

AVIAN RESPIRATORY ANATOMY, PHYSIOLOGY AND DISEASE

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- I. Normal anatomy/physiology; vocabulary terms
 - A. Upper respiratory tract
 - a. Cere
 - b. Nares
 - c. Operculum
 - d. Birds have an incomplete hard palate with a median fissure
 - i. Choanae (internal nares)
 - ii. Choanal slit
 - iii. Choanal papillae
 - iv. Infundibular cleft
 - e. Birds have one paranasal sinus: infraorbital sinus (IOS)
 - f. The IOS has diverticula
 - g. The upper airway is relatively unprotected
 - i. Glottis
 - ii. No epiglottis
 - B. Trachea
 - a. Complete, overlapping rings
 - b. Long and flexible
 - c. Large diameter
 - d. Syrinx: the site of vocal production
 - i. Distal trachea
 - ii. Modified cartilages and muscles
 - e. Bifurcates in primary bronchus, secondary bronchi and then parabronchi within lung
 - C. Lower respiratory tract
 - a. The avian lungs are located dorsally, fixed in place
 - b. The air capillary off atria of parabronchi; analogous to the alveolus
 - c. The air sacs serve as bellows
 - D. Respiration
 - a. Low respiratory rate and minimally visible is normal
 - b. Two breath cycle: Inspiration > Expiration > Inspiration > Expiration
 - c. Unidirectional air flow
 - d. Cross current blood flow
 - e. Gas exchange in parabronchi, atria and air capillary
 - i. Best in air capillary
 - ii. Blood-gas barrier thinner
 - iii. Smaller diameter of air capillary
 - iv. Greater density of air capillary to alveoli
- II. Clinical signs of respiratory disease; Five areas for diseases
 - A. Upper respiratory disease (infection, allergy, foreign body, tumor)
 - a. Open-mouthed breathing without dyspnea
 - b. Nasal discharge
 - c. Abnormal beak with chronic disease (groove, etc)
 - d. Abnormal shape of naris
 - e. Nasal plug
 - f. Facial swelling

- B. Large airway disease (granuloma, foreign body, thyroid)
 - a. History of voice change
 - b. Exaggerated respiratory click
 - c. Open-mouthed breathing
 - d. Increased expiratory effort
 - e. Wet, sterterous sounds
 - C. Small airway disease (inhaled toxins, smoke, asthma)
 - a. Open-mouthed breathing
 - b. Wide-based stance, wings abducted
 - c. Expiratory squeak
 - D. Pulmonary parenchymal disease (lungs and air sacs)
 - a. Nebulous signs; quiet, poor appetite, decreased activity
 - b. Increased respiratory rate and effort
 - c. Mild to moderate tail-bob
 - d. Not usually open-mouthed breathing
 - E. Coelomic disease (ascites, egg, mass)
 - a. Loss of air sac volume
 - b. Tachypnea
 - c. Short, shallow respirations
- III. Emergent treatment of respiratory disease
- A. Move to warm oxygen cage immediately; allow time to rest before treatment if possible
 - B. During movement to oxygen cage; brief physical examination
 - a. Palpate abdomen for mass, fluid
 - b. Palpate keel for body condition
 - c. Palpate crop for presence of food/liquid
 - d. Assess hydration
 - C. Treatment of upper respiratory disease
 - a. Remove any nasal plugs
 - b. Cytology of plug and discharge
 - c. Nasal flush
 - d. Topical and systemic treatments may be warranted
 - D. Treatment of large airway disease
 - a. Terbutaline 0.1mg/kg IM may help
 - b. Air sac cannula may be needed
 - i. Anesthetize bird if possible
 - ii. Place on right side, caudal to ribs, cranial to thigh, just below vertebrae
 - iii. Use tracheal tube or red rubber tube
 - iv. Suture into place with purse-string and finger knot
 - E. Treatment of small airway disease
 - a. Terbutaline 0.1mg/kg IM
 - b. Diphenhydramine 1-2mg/kg IM
 - c. Nebulize and ventilate with terbutaline for inhaled toxin
 - F. Treatment of coelomic disease
 - a. Remove fluid if present (cytology/culture)
 - b. Keep quiet and avoid stress
 - c. Remove egg if present
- IV. Diseases of the respiratory tract
- A. Nares, nasal cavity
 - a. Foreign body
 - i. Clear to mucopurulent discharge
 - ii. Remove with flushing
 - iii. Endoscopy or biopsy
 - b. Rhinoliths or nasal granuloma
 - i. Malnutrition, air quality, low humidity play roles
 - ii. Wheezing, sneezing, discharge

- iii. Debride and remove material
 - iv. Submit for cytology/culture
 - v. Topical and systemic treatment
 - c. Rhinitis
 - i. Infection, allergy, irritation
 - ii. Discharge reflects cause
 - iii. Environmental factors can play role: dust, low humidity, smoke, aromatic oils
 - iv. Bacteria include: *Klebsiella*, *Pseudomonas*, *E. coli*, *Enterobacter*, *Mycoplasma* (small birds), *Chlamydia*.
 - v. Aspergillosis in some species
 - vi. Culture, flush, systemic and topical treatment
 - d. Infraorbital sinus
 - i. Infection, hypovitaminosis A
 - ii. Caseous exudate difficult to remove
 - iii. Surgical debridement may be needed
- B. Trachea
 - a. Tracheitis
 - i. Bacteria; gram negative, *Staphylococcus*, *Streptococcus*
 - ii. Fungal; aspergillosis most common
 - iii. Viral; uncommon in pet birds
 - iv. Granulomas form at bifurcation
 - v. Radiographs and endoscopy helpful for diagnosis and removal
 - b. Foreign body
 - i. Aspiration of small material
 - ii. Usually obstruct at level of bifurcation
 - iii. Visible radiographically or via endoscopy
 - iv. Removal with endoscopy or tracheotomy
 - c. Other disease
 - i. Bite wound and infection; cat, dog, bird
 - ii. Trauma during flight (wild birds)
 - iii. Thyroid mass
- C. Lungs and air sacs
 - a. Neoplasia
 - i. Uncommon
 - ii. Primary: adenoma, carcinoma, bronchial carcinoma
 - b. Asthma
 - i. Common in macaws
 - ii. History of environmental contaminants
 - iii. Quick response to terbutaline and diphenhydramine
 - c. Infectious disease
 - i. Bacteria typically gram negative
 - ii. *Chlamydia* will have other signs with air sacculitis
 - iii. Viral diseases less common in pet birds (pox, paramyxovirus)
 - iv. Parasitic infections in outdoor birds (*Sarcocystis*, *Syngamus*, *Sternosoma*)
 - d. Aspiration pneumonia
 - i. Caudal lungs and air sacs (radiographs)
 - ii. Food and fluid can cause
 - iii. History of hand-feeding, vomiting, etc
 - e. Toxins
 - i. Very sensitive due to physiology
 - ii. Smoke, CO, CO₂, aromatic chemicals, teflon
 - iii. Acute onset pulmonary edema, hemorrhage
 - iv. Chronic pneumoconiosis can occur
- D. Coelomic disease
 - a. Fluid accumulation
 - i. Transudate: liver disease, hypoproteinemia, inflammation, neoplasia

- ii. Exudate: egg-yolk peritonitis, infection, neoplasia
- iii. Remove fluid for respiratory comfort and cytology
- iv. Ultrasound helpful diagnostically
 - a. Fluid in different compartments depending on cause