Pathology of the Lungs of Domestic Animals
Presentation #5

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Case 37. Feedlot steer, 62 days on feed
Lung rubbery, fails to collapse, emphysema

- Morphologic diagnosis
- Suggest 2 causes
Case 37. Feedlot steer, 62 days on feed
Cranioventral chronic bronchopneumonia
Dorsocaudal lung fails to collapse, rubbery texture, emphysema

• Morphologic diagnosis (dorsocaudal lung)

• Two causes
  – 1.
  – 2.
Case 46. Dog, age 4 months, progressive dyspnea <1h after physical abuse by owner

Additional details of the clinical history

- Morphologic diagnosis
- Possible cause
Case 46. Dog, age 4 months,
progressive dyspnea <1h after physical abuse by owner

Morphologic diagnosis & mechanism
  a) Oxygen-induced lung damage
  b) Pulmonary contusion due to trauma
  c) Diffuse alveolar damage due to partial asphyxia
  d) Diffuse alveolar damage due to whole-body trauma
  e) Protein-rich edema due to epinephrine release
Causes of alveolar ± bronchiolar damage

1. Viral infection
   a. Cytolytic viral infection of respiratory epithelium

2. Toxins
   1. Metabolized toxin
   2. Inhaled direct-acting toxin

3. Sepsis / Systemic inflammatory response syndrome

4. Trauma, CNS injury: (epinephrine release?)

5. Other: Hypersensitivity, trauma, heat, uremia, overventilation, surfactant dysfunction
Case 13. Dog, age 8 years, acute respiratory distress

- Morphologic diagnosis
- Predisposed breed
Case 13. Dog, age 8 years, acute respiratory distress

• Morphologic diagnosis

• Predisposed breed
  a) Boxer
  b) Cavalier King Charles spaniel
  c) Deutsche dogge
  d) West Highland white terrier
  e) Yorkshire terrier
3. Interstitial lung disease “Interstitial pneumonia”

Interstitium = alveolar septa + interlobular septa + vessels
“tissue other than airways”

- Injury to alveolar epithelium or endothelium
- Etiology: viruses, toxins, hypersensitivity, idiopathic
- Gross lesions: diffusely rubbery
- Histologic lesions
  - Hyaline membranes
  - Repair: proliferation of type II pneumocytes, interstitial fibrosis
Case 2. Dairy cow
Dyspnea 12h after calving; death <12h later

• Morphologic diagnosis
• Possible underlying cause
Case 2. Dairy cow
Dyspnea 12 hours after calving
Postmortem examination by practitioner;
no other lesions reported

• Morphologic diagnosis
Case 2. Dairy cow
Dyspnea 12h after calving; death <12h later
Postmortem examination by practitioner; no other lesions reported

Mechanism of the lung lesion?
  a) Mammary thrombus embolizes to lung
  b) Mammary thrombosis consumes coagulation factors
  c) Hypotension causes pulmonary infarcts
  d) Endotoxin damages lung endothelial cells
  e) Cytokines stimulate lung endothelial cells
Causes of alveolar ± bronchiolar damage

1. Viral infection
   a. Cytolytic viral infection of respiratory epithelium
2. Toxins
   1. Metabolized toxin
   2. Inhaled direct-acting toxin
3. Sepsis / Systemic inflammatory response syndrome
4. Trauma, CNS injury: (epinephrine release?)
5. Other: Hypersensitivity, trauma, heat, uremia, overventilation, surfactant dysfunction
Case 32. Dog, age 4 yrs
IMHA: immune-mediated hemolytic anemia
immuno-suppressive therapy, transfused

• 2 morphologic diagnoses
• Pathogenesis of lesions
Case 32. Dog, age 4 yrs
IMHA: immune-mediated hemolytic anemia
immuno-suppressive therapy, transfused

What cell type initiates this lesion?

a) Kupffer cell
b) Megakaryocyte
c) Pulmonary alveolar macrophage
d) Pulmonary intravascular macrophage
Case 32. Dog, age 4 yrs
IMHA: immune-mediated hemolytic anemia
immuno-suppressive therapy, transfused

• 2 morphologic diagnoses

• Pathogenesis: cause → → → → observed lesions
Write an answer, please!
Case 32. Dog, age 4 yrs

**IMHA**: immune-mediated hemolytic anemia

immuno-suppressive therapy, transfused

Pathogenesis:
Case 12. Acute onset in a group of yearling feedlot cattle

- Morphologic diagnosis
- Specific cause
Case 12. Acute onset in a group of yearling feedlot cattle

Specific cause

a) Suggestive of viral infection
b) Bovine respiratory syncytial virus
c) Bovine herpesvirus 1
d) Bovine cytomegalovirus
Canine distemper 17-028559-7 what is the best evidence for bronchiolar necrosis?
Case 40. Young pigs; respiratory disease, also in source sow herd

- 2 morphologic diagnoses
- Possible causes of each
Case 40. Young pigs; respiratory disease, also in source sow herd

- Morphologic diagnoses; possible causes of each

1.

2.

3.

4.
Case 21. Dog, age 2 years.
Harsh lung sounds, vomiting, lethargy

- Morphologic diagnosis
- Possible underlying cause
Case 21. Dog, age 2 years.
Harsh lung sounds, vomiting, lethargy

Most likely underlying cause

a) Sepsis
b) Renal failure
c) Canine influenza virus
d) Lung lobe torsion
Case 21. Dog, age 2 years.
Harsh lung sounds, vomiting, lethargy

- Morphologic diagnosis
- Possible underlying cause
Different case
Causes of alveolar ± bronchiolar damage

1. Viral infection
   a. Cytolytic viral infection of respiratory epithelium

2. Toxins
   1. Metabolized toxin
   2. Inhaled direct-acting toxin

3. Sepsis / Systemic inflammatory response syndrome

4. Trauma, CNS injury: (epinephrine release?)

5. Uremia

6. Other: Hypersensitivity, trauma, heat, uremia, overventilation, surfactant dysfunction
Case 18. Pig, age 24 days
Recently weaned. Organic herd.

- Morphologic diagnosis
- Possible cause
Collapse vs interstitial pneumonia?
Collapse vs interstitial pneumonia?
Case 18. Pig, age 24 days
Recently weaned. Organic herd.

Most likely cause
a) Influenza virus
b) Classical swine fever virus
c) Porcine reproductive and respiratory syndrome virus
d) Mycoplasma hyopneumoniae
e) Actinobacillus pleuropneumoniae
Case 18. Pig, age 24 days
Recently weaned. Organic herd.

• Morphologic diagnosis

• Testing
Respiratory Diseases of Swine

1. PRRS
2. Porcine circovirus
3. Swine influenza
4. *Mycoplasma hyopneumoniae*
   - Craniocentral bronchopneumonia
5. Opportunistic bacterial pneumonia
6. *Actinobacillus pleuropneumoniae*
   - Bronchopneumonia: middle/caudal lobe, fibrinonecrotic
Infectious Agents

M. hyopneumoniae, PRRSV, circovirus, influenza virus

Pig Factors

Environmental & Social Stresses
Genetics Nutrition Vaccination

Environment

Ammonia Dust
Heat Cold Humidity

Pneumonia
What is the defining histologic characteristic of interstitial pneumonia?

a) Lesions affecting the “non-airway” tissue of the lung
b) Hypercellularity of alveolar septa
c) Hyaline membranes or type II pneumocyte proliferation
Causes of alveolar ± bronchiolar damage

1. Viral infection
   a. Cytolytic viral infection of respiratory epithelium
   b. Macrophage-infecting viruses that elicit inflammation (PRRSV)

2. Toxins
   1. Metabolized toxin
   2. Inhaled direct-acting toxin

3. Sepsis / Systemic inflammatory response syndrome

4. Trauma, CNS injury: (epinephrine release?)

5. Uremia

6. Other: Hypersensitivity, trauma, heat, uremia, overventilation, surfactant dysfunction
Case 36. Feedlot heifer, 142 days on feed
Lung rubbery, fails to collapse, emphysema

• Morphologic diagnosis
• Suggest 2 causes
Case 36. Feedlot heifer, 142 days on feed
Lung rubbery, fails to collapse, emphysema

- Morphologic diagnosis (dorsocaudal lung)

- Suggest 2 causes,
  for a sporadic disease in feedlot cattle
Case 3. Adult mare
Respiratory signs >4 months duration

- Morphologic diagnosis
- Specific cause
Case 3. Adult mare
Respiratory signs >4 months duration

• Morphologic diagnosis

• Specific cause
Causes of alveolar ± bronchiolar damage

1. Viral infection
   a. Cytolytic viral infection of respiratory epithelium
   b. Macrophage-infecting viruses that elicit inflammation (PRRSV), or reparative responses (EHV-5)

2. Toxins
   1. Metabolized toxin
   2. Inhaled direct-acting toxin

3. Sepsis / Systemic inflammatory response syndrome

4. Trauma, CNS injury: (epinephrine release?)

5. Uremia

6. Other: Hypersensitivity, trauma, heat, uremia, overventilation, surfactant dysfunction
Dog, lung, incidental finding at post-mortem examination
Causes of alveolar ± bronchiolar damage

1. Viral infection
   a. Cytolytic viral infection of respiratory epithelium
   b. Macrophage-infecting viruses that elicit inflammation (PRRSV), or reparative responses (EHV-5)

2. Toxins
   1. Metabolized toxin
   2. Inhaled direct-acting toxin
   3. Inhaled inorganic dust

3. Sepsis / Systemic inflammatory response syndrome

4. Trauma, CNS injury: (epinephrine release?)

5. Uremia

6. Other: Hypersensitivity, trauma, heat, uremia, overventilation, surfactant dysfunction
Acute Interstitial Lung Injury

**Direct lung injury**
- Infectious agents: viruses, protozoa, (bacteria)
- Acid aspiration
- Pulmonary contusion
- Inhaled gases incl O$_2$
- Metabolized toxins
- Near drowning
- Thermal injury
- Ventilator-induced lung injury
- Surfactant dysfunction
- Ischemia (torsion, infarct)

**Indirect lung injury**
- Sepsis & SIRS
- Massive trauma
- Epinephrine surge
- Uremia
- Fat embolism
- Acute pancreatitis
- Hypersensitivity, anaphylaxis, drug reaction
- Strangulation

+ Chronic: persistent viruses, inorganic dusts, autoimmune