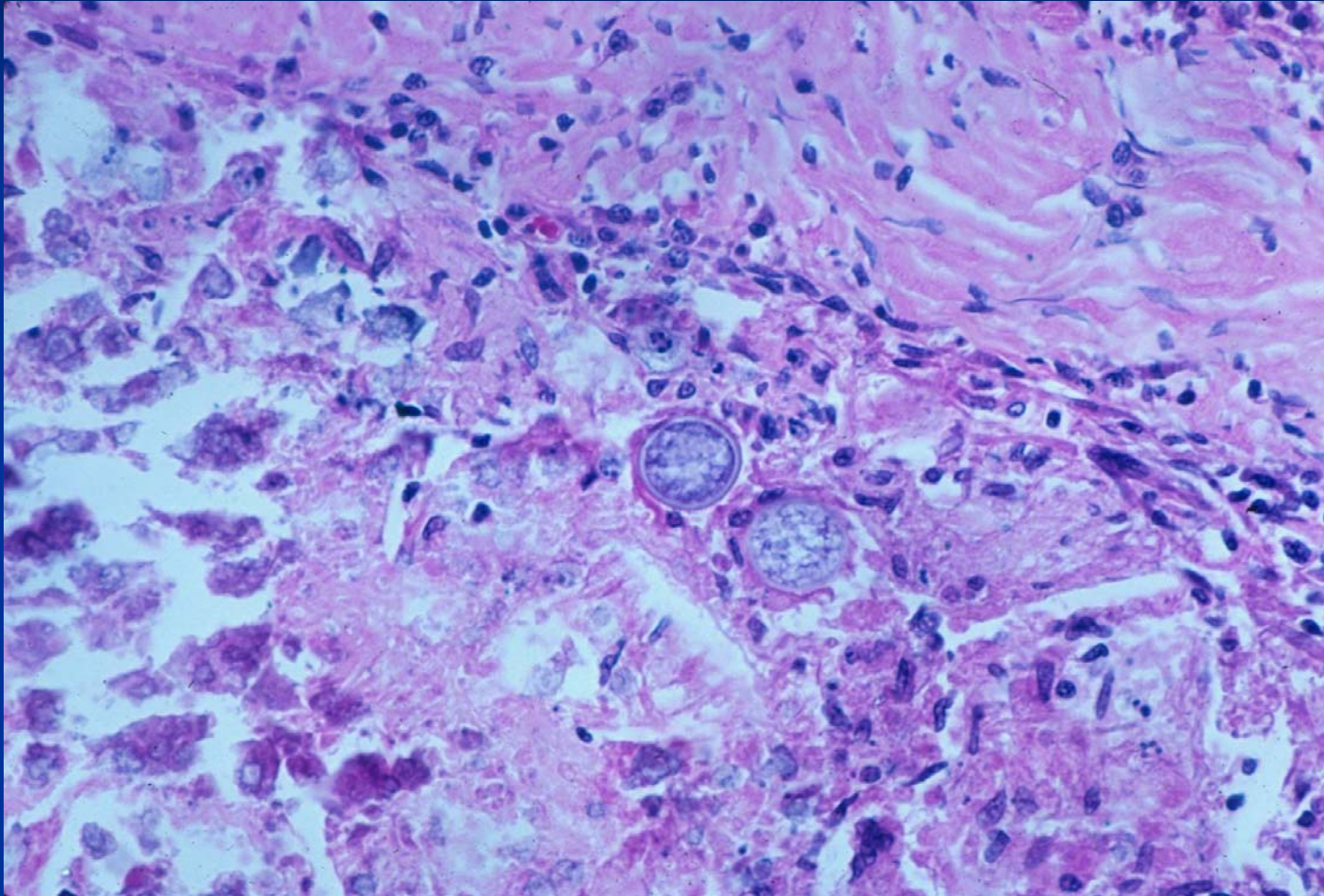
Blastomycosis



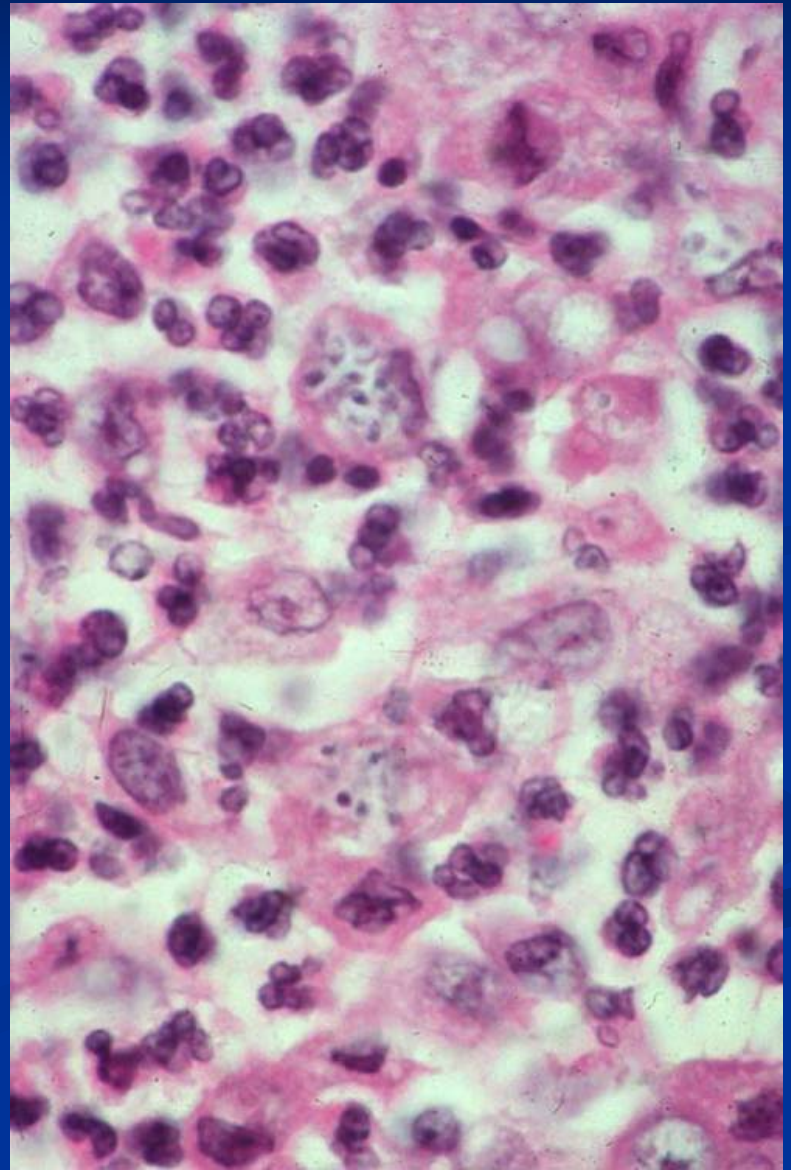
Blastomycosis —Rottweiler



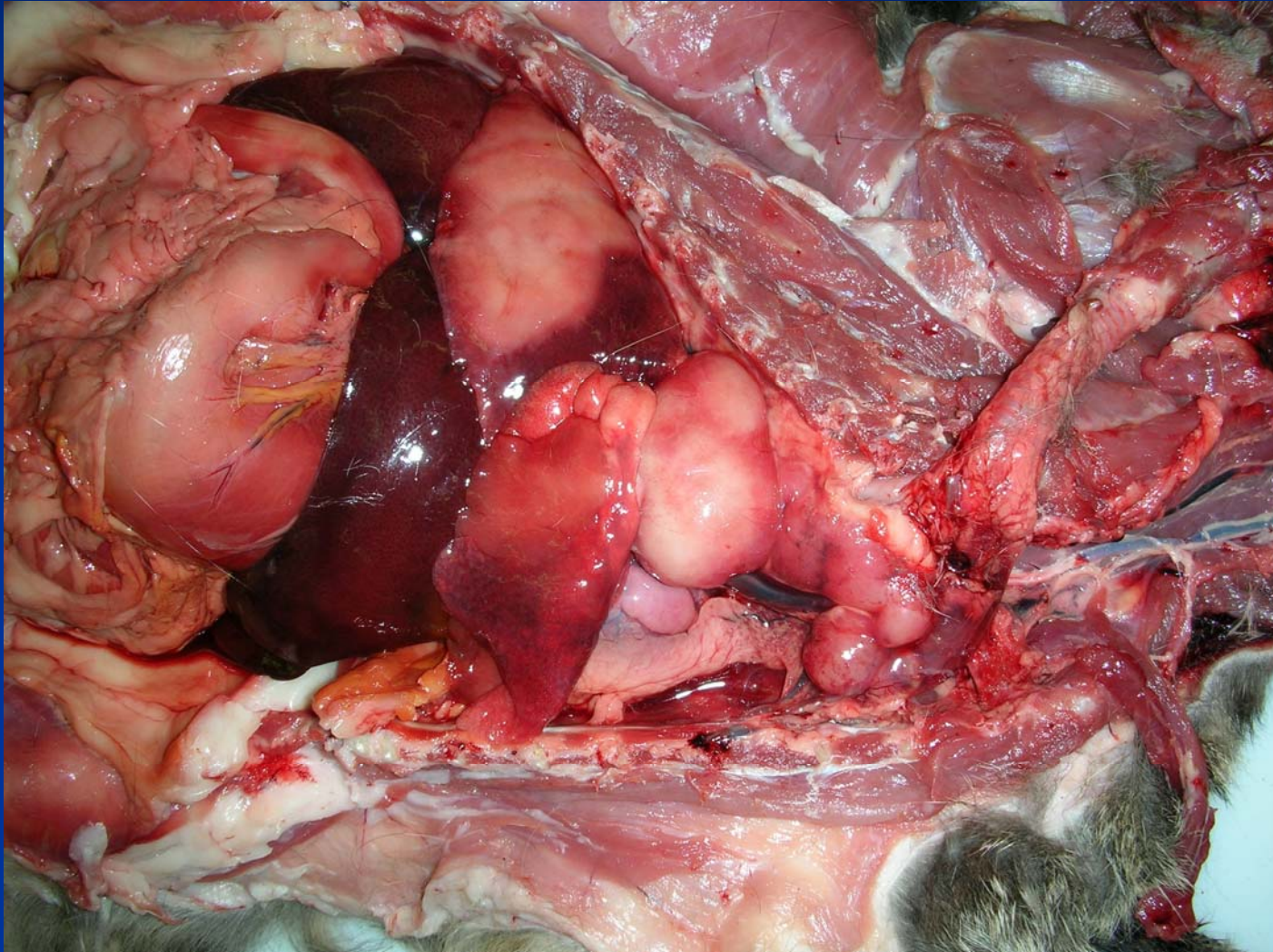
Coccidiomycosis—Sea Otter



Histoplasmosis—Cat



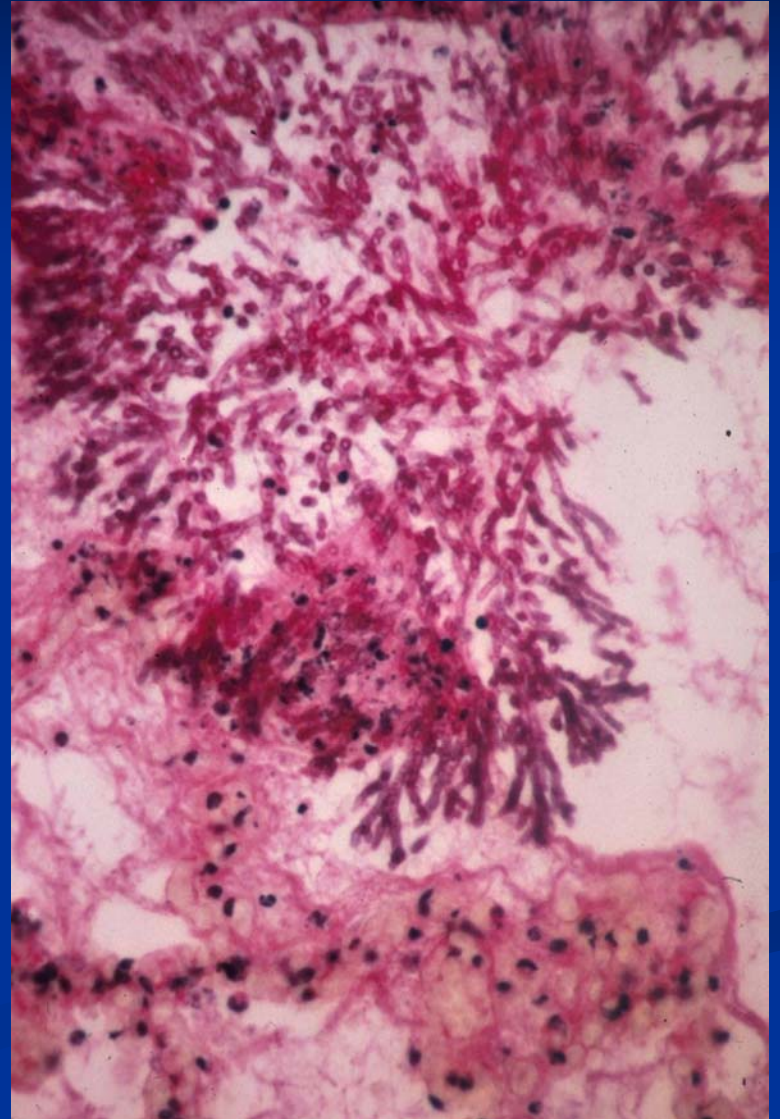
Cryptococcal Pneumonia - Cat



Aspergillus spp.

- Nasal lesions in dogs
- Pulmonary involvement occasionally
- Can be disseminated in immune suppressed dogs
- Pleuritis
- DD *Nocardia*, *Actinomyces spp*

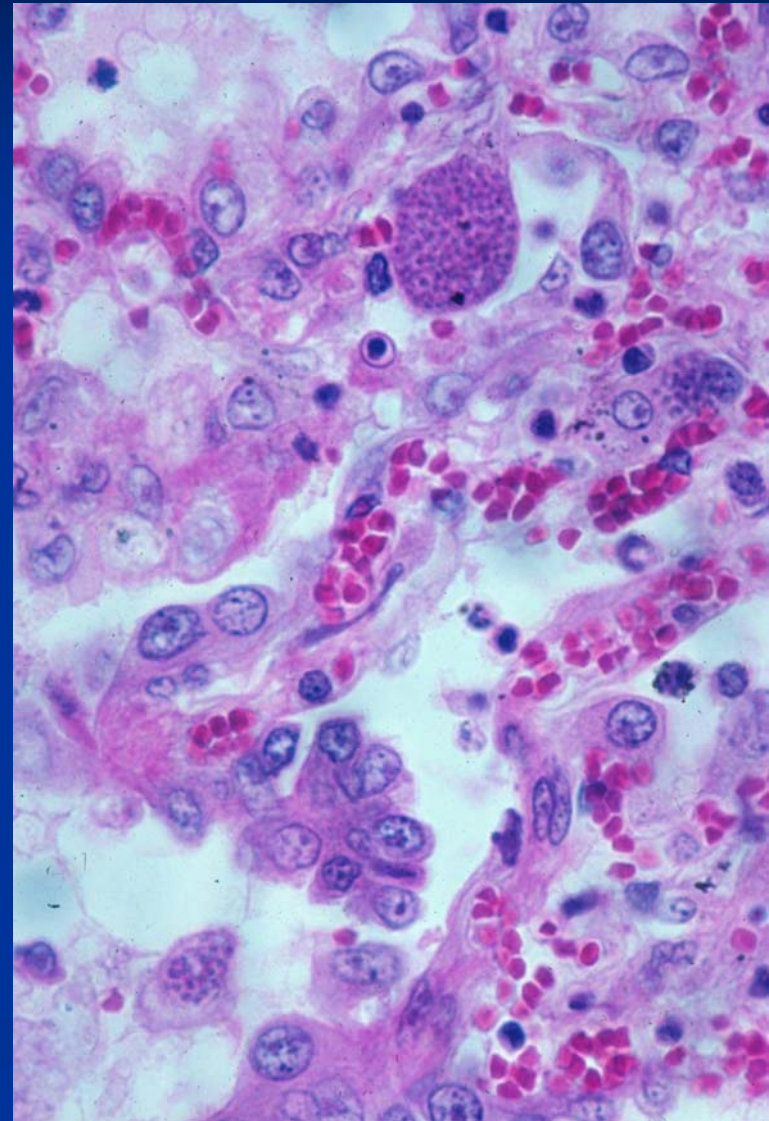
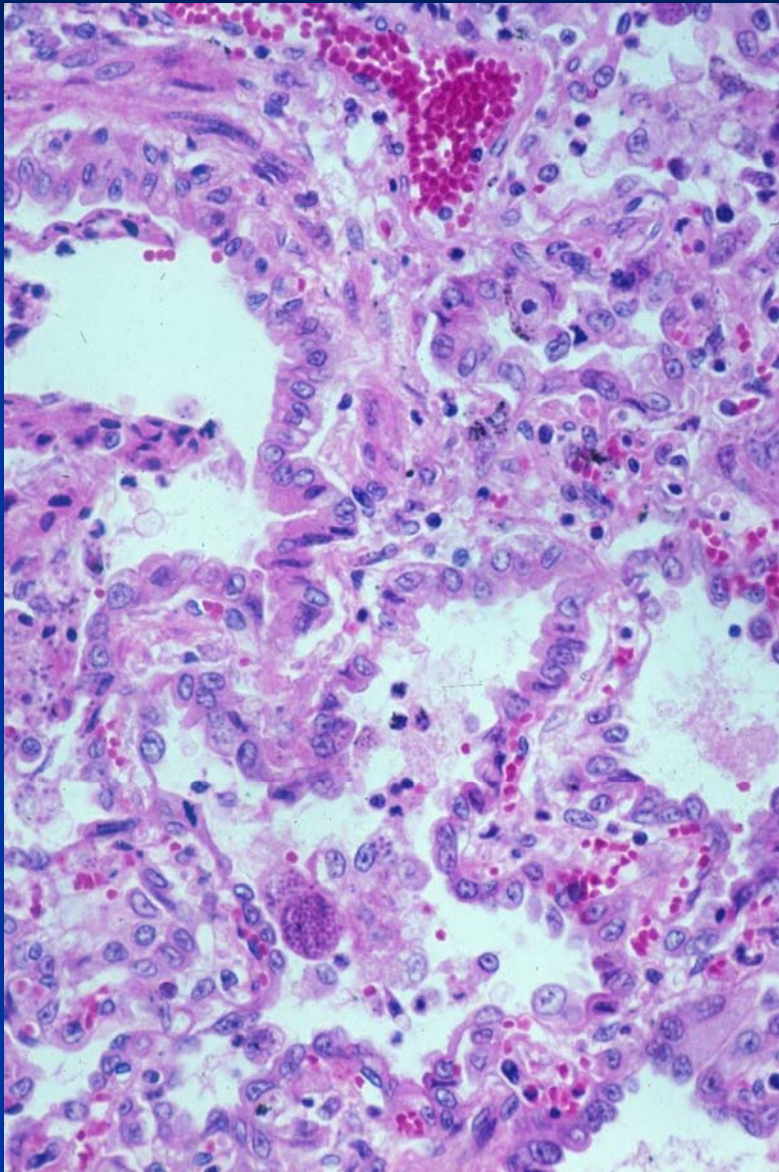
Pleural Aspergillosis—Dog



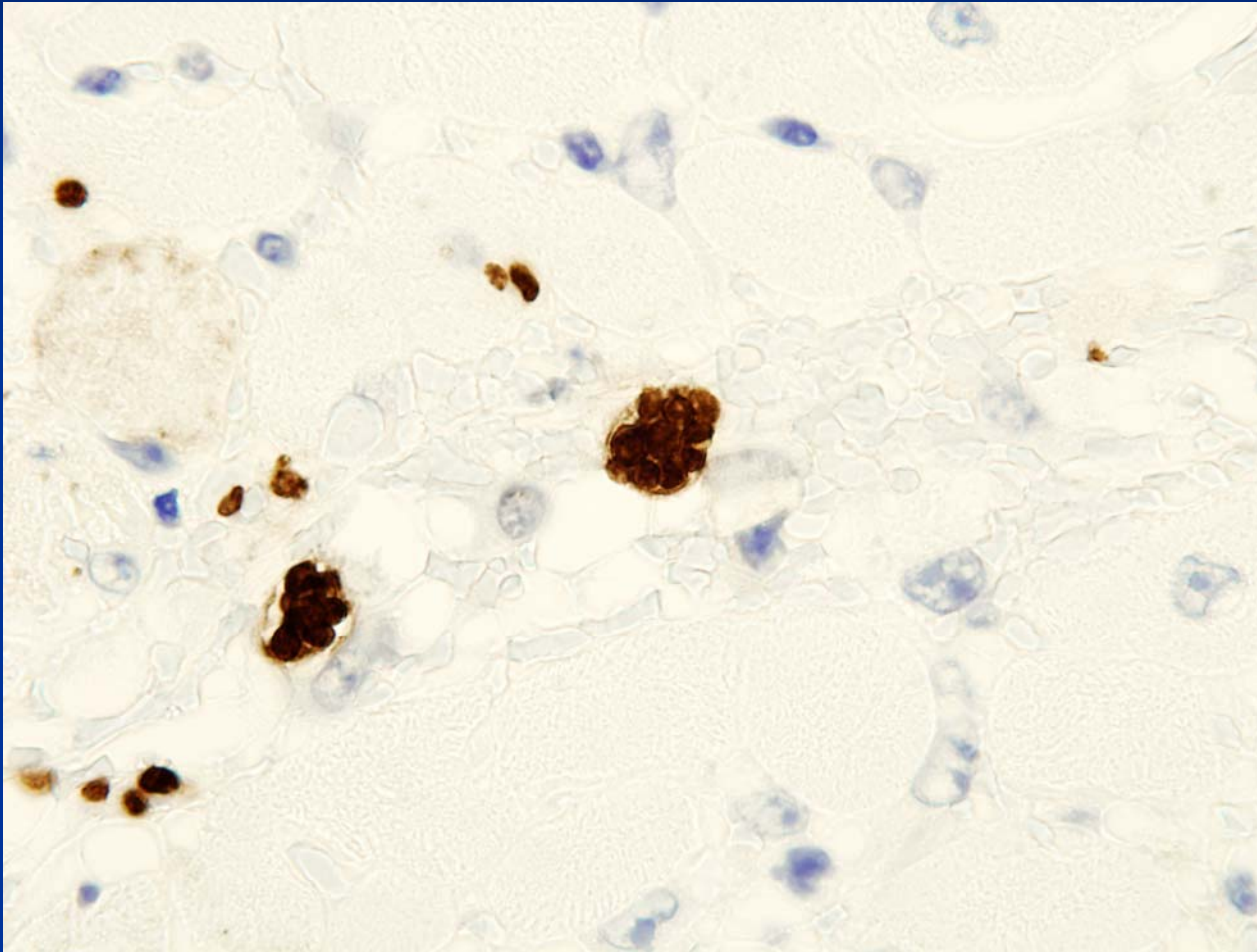
Protozoal Pneumonias

- Toxoplasmosis
 - *Toxoplasma gondii*
 - Cat (zoonosis), dog
 - Often secondary to immunosuppression
 - Associated with distemper, FIV, FLV, AIDS
 - Necrotizing interstitial pneumonia
- *Sarcocystis canis*
 - In dogs, differentiate by IHC from toxo
- *Pneumocystis carinii*
- *Cytosaxoon felis* - cat
- *Encephalitozoon caniculi* - rare

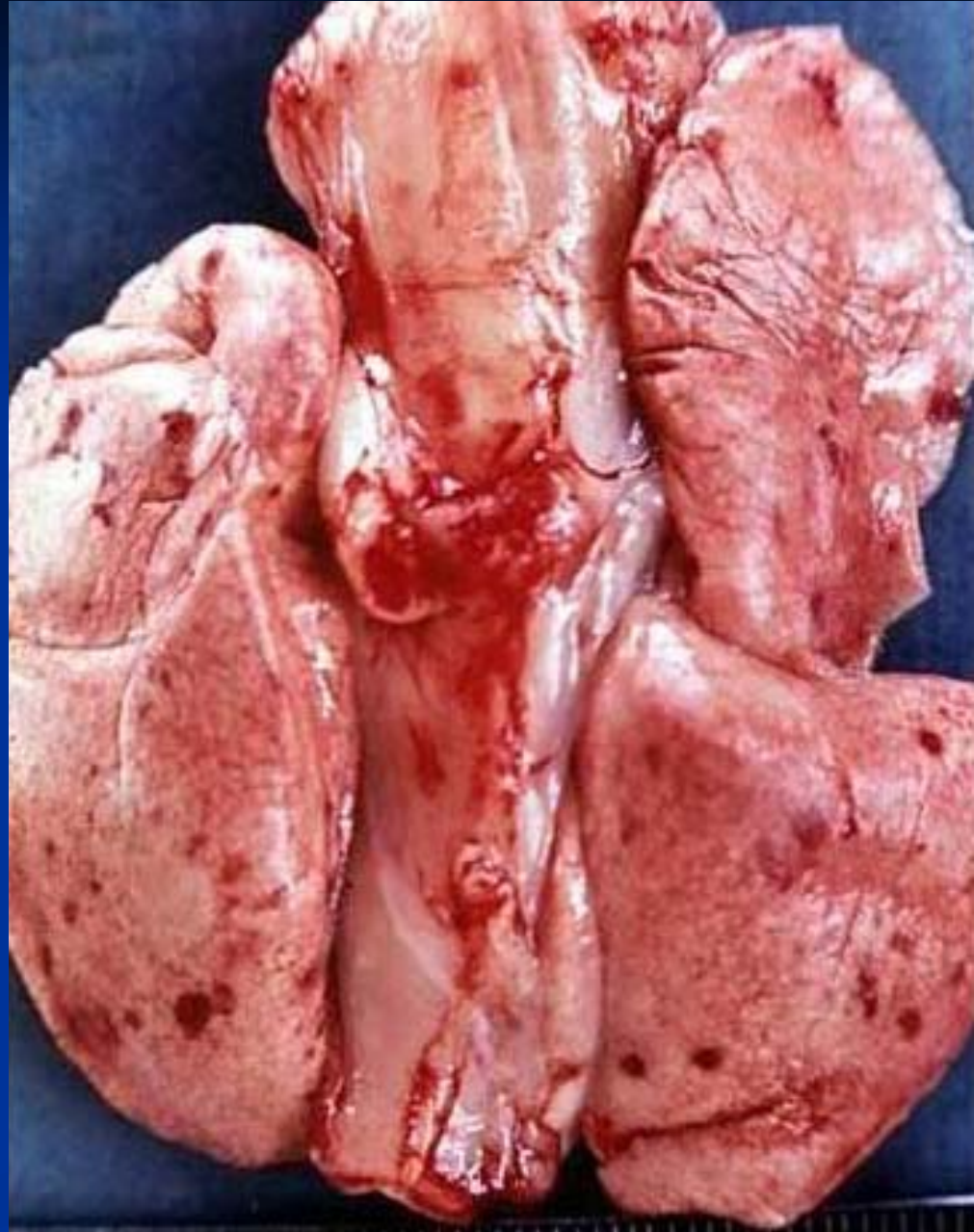
Toxoplasmosis



Toxoplasmosis—IHC



Encephalito- zoonosis— Dog



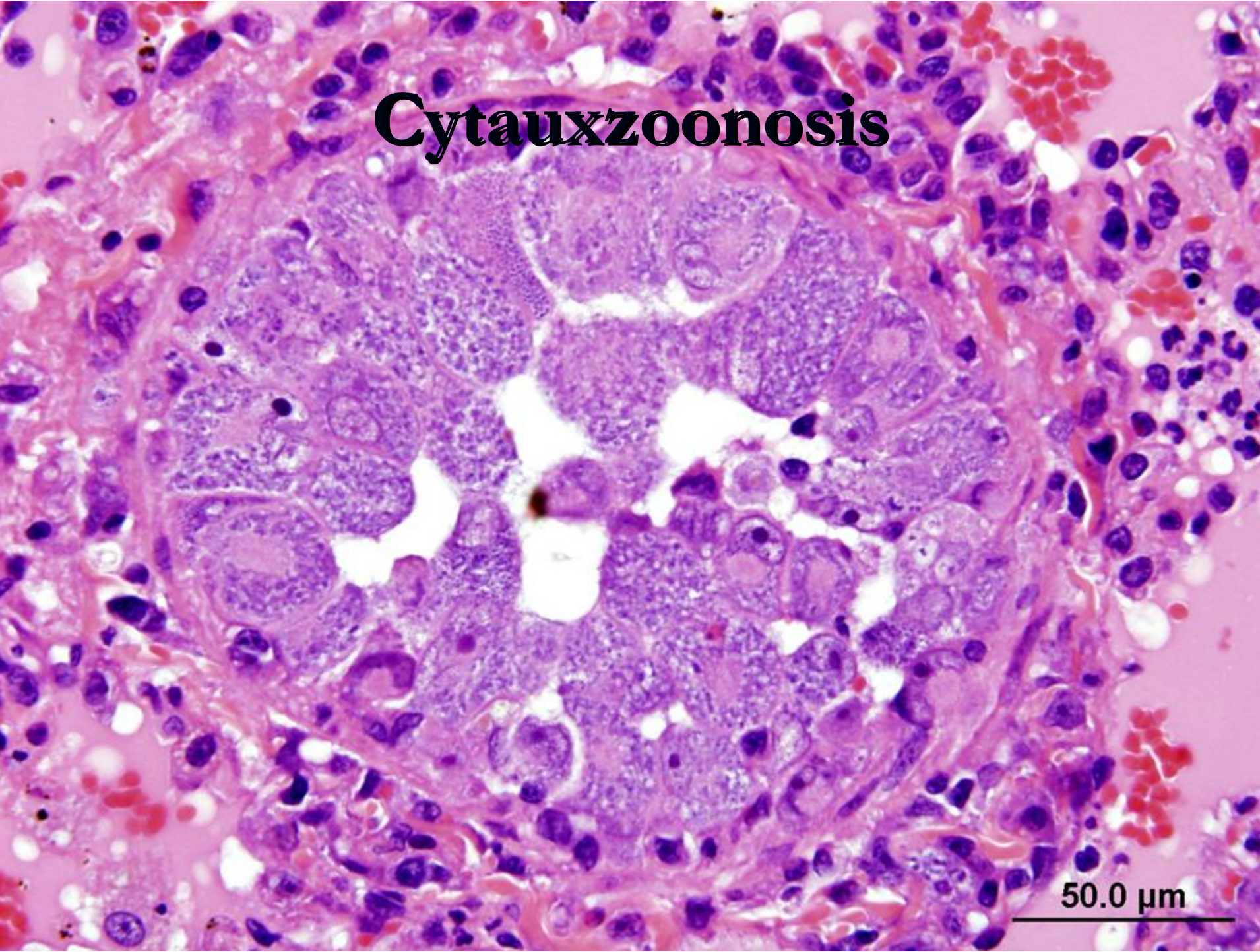
Cytauxzoonosis

- Caused by *Cytauxzoon felis*
 - Family Theileriidae
- Transmitted by Ixodid tick
- Natural host – North American bobcat
- Clinical signs: anemia, icterus, dyspnea, lethargy
- Pathology:
 - Often blood oozing from nares and mouth
 - Histiocytosis of liver, spleen, lungs with intracytoplasmic protozoal schizonts

Cytauxzoonosis

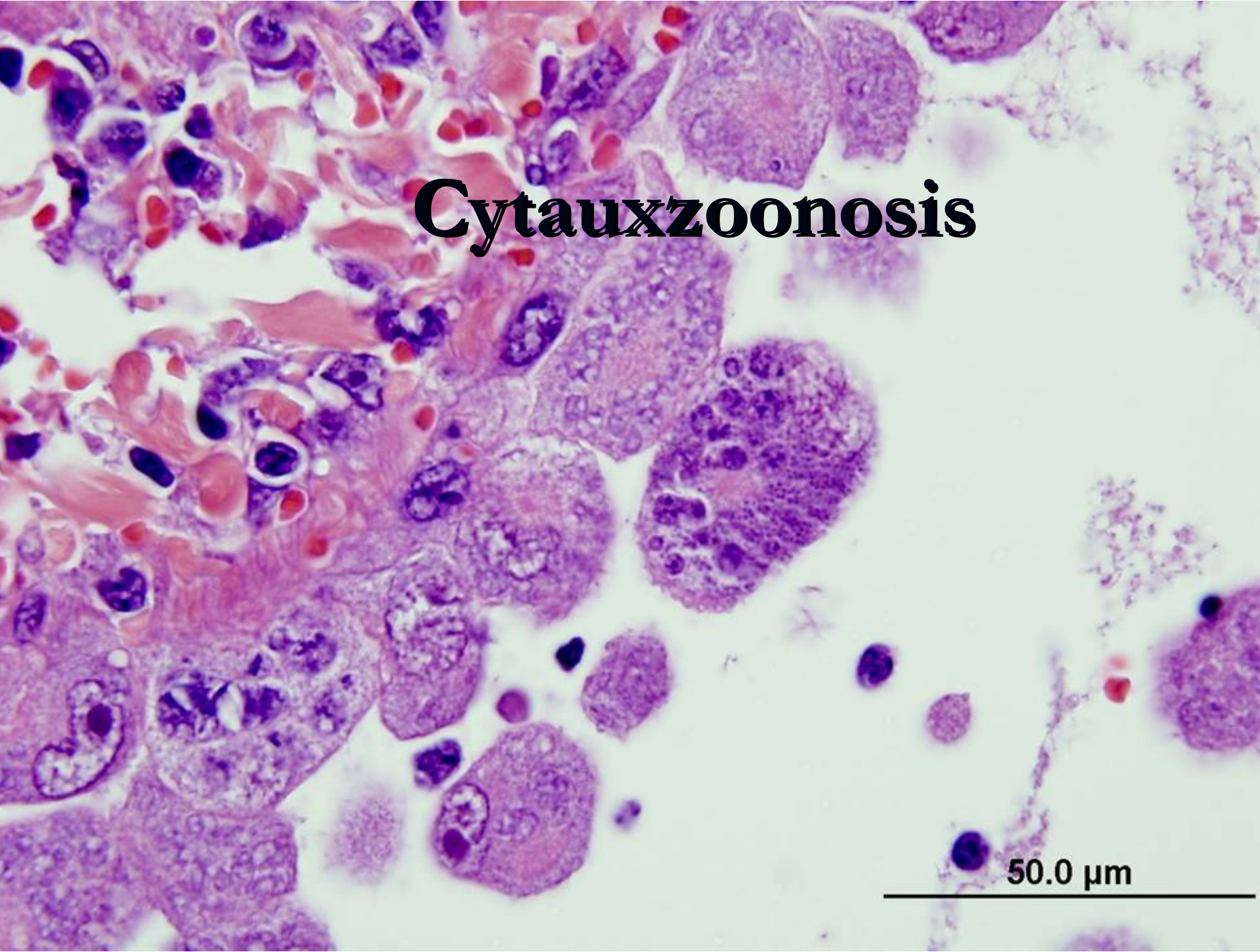


Cytauxzoonosis



50.0 μ m

Cytauxzoonosis



50.0 μm

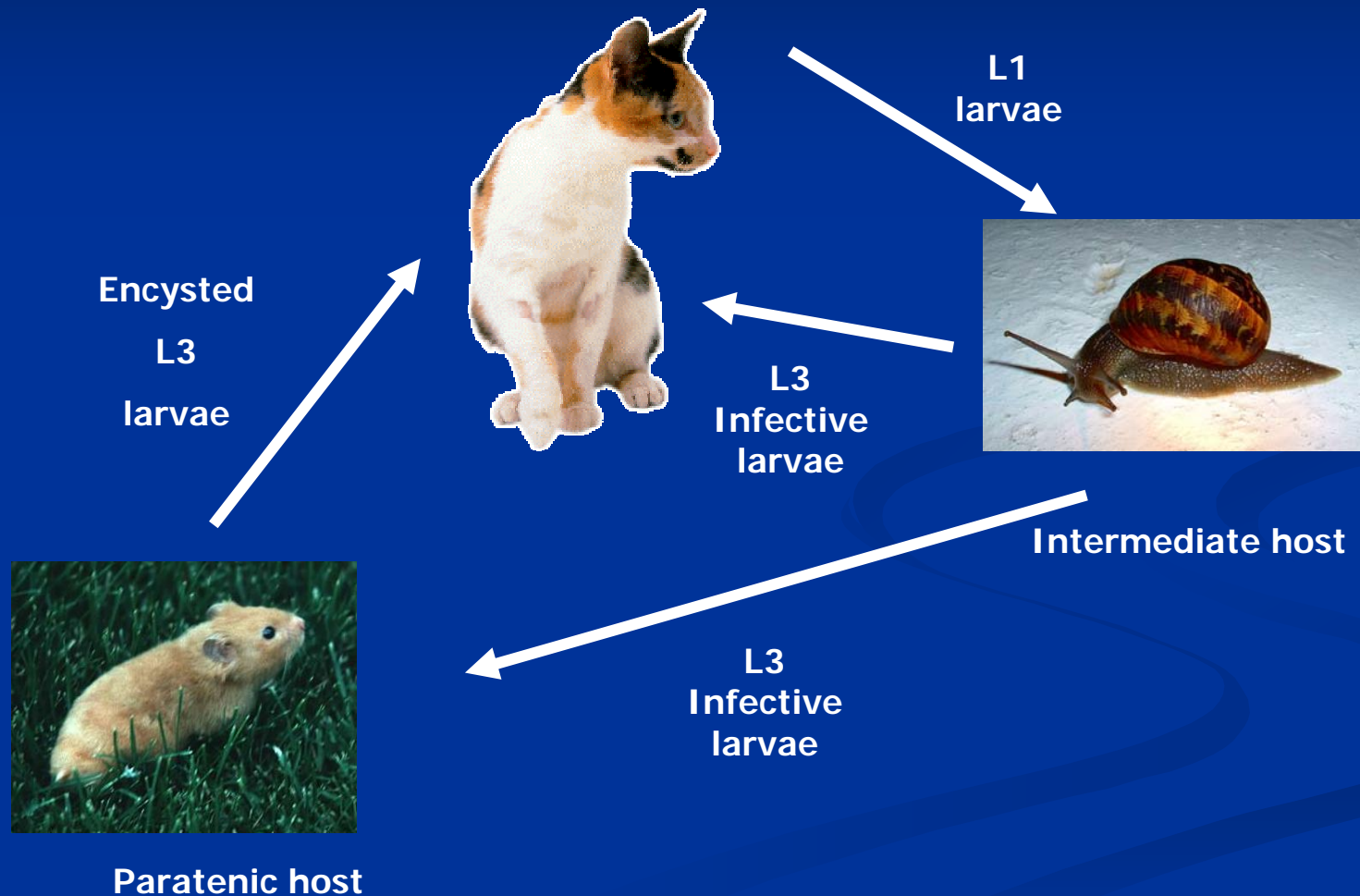
Other Parasitic Diseases of Dogs and Cats

- *Oslerus (Filaroides) osleri* (dogs)
- Vascular system
 - *Dirofilaria immitis* (mainly dogs),
 - *Angiostrongylus vasorum*
- “Lungworms”
 - *Capillaria aerophila*
 - *Aelurostrongylus abstrusus* (cat only)
 - *Crenosoma vulpis* (foxes, occasionally dogs)
 - *Filaroides hirthi* (dogs)
- Lung fluke
 - *Paragonimus kellicotti*

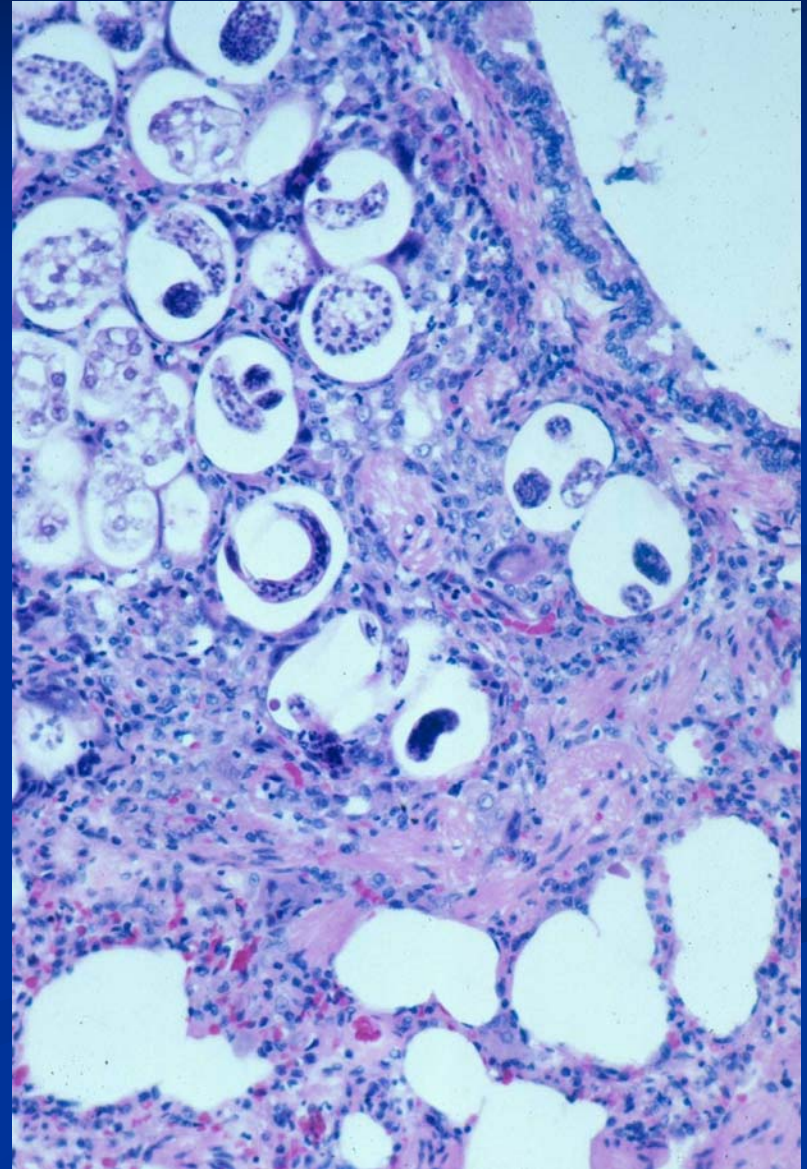
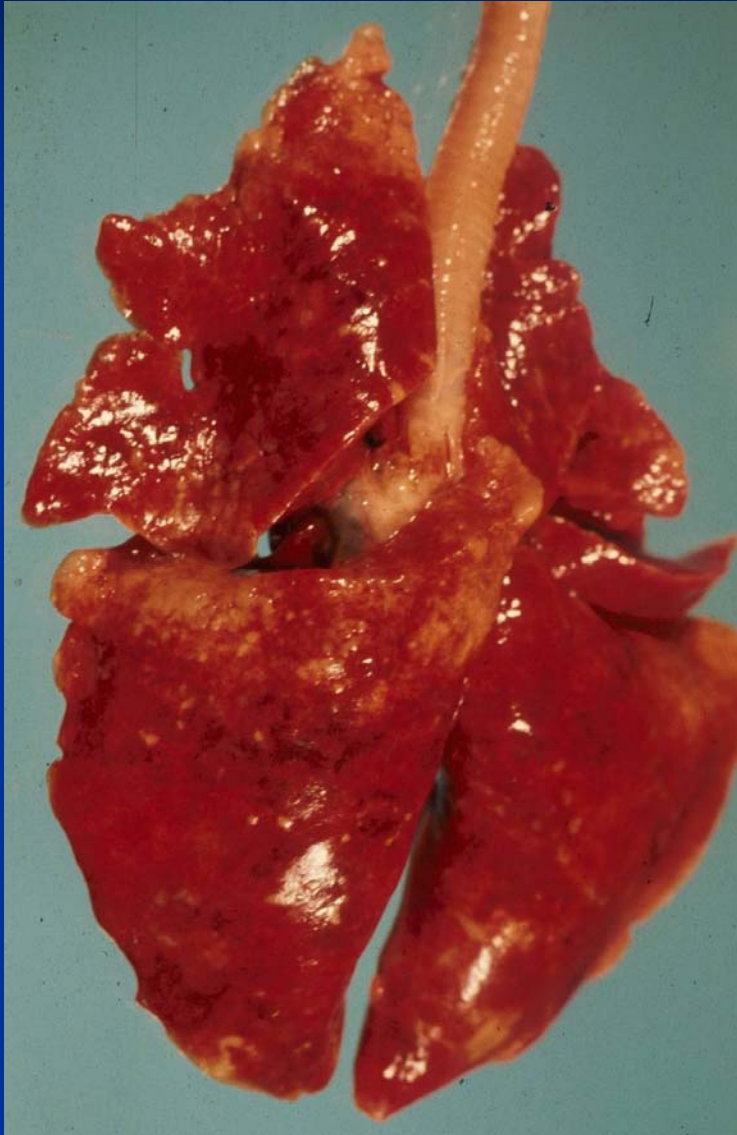
Capillaria aerophila

- Live in trachea and bronchi of carnivores
- Occasionally in nose and sinuses
- Coughing may occur

THE LIFE CYCLE OF *AELUROSTRONGYLUS ABSTRUSUS*



Aelurostrongylosis



Aelurostrongylus abstrusus

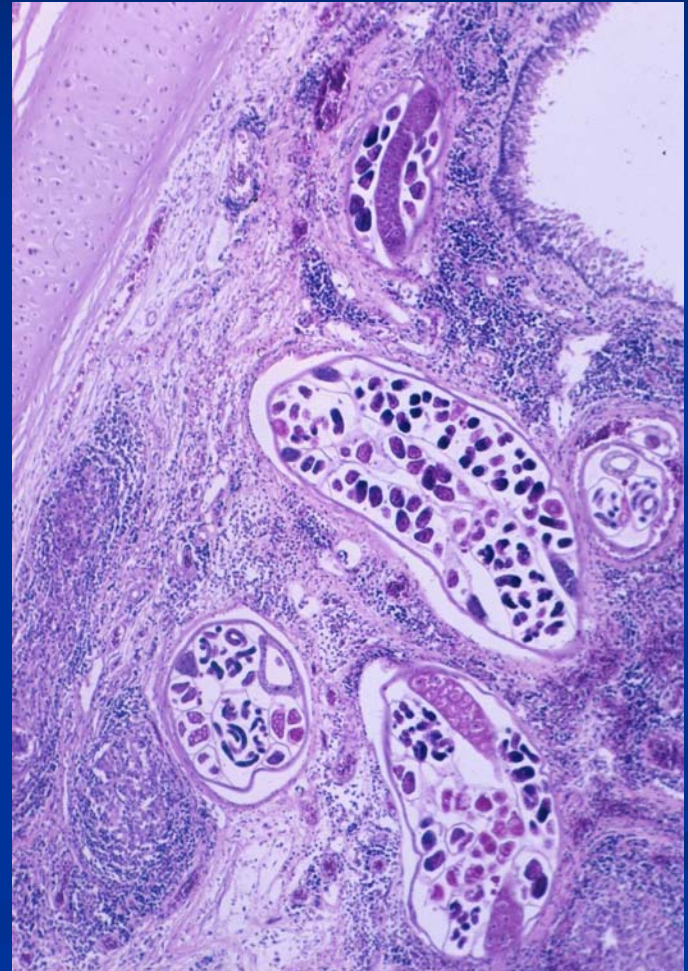
■ Pathology

- Interstitial pneumonia
- Histiocytes, lymphocytes and plasma cells
- Aggregates of eosinophils
- Multinucleated giant cells

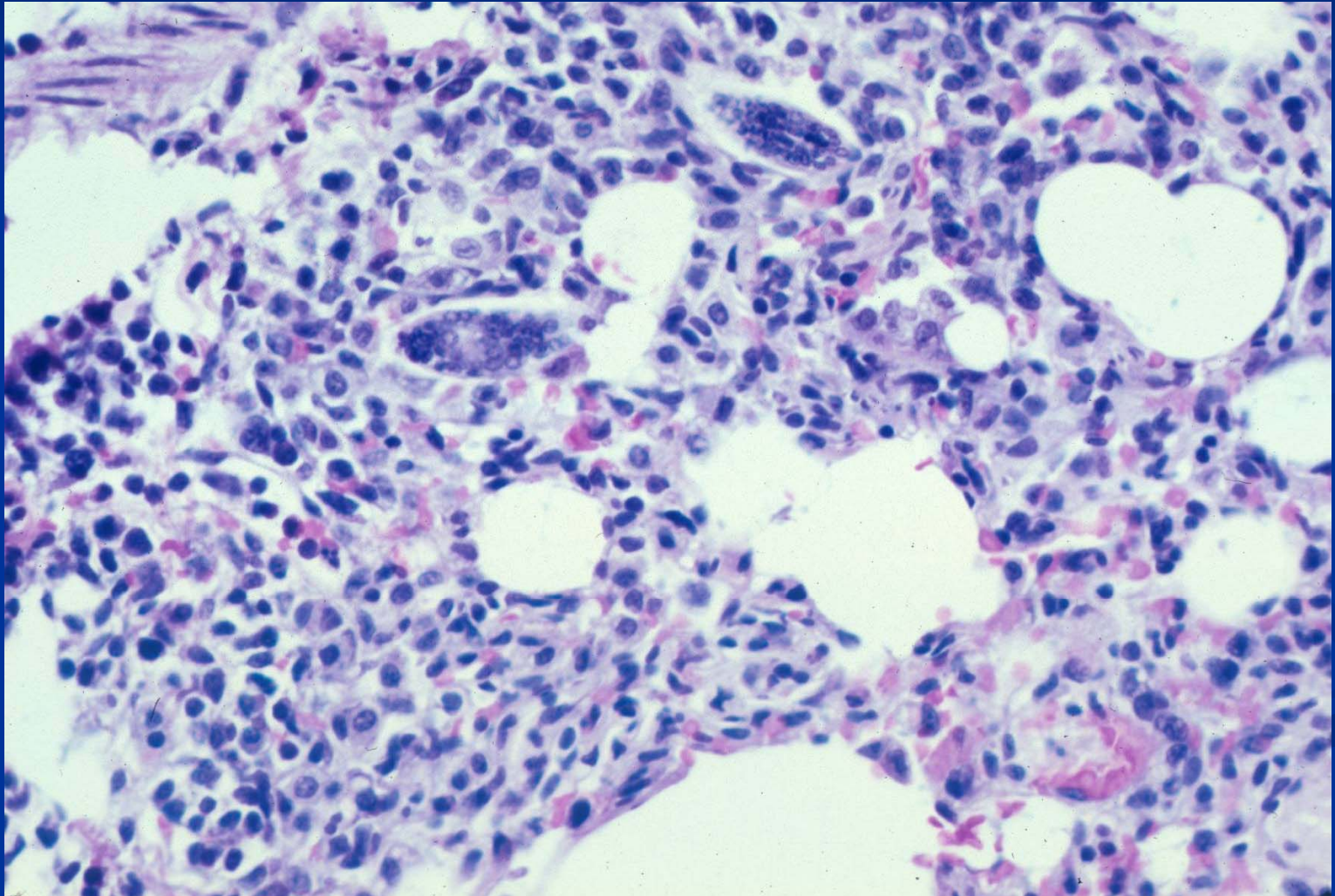
Oslerus (Filaroides) osleri

- Dogs and other Canidae
- Worldwide, most common respiratory nematode
- Chronic cough exacerbated by exercise
- Emaciation and death if very severe
- Nodules at tracheobronchial bifurcation
- Mild reaction with live parasite
- Severe granulomatous response to dead parasite

Oslerus (Filaroides) osleri



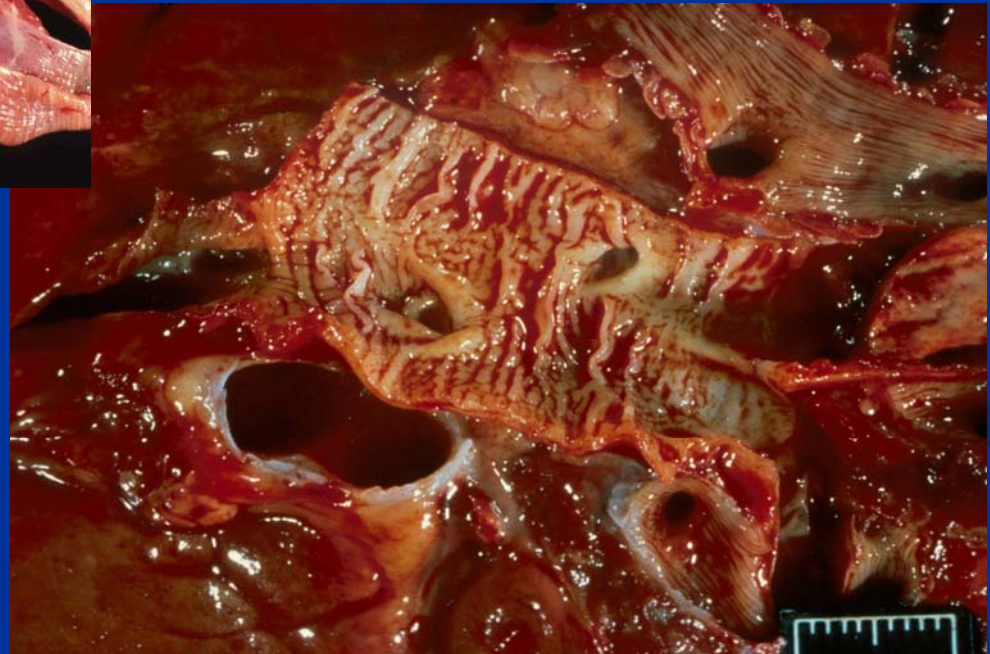
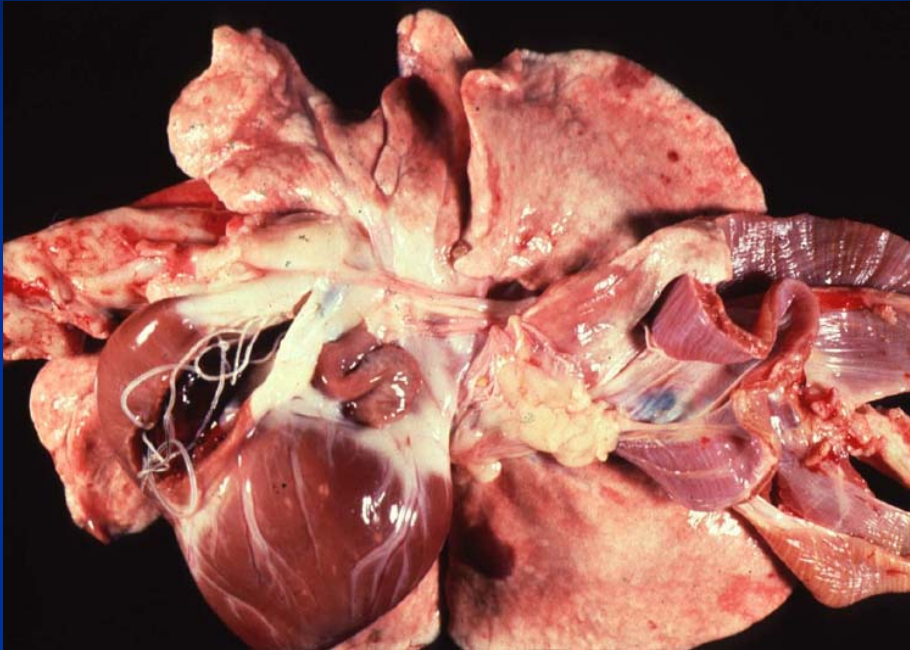
Filaroides hirthi



Dirofilariasis

- Affected species: dog, cat (infrequent)
- Disease
 - Cardiac: adult worms
 - Pulmonary artery: endarteritis, intimal proliferation
 - Lung:
 - Larvae – granulomas, interstitial eosinophilic pneumonia
 - Adults – congestive heart failure, interstitial pneumonia
 - Dead adults - embolism/infarcts
 - Renal: immune complex glomerulonephritis

Dirofilariasis



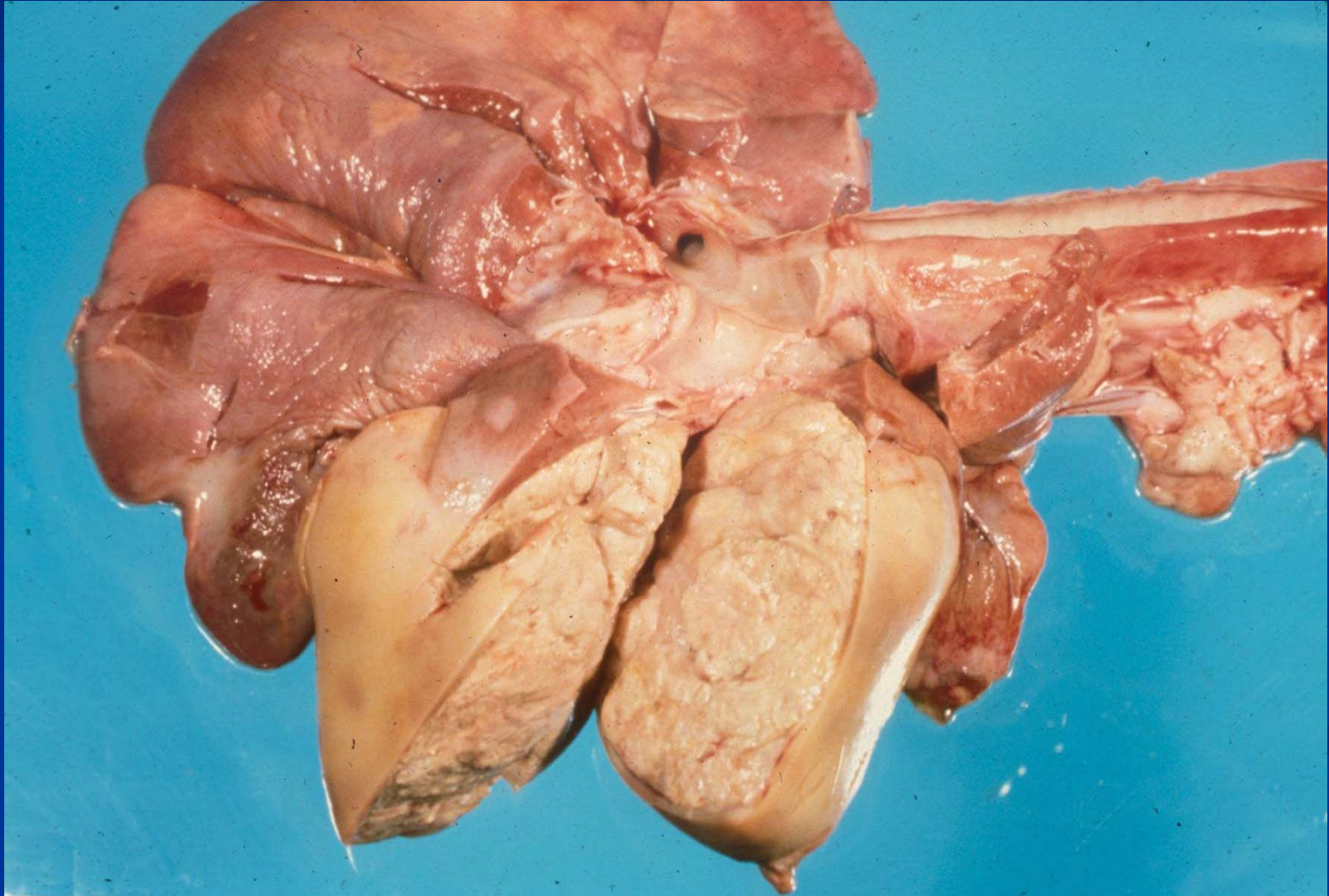
Paragonimus kellicotti

- Fluke of dogs and cats
- Multifocal cysts in lung
- Can occasionally rupture thru pleura and result in pneumothorax

Neoplasia

- Primary pulmonary neoplasia
 - Rather rare in domestic animals
 - Most epithelial
 - Generally solitary
 - Carcinomas most common
 - Mesenchymal tumors
 - Lymphomatoid granulomatosis

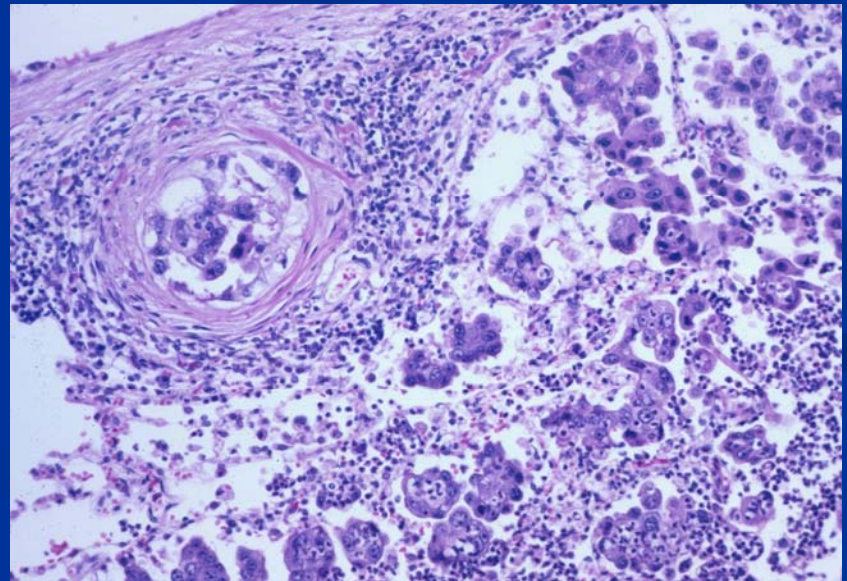
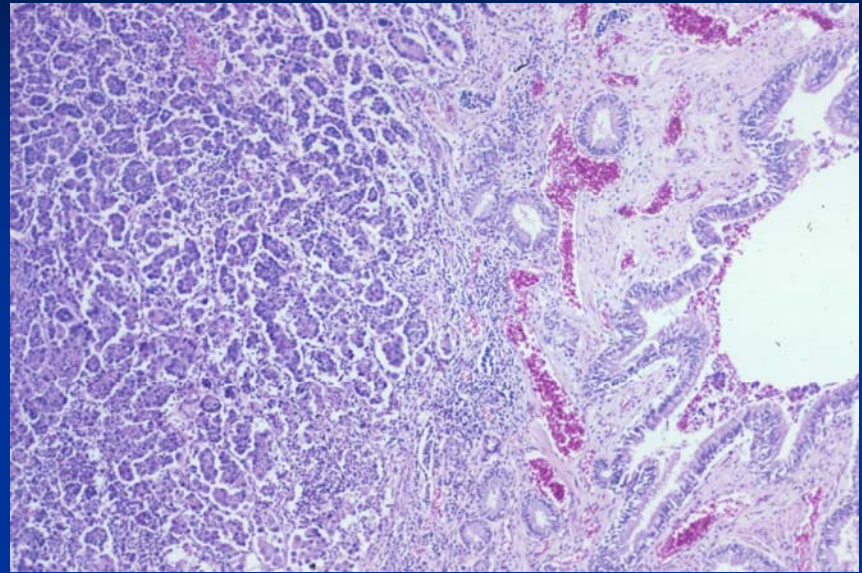
Pulmonary Neoplasia—Dog



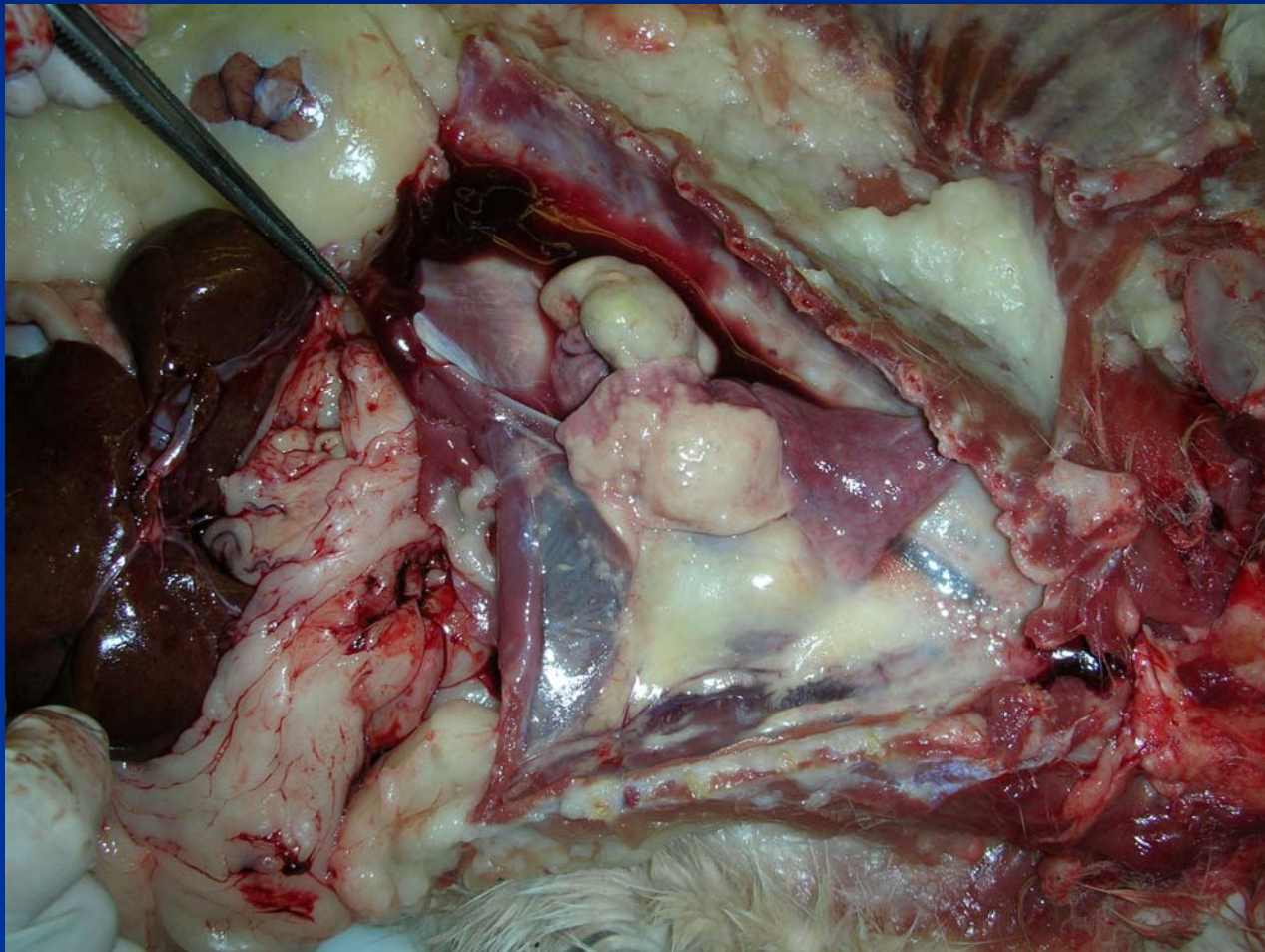
Primary Epithelial Tumors

- Benign are rare
 - Papillary adenoma
 - Broncholar-alveolar adenoma
- Malignant
 - Adenocarcinoma, papillary or acinar
 - Squamous cell carcinoma
 - Adenosquamous carcinoma
 - Bronchiolar-alveolar carcinoma
 - Small and large cell carcinoma
 - Anaplastic carcinoma
- Cats – metastasis to digit

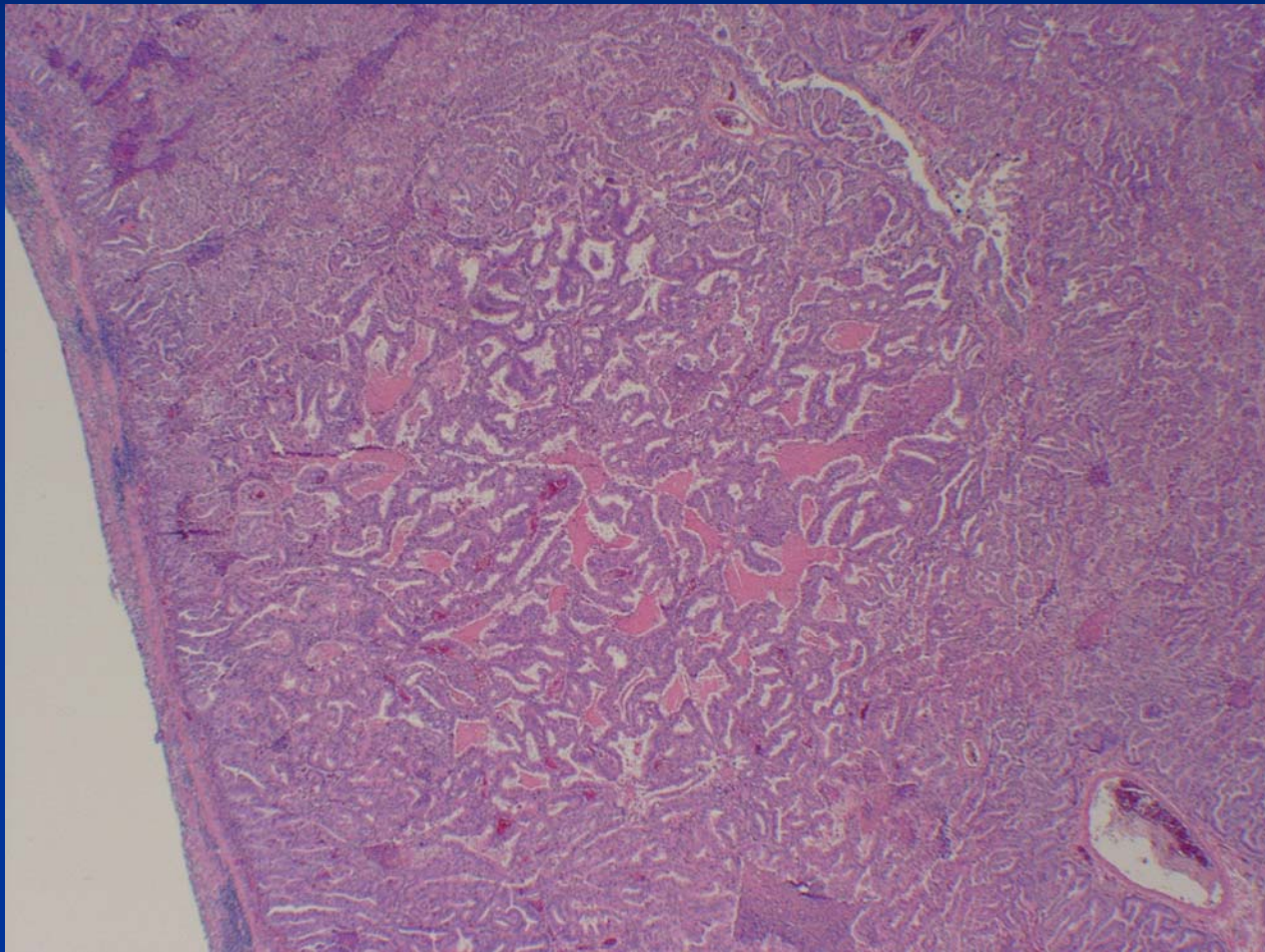
Bronchogenic Carcinoma—Dog



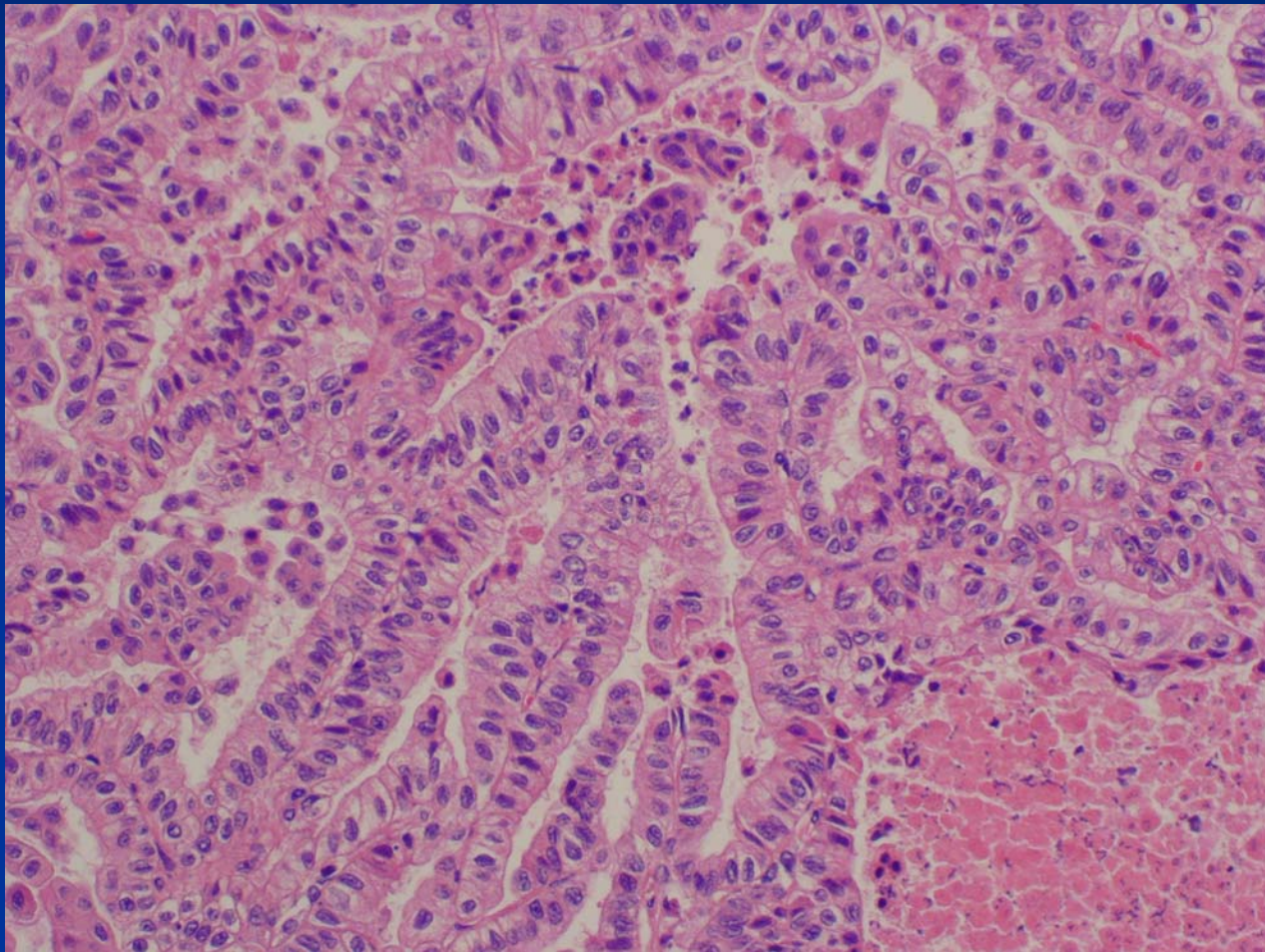
Bronchogenic Carcinoma—Cat



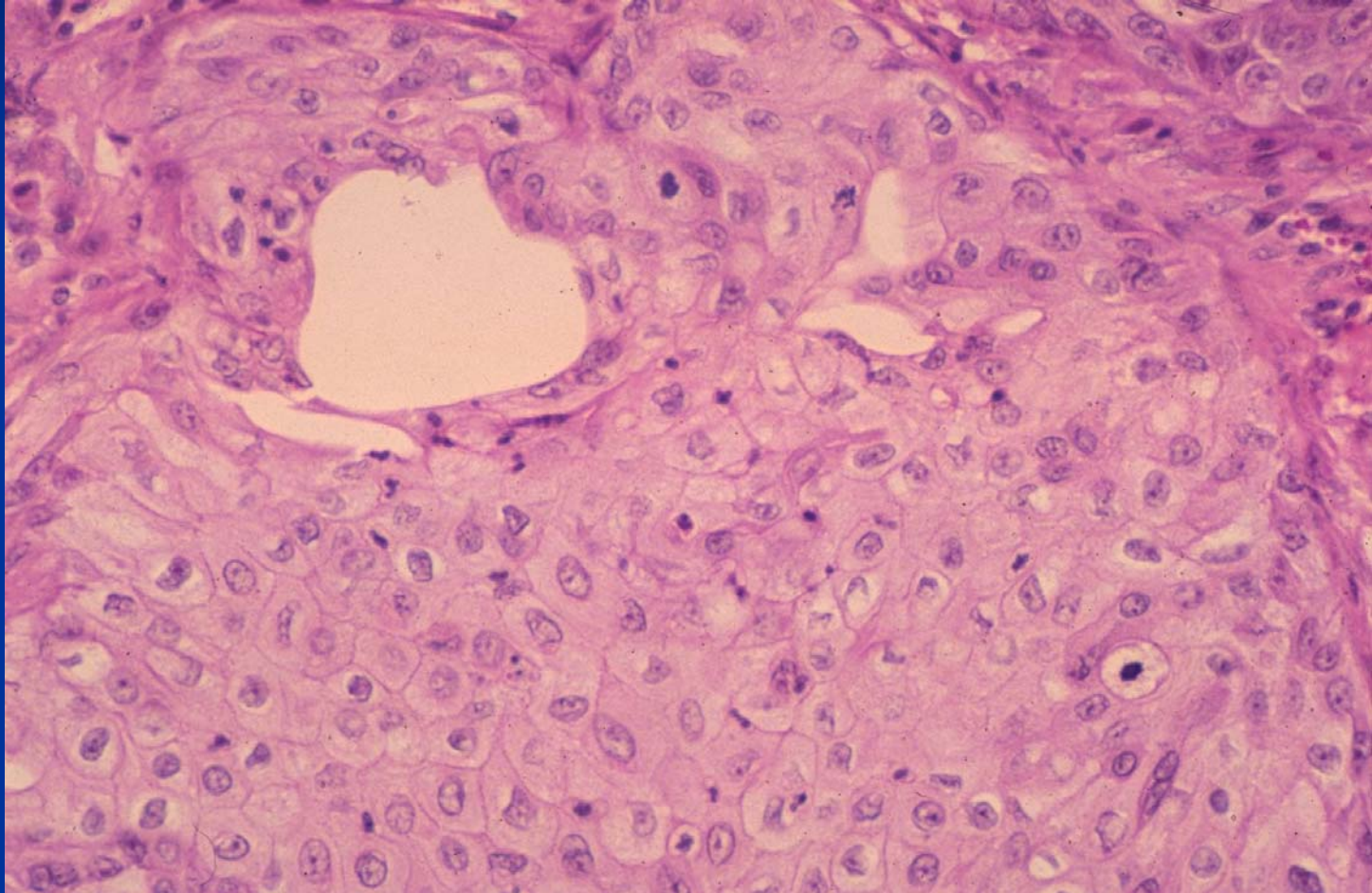
Bronchiolar-Alveolar Carcinoma— Cat



Bronchiolar-Alveolar Carcinoma— Cat



Squamous Cell (Epidermoid) Carcinoma—Cat



Mesenchymal Tumors

- Osteo- and chondro- sarcomas
- Hemangiosarcoma
- Malignant histiocytosis
- Lymphomatoid granulomatosis
- Granular cell tumor

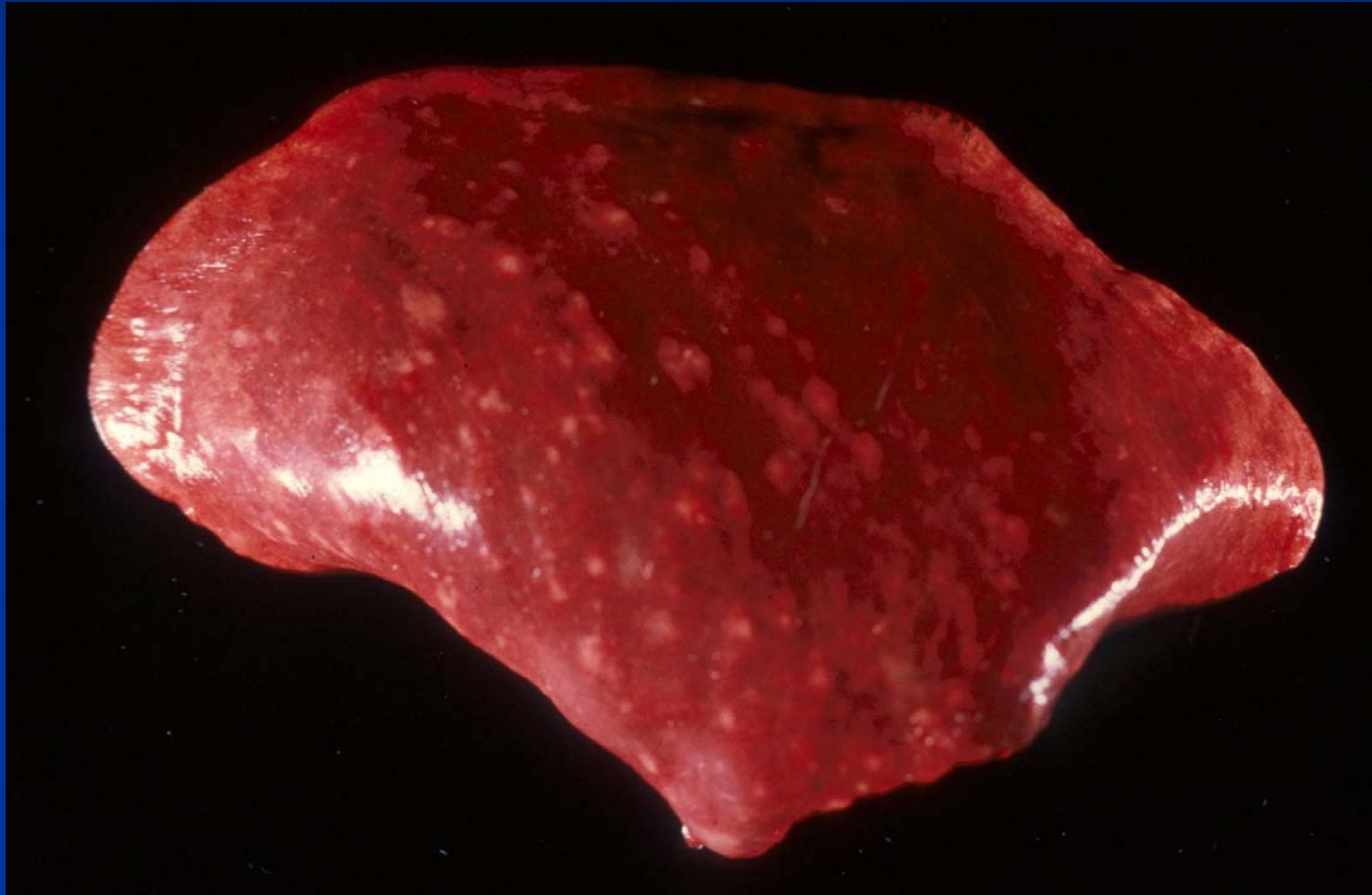
Lymphomatoid Granulomatosis

- Nodules or large masses in one or more lobes
- Frequently metastasize – lymph nodes, kidneys and liver
- Large pleomorphic mononuclear (lymphomatoid) cells
 - High mitotic rate
 - Phenotypic markers indicate mixture of B- and T-lymphocytes and histiocytes
- Often lots of eosinophils
- Perivascular distribution and vasoinvasive

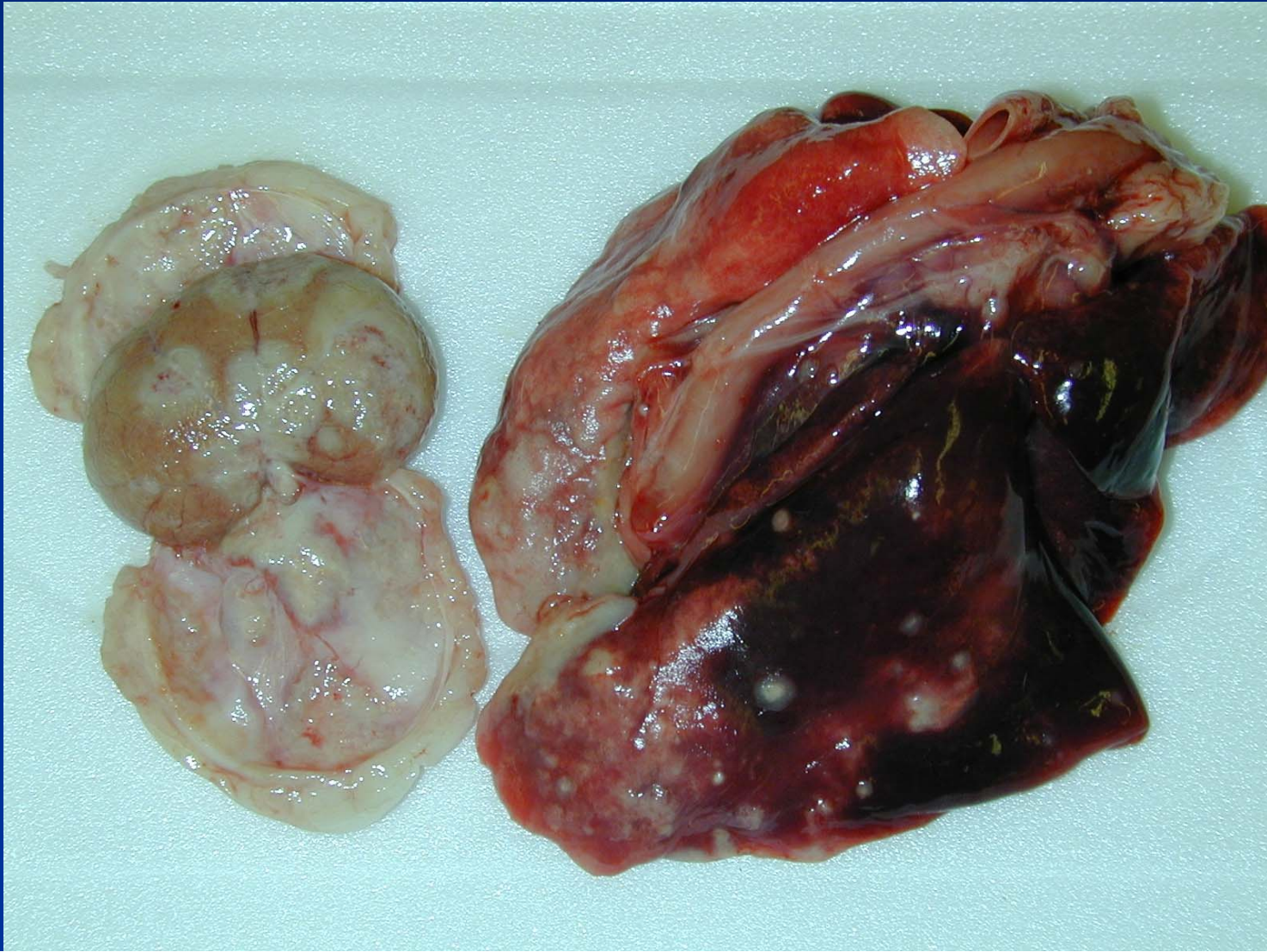
Neoplasia

- Secondary (metastatic) neoplasia more common
 - Adenocarcinoma (especially mammary, thyroid origin)
 - Osteosarcoma /chondrosarcoma
 - Vaccination site fibrosarcoma of cats
 - Hemangiosarcoma especially atrial origin
 - Malignant melanoma in dogs
 - Lymphosarcoma

Metastatic Adenocarcinoma - Dog

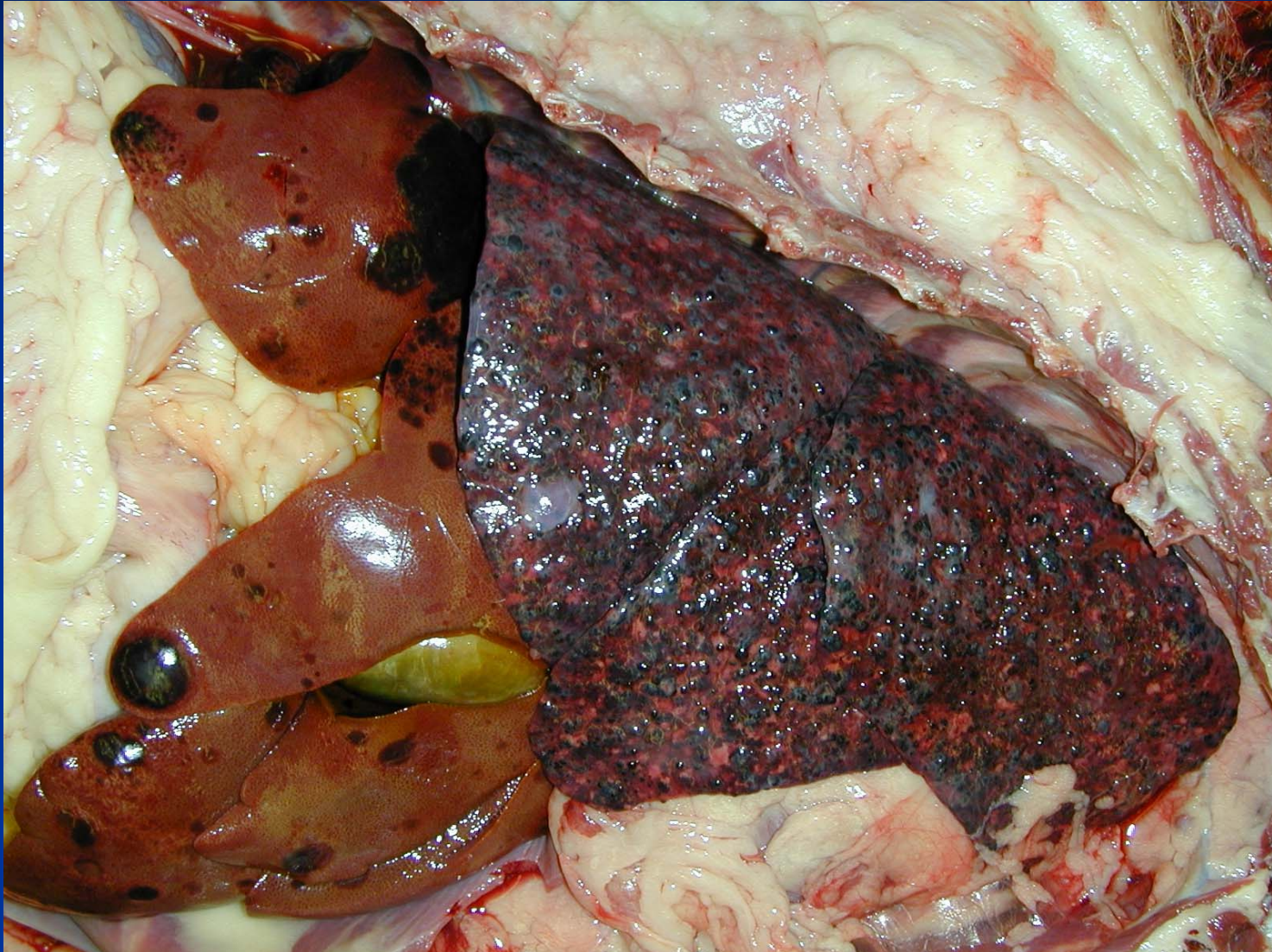


Mammary Tumor Metastatic to Lung – Cat

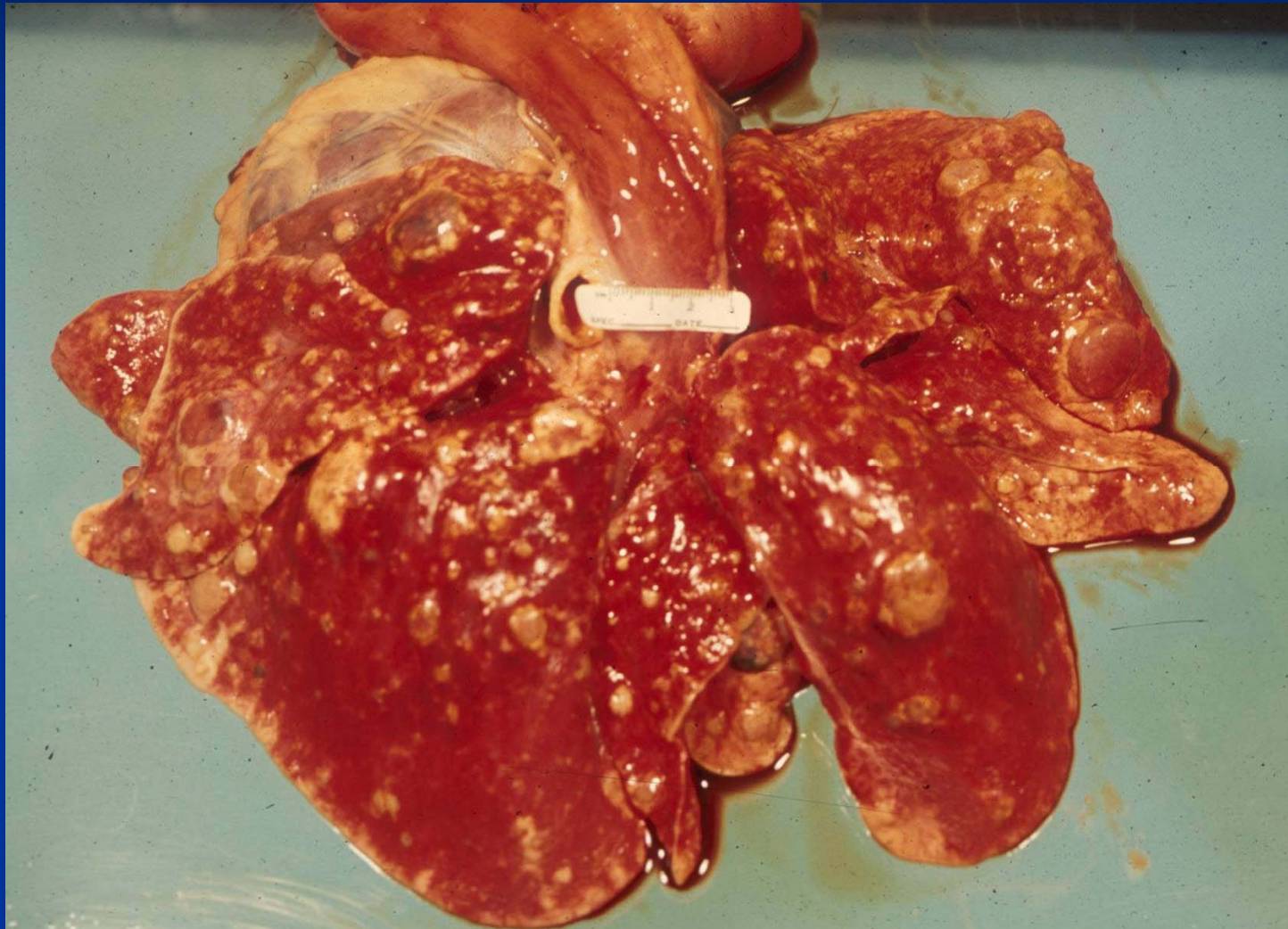


Hemangiosarcoma – Dog

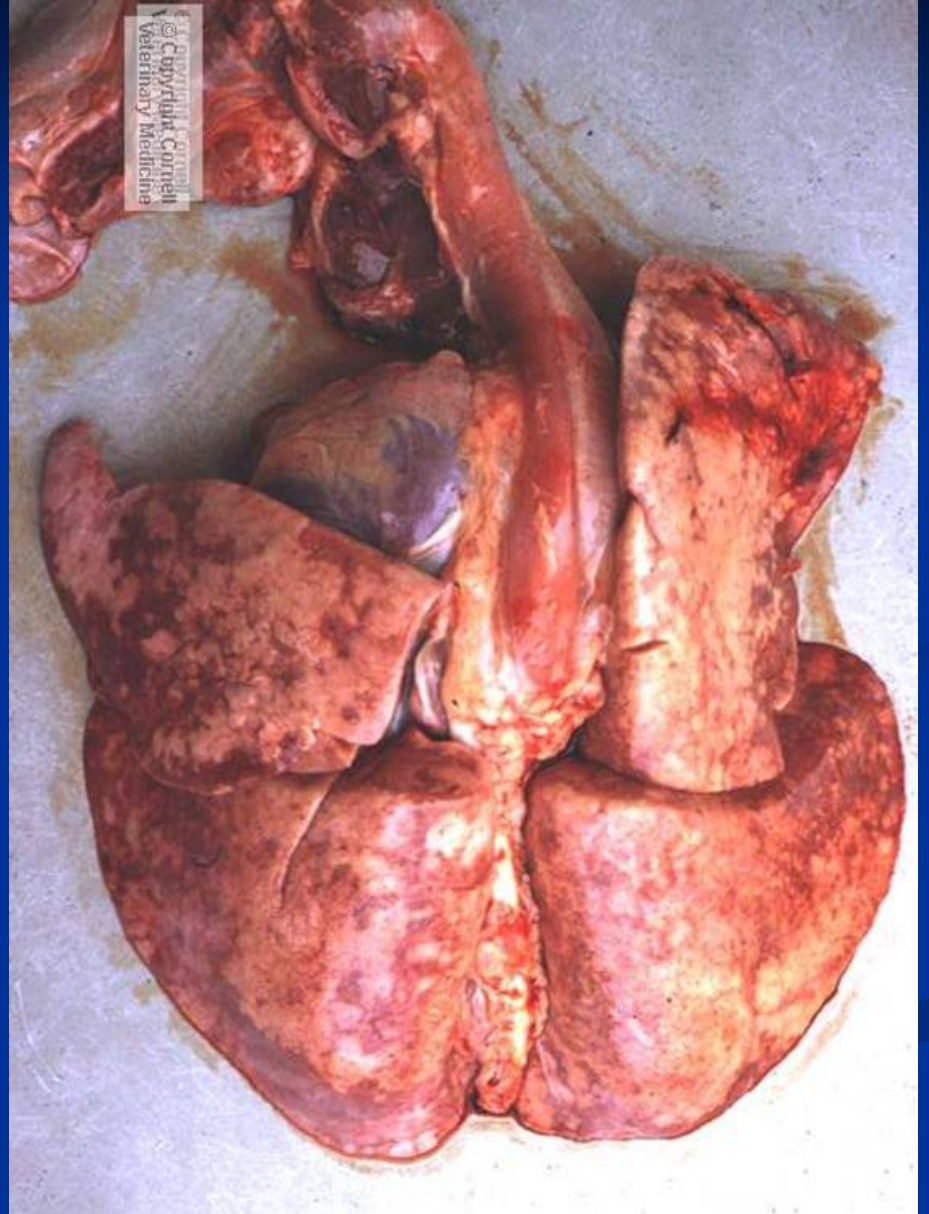
Metastatic from Atrium



Metastatic Chondrosarcoma - Dog



Lymphosarcoma —Dog



Diseases of the Pleura and Thoracic Cavity

- Pneumothorax
 - Lungs are atelectatic
 - Rupture of *Paragonimus* cysts
 - Trauma, may be iatrogenic
- Hydro-, Chylo-, Hemo-thorax
- Pleuritis/Pyothorax
- Neoplasia - mesothelioma

Primary Pleuritis

- Viral
 - Feline Infectious Peritonitis - cats
 - Immune complex vasculitis
 - Cats imported into Australia to star in Babe II movie (personal communication)
- Bacterial
 - *Nocardia*, *Actinomyces*, *Bacteriodes* spp.
 - Pygranulomatous pleuritis
 - Blood stained exudate (“tomato soup”) with sulfur granules
- Mycotic – *Aspergillus* sp

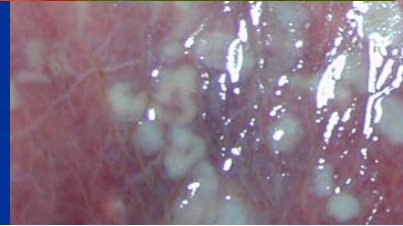
Primary Pleuritis - FIP



Aspergillosis - Dog



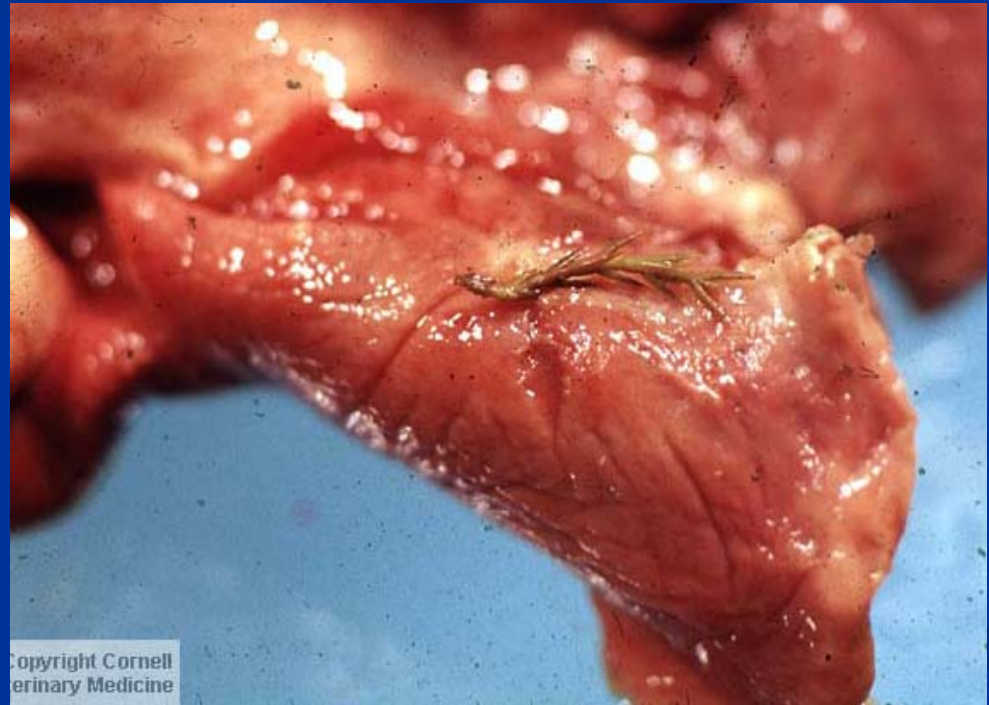
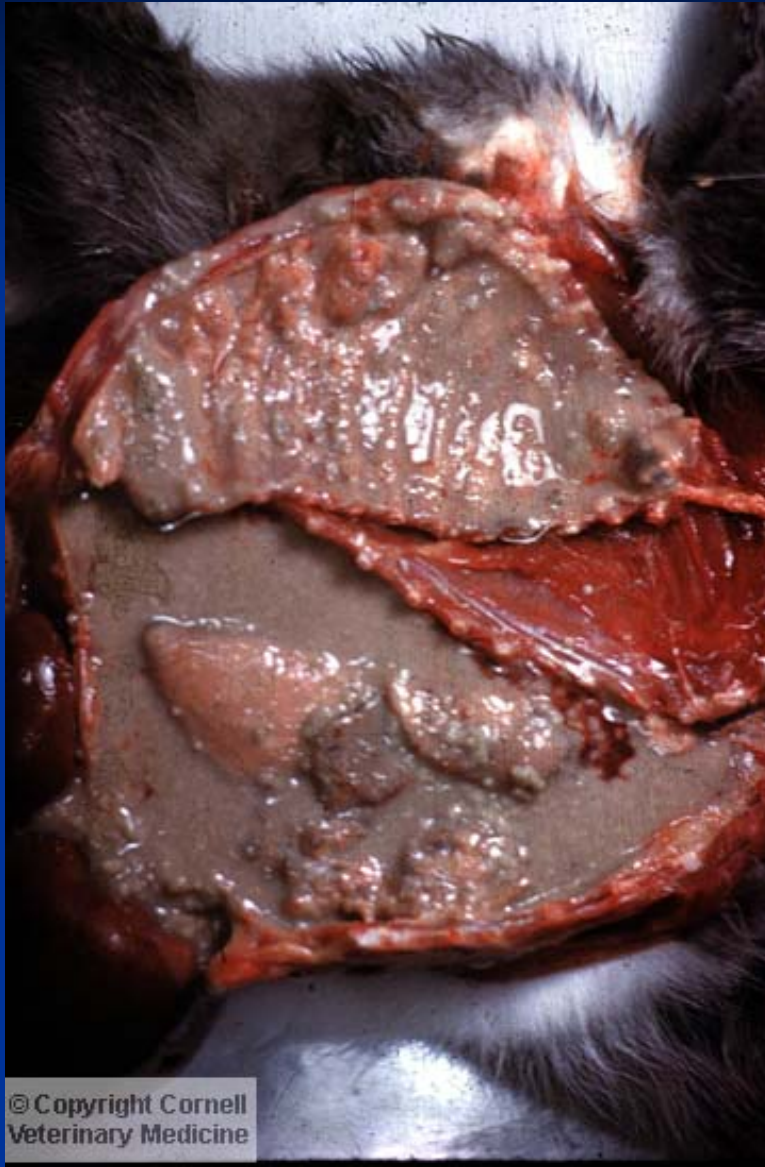
Aspergillosis



Secondary Pleuritis/Pyothorax

- Extension of pneumonia
- Traumatic penetration
 - Awns
 - Bite wounds
- Ruptured lung abscess
- Pyothorax usually has mixture of bacteria
 - *A. pyogenes*, *P. multocida*, *F. necrophorum*

Pyothorax— Traumatic Penetration - Cat



Awn that Migrated in a Cat Causing Pleuritis

