AVIAN RESPIRATORY DISEASES

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The avian respiratory system is highly efficient, but also highly susceptible to a variety of diseases. This lecture will summarize common respiratory diseases seen in pet birds and provide information on the diagnosis and treatment options for avian patients suffering from respiratory tract disease.

Anatomy and Physiology

The avian respiratory tract is substantially different and much more efficient compared to mammals. The upper respiratory tract in birds is characterized by an extensive infraorbital sinus, a choana, and a larynx that is lacking an epiglottis. In addition, the larynx is not used for voice production in birds; instead, this occurs in the syrinx. The trachea in birds is comparatively longer and wider compared to mammals, increasing ventilatory dead space. The tracheal rings are closed and the trachea bifurcates at the syrinx into the two primary bronchi. Air movement within the lower respiratory tract is complex, and involves movement between various air sacs and the lungs. During both inspiration and expiration fresh oxygenated air is moved through the parabronchi of the lungs, the site of gas exchange. This unique mechanism makes the avian respiratory system much more efficient, but also makes birds much more susceptible to airborne toxins. The air sacs are thin-walled poorly vascularized membranes, which outline the entire coelom and cover the coelomic organs. The lung volume does not change during inspiration or expiration, like in mammals, and a diaphragm is lacking. Therefore, air is moved in and out of the lungs by changes in air sac volume, secondary to movement of the keel and body wall. Since the air sacs are extensive and are critical in the ventilation of the lungs, any process which leads to compression of the air sacs, such as organ enlargement, intracoelomic fluid accumulation, obesity or an intracoelomic mass can lead to respiratory problems.

Clinical Signs

Clinical signs vary greatly and depend on the underlying cause, chronicity of disease and area of the respiratory system affected. Due to the presence of the choana most nasal secretion drain directly into

the oral cavity and get swallowed. Therefore, nasal discharge and sneezing is less common in birds with upper respiratory tract (URT) disease compared to mammals. Crusting around the nares, mucoid discharge or cellular debris accumulated in the choanal slit may be present in birds with URT disease. Periorbital swelling is a common finding in birds with infections of the infraorbital sinus.

A visual examination prior to manual restraint should always be performed. Tail bobbing is a common finding in dyspneic birds, indicating an increased effort to breathe. Coughing is rarely reported in birds, due to the lack of a diaphragm. Dyspnea is common in birds and is associated with lower respiratory tract disease. Stridor is uncommon in birds, but occurs in cases obstruction of the trachea or syrinx. A voice change can occur in cases of tracheal, syrinx or primary bronchial lesions. Tachypnea is a common finding in birds with lower respiratory tract disease affecting the air sacs and the lungs and leading to reduced gas exchange. Stress can also lead to tachypnea in birds and this should be considered as a differential. Administration of sedation will attenuate stress-induced tachypnea.
Coelomic distension is a common finding in birds evaluated for respiratory problems, since any intracoelomic process which results in compression of the coelomic air sacs can lead to respiratory signs. Heart murmurs are a possible indication of an underlying cardiac problem, and congestive heart failure can lead to respiratory signs, secondary to pulmonary edema and coelomic (peri-hepatic) fluid accumulation.

Diagnostics

Depending on the bird's condition, diagnostics may need to be delayed until the patient has been stabilized. Acute decompensation and death is a significant risk in birds presenting in respiratory distress. Limiting handling, manual restraint and other environmental disturbances are important. Sedation is recommended for all dyspneic or tachypneic avian patients. Midazolam or midazolam-butorphanol administered intramuscularly results in mild-moderate dose-dependent sedation, which will facilitate manual restraint, diagnostic sample collection and therapeutic interventions, if necessary. Birds in respiratory distress should be immediately placed in an oxygen enriched environment (i.e. incubator) prior to any manual restraint, and manual restraint and physical exam may have to be performed in stages if the patient is at risk of decompensating.
A thorough examination of the oral cavity, choanal slit and nares is important in cases of suspected URT disease. A nasal flush can be diagnostic and therapeutic in cases of URT disease. Physiological (0.9%) saline or a balanced electrolyte solution should be used and any material recovered following the flush

should be evaluated cytologically. Submission of the obtained samples for bacterial and/or fungal culture is not recommended, unless indicated by cytological evidence of an infection. Since the fluid collected during the nasal flush passed through the oral cavity, bacterial growth reported should be interpreted cautiously.

Auscultation of the lungs, air sacs and heart as well as palpation of the coelom for any distension or organomegaly are important steps to determine the cause and location of suspected lower respiratory tract disease.

Whole body radiographs performed under sedation are in most cases the next recommended step. However, a dyspneic patient may not tolerate restraint for this procedure. Therefore pre-oxygenation, oxygen flow-by and sedation may need to be considered. In cases of severe dyspnea, general anesthesia may be indicated, if the patient can either be endotracheally intubated or an air-sac tube can be placed (in cases of tracheal or primary bronchial obstruction). Lateral and ventrodorsal radiographs should be performed and care should be taken to properly position the bird, since otherwise the diagnostic value of the obtained radiographs is greatly reduced.

If available, computed tomography is always preferred over radiographs for evaluation of the respiratory tract in birds. CT scans can be performed under sedation or even in unsedated birds, without any manual restraint, making CT scans a safer diagnostic imaging option. The diagnostic value of CT scans for evaluation of the upper and lower respiratory tract is much higher compared to radiographs. CT scans allows for ruling out tracheal, syringeal, and bronchial obstructions, which cannot be achieved by radiography. The lungs and air sacs can be evaluated much better by CT scan and intracoelomic organomegaly, masses or fluid accumulation can be diagnosed much more reliably compared to radiographs.

A complete blood count (CBC) should be performed in most avian patients, in order to assess for an underlying inflammatory and/or infectious cause as well as to assess the red blood cells. Many birds suffering from chronic respiratory disease will develop polycythemia, due to the reduced oxygenation occurring. A biochemistry profile may aid in diagnosing concurrent organ disease (e.g. liver, kidney), but usually does not aid in establishing a primary diagnosis for the respiratory signs observed.

Endoscopy of the lower respiratory tract can be performed in birds, but patient size may limit its use in patients < 300 grams. Tracheoscopy can be performed in anesthetized birds after placement of an air sac catheter to maintain gaseous anesthesia. Laparoscopy by the left or right lateral approach allows for visualization of the air sacs and lungs, as well as sample collection for cytology, histopathology, fungal and bacterial cultures as well as PCR testing, if indicated.

Diseases of the upper respiratory tract

Rhinitis and sinusitis are often associated with low humidity, foreign bodies, neoplasia or choanal atresia in birds. Rhinoliths can form in the nares, particularly in African grey parrots. Frequently fungal organisms (e.g. Aspergillus) are associated with rhinoliths in this species. Infection of the infraorbital sinus are challenging to treat, due to the complex anatomy of the infraorbital sinus. Frequently surgical access to the sinus is required to removed larger amounts of inflammatory debris, to collect diagnostic samples and to administer medications directly into the sinus.

Hypovitaminosis A has been suggested to be a common cause for upper respiratory diseases in birds. It is likely that insufficient dietary vitamin A or beta-carotenes will predispose animals to the development of URT diseases. Therefore, in all avian patients diagnosed with URT disease, the diet should be reviewed and vitamin A supplemented, if considered appropriate.

Nasal flushes in birds are frequently used to aid in the treatment of URT diseases. The flush removes inflammatory debris, rehydrates the nasal mucosa, and therefore aids in the healing of URT disease.

Diseases of the lower respiratory tract

In pet birds, a variety of non-infectious and non-respiratory diseases can lead to clinical signs consistent with respiratory disease. Any intracoelomic process which results in compression of the air sacs, may result in lower respiratory tract signs, mainly tachypnea and dyspnea in advanced cases. Common causes include reproductive tract disease leading to coelomitis, or an enlarged oviduct, hepatomegaly, severe obesity, or large neoplastic masses in the coelom. Fluid accumulation due to liver or heart disease will also lead to compression of the air sacs. Non-infectious causes which directly involve the lower respiratory tract include neoplasia of the lungs and less commonly air sacs, chronic pulmonary fibrosis, and pulmonary edema due to heart failure.

The most common infectious cause leading to lower respiratory tract in birds is Aspergillosis. African grey parrots, Amazon parrots and Pionus parrots appear to be more susceptible than other species. In birds, aspergillosis can be acute or chronic, with the chronic form being more common. The acute form is thought to be due to inhalation of an overwhelming number of spores (with or without immunocompromise). The acute form typically results in rapid colonization of the respiratory tract and subsequent death. The chronic form of the disease is considered to be related to immunosuppressive events. Both forms carry a poor prognosis.[5] Predisposing factors are include, poor hygiene, poor

ventilation, hypovitaminosis A, stress, prolonged antibiotic therapy, and recent transportation, among others.

Clinical signs of aspergillosis can be non-specific and are typically related to the location of the lesions. Vague signs can include inability to fly, anorexia, emaciation, change in voice or aphony, polydipsia, polyuria, and lethargy. Open mouth breathing, stridor, tail bob, and wheezing are all common respiratory signs reported with aspergillosis.

Diagnosis of aspergillosis in birds is typically multimodal. Radiographs and hematology have been suggested as diagnostic tests; however, these are considered non-specific and neither is able to definitively diagnose aspergillosis in birds. Endoscopy (tracheoscopy and coelioscopy) is the best way to visualize the respiratory tract and sample lesions for a definitive diagnosis. This is considered to be the gold standard for diagnosis. Diagnosis is considered confirmed if fungal elements (by cytology or histopathology) are identified associated with a lesion.

Treatment is thought to be most effective when the lesions can be treated both topically and systemically. Amphotericin B, itraconazole, voriconazole, and terbinafine are some of the multiple pharmaceuticals recommended for topical and systemic treatment. Debridement of any lesions is recommended, when feasible.