As every veterinary practitioner knows, respiratory cases usually present with typical signs of sneezing, nasal discharge, respiratory noise, coughing, abnormal ventilation, or respiratory distress. Symptoms can be associated with infectious and inflammatory diseases, tumors and polyps, foreign bodies, immunologic reactions, laryngeal dysfunction, tracheal and bronchial collapse, heart disease, injuries, pleural and mediastinal disorders, and even poisoning. In some cases, the cause is obvious, but in others the etiology of respiratory signs is undefined. It can be a frightening moment for clients when their pet suddenly is struggling for breath and experiences chronic respiratory problems such as coughing and tachypnea. Chronic respiratory diseases can erode quality of life -- such as preventing the daily walk in the park -- and sometimes these can become life-threatening situations.

Whether the cause is obvious or complicated, the specialists at the Ohio State Veterinary Hospital diagnose and treat animals with respiratory conditions on a daily basis. No organ system requires a more multi-disciplinary approach to diagnosis and treatment than the respiratory system. Since the causes, diagnostics, and treatments are so varied, patients may be primarily cared for on a number of hospital services, including Cardiology and Interventional Medicine, Internal Medicine, Emergency and Critical Care Medicine, Oncology, and Small Animal Surgery. Some patients require advanced diagnostic services that include radiology, ultrasound, computed tomography, or MRI. Respiratory endoscopy is a commonly-performed procedure in Small Animal Internal Medicine and the Cardiology and Interventional Medicine service, and these critical cases greatly benefit from the monitoring of our Anesthesia service. On-site clinical pathology, pathology, and microbiology-infectious disease services provide invaluable support for respiratory diagnostics. When the respiratory disorder is related to a tumor, the Oncology and Radiation Oncology services are readily available for consultation and primary care. Importantly, our Emergency and Critical Care specialists are available every day to help manage the most difficult and unstable patients. When surgical procedures are required, disorders of the upper airways and thorax can be referred to our General Surgery service. Increasingly, the Cardiology and Interventional Medicine service helps to manage some respiratory disorders with minimally invasive procedures such as nasopharyngeal and tracheal stents. In short, the Ohio State Veterinary Hospital has the breadth of specialists and cutting-edge diagnostics and therapies to stabilize, diagnose, and treat companion animal patients for the wide range of routine and complex respiratory conditions presented to us.

As demonstrated by the cases described in this publication, our board-certified faculty members work as a team to provide comprehensive and compassionate care for animals with respiratory issues. This multiple-disciplinary approach ensures the highest quality patient care, client care, referral services and the best potential outcome for patients that are having trouble doing what comes naturally for most of us -- taking a simple breath or a deep cleansing sigh. To refer a patient, please contact our companion animal referral coordinator at 614-292-0950.

For Our Equine and Farm Animal Patients
The same multidisciplinary approach is available in the Galbreath Equine Center and the Farm Animal Clinic. Specialists in farm animal and equine internal medicine, surgery, and emergency and critical care work cooperatively and cohesively to provide the best possible care for our equine and farm animal patients. Additionally, specialists in diagnostic imaging, anesthesiology, oncology, clinical pathology, and cardiology provide their consultative expertise where indicated.

We examine and treat routine, unusual and complex cases involving the upper and lower respiratory tract in horses and farm animals. In horses, the most common conditions include bacterial pneumonia and pleuropneumonia, recurrent airway obstruction, primary sinusitis and sinusitis associated with infected tooth roots, cysts and/or tumors, nasal passage diseases such as obstruction due to masses or tumors, guttural pouch disease such as tympany and empyema, nasopharyngeal obstructive disease such as laryngeal hemiplegia, dorsal displacement of the soft palate, epiglottic entrapment and other conditions that occlude or obstruct airflow at rest or during exercise. In cattle and other farm animals, infectious conditions affecting the respiratory tract are quite common. Other causes of respiratory disorders in farm animal are similar to some of those afflicting horses.

Advanced diagnostic services for horses and farm animals with respiratory disease include endoscopic examination of the upper respiratory tract at rest and in some cases while exercising on a high-speed treadmill (horses only), radiography of the skull and thorax, ultrasonography of the thoracic cavity, CT imaging of the skull for assessing abnormalities, cytologic and microbiologic testing of tracheal wash/bronchoalveolar lavage.

To refer an equine or farm animal patient, please call 614-292-6661.
Greetings from the Acting Hospital Director

At The Ohio State University Veterinary Hospital, we greatly value the relationship we have with our referring veterinarians and acknowledge the importance of patient referrals to the clinical education of our students, for the continued growth and development of our specialty services, for the advancement of our programs through clinical and translational discovery and resident and graduate student instruction, and ultimately for the advancement of clinical veterinary medicine.

This fall is a time of transition for the Veterinary Hospital. As some of you may be aware, Dr. Grant Frazer, director of the Veterinary Hospital, has accepted a similar position at the University of Queensland and is moving back to his homeland of Australia to be closer to his family. His last day was August 31st. We wish him all the best in his move and his new professional endeavors, and we appreciate his commitment, loyal service, and many contributions to the hospital and college.

Per the request of Dean Lonnie King, I will be serving as Acting Hospital Director through the transition while our current structure is reviewed and decisions are made about the hospital’s future organization, leadership and administration. During this time I will do my best to provide a smooth transition while continuing to advance our program. We will build upon the foundation established under Dr. Frazer’s leadership and continue the hospital’s momentum by exploring additional ways to improve operational efficiency, optimize resources, enhance customer care, and advance our services and programs.

We are pleased to provide this issue of the Veterinary Hospital Update, focusing on respiratory medicine and our multi-disciplinary approach to patient care and treatment. We hope you find it informative and useful.

As always, we are pleased and honored to be able to serve you and your referral clients with their current and future veterinary medical needs. We continually strive to provide the best in patient management, client care, and consultation and referral services, and encourage your candid and constructive feedback on how we can better meet the needs and expectations of you and your clients. We sincerely thank you for your patronage and your continued support of our program.

Respectfully and appreciatively,

Rustin Moore, DVM, PhD, DACVS
Chair, Department of Veterinary Clinical Sciences
Acting Director, Veterinary Hospital
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Cat Breathes More Easily after Non-invasive Procedure to Repair Collapsed Trachea

Leo is a two-year-old male Abyssinian cat that was experiencing episodes of stridulous and labored breathing, during which he would open-mouth breathe and produce squeaking sounds. He was examined by an internal medicine specialist who determined that he had a collapsing trachea. Tracheal collapse occurs frequently in older toy breed dogs when the tracheal rings lose their rigidity, but it is quite rare in cats. Leo was treated with a regimen of steroids and bronchodilators, which initially improved his symptoms. He continued to have episodes of labored breathing, so he was referred to Dr. Brian Scansen, assistant professor of cardiology and interventional medicine at the Ohio State Veterinary Hospital, to determine other treatment alternatives.

Dr. Scansen has placed tracheal stents in dogs to hold open a collapsed airway, but the procedure had rarely been performed in cats. Given the rarity of tracheal collapse in the cat, a CT was performed of Leo’s head, neck and thorax to rule out other causes of airway compression. This revealed no extra-tracheal causes for the collapse and so Dr. Scansen proceeded with a non-invasive procedure using fluoroscopy to guide placement of two stents into the airway and hold open the collapsing trachea. The challenge was choosing what size stents to use and how to deploy them precisely over the area of collapse. The stent needs to be approximately 10 percent larger in diameter than the airway so it can expand and fit tightly enough against the tracheal walls as to stay in place and not cause tissue necrosis. To our knowledge, this was the first time this procedure was performed in a cat for a collapsed trachea. Leo was released one day later and his recovery was swift thanks to the non-invasive nature of the procedure.

“Leo has resumed normal activity, no longer has episodes of labored breathing, is living comfortably and enjoying life.

Leo’s case is just another example of the advantages of using minimally invasive interventional techniques that offer reduced risk, pain, and recovery time than standard invasive surgery. As our first feline tracheal collapse stent, Leo has helped pioneer the way for cats that may have similar conditions. To consult or refer a patient for an interventional technique, please contact Dr. Brian Scansen at 614-292-3551, Brian.Scansen@cvm.osu.edu. More information can be found at vet.osu.edu/4925.htm.
Complicated Thoracic Wall Tumor Successfully Removed

The Ohio State University Veterinary Hospital offers board-certified specialists who work with referring veterinarians to manage complicated cases that require a team approach. One particularly complicated case provides an excellent example of how that teamwork can pay off.

Brandy, an 11-year-old Cocker Spaniel, was referred to Ohio State’s Veterinary Hospital after a biopsy performed by her primary care veterinarian revealed a large chondrosarcoma. As is typical, this mass was deceptively large, arising from the 11th rib and extending internally over a large portion of the thoracic and abdominal wall on both sides of the diaphragm.

“This is a dog who was really saved by her referring veterinarian, Dr. Joe Bando who recognized the problem, obtained a diagnosis with a surgical biopsy and offered referral for specialty care,” said Dr. Christopher Adin, assistant professor in the Department of Veterinary Clinical Sciences. Dr. Adin and Dr. Andrew Mercurio, a resident in small animal surgery, coordinated Brandy’s care and performed her surgery.

Brandy’s care was further complicated by several other pre-existing conditions, including heart disease, hypertension, controlled hyperadrenocorticism and mild kidney disease. Due to her multiple problems, the surgeons consulted with the oncology, radiology, cardiology and anesthesia services at the hospital to tailor a safe yet effective treatment plan for Brandy.

After assembling the team, Drs. Adin and Mercurio performed an aggressive surgery to partially remove the lower five ribs on Brandy’s left side as well as portions of the diaphragm and body wall. The thoracic cavity was reconstructed by performing a diaphragmatic advancement, then the thoracic defect was stabilized using synthetic (polypropylene) mesh. The repair was further augmented by exteriorizing the omentum through a small hole in the abdomen, and placing it over the synthetic mesh, providing a source of fluid drainage and vascular supply to the healing wound.

Despite the major surgery, Brandy was walking the next day, and returned home only two days after surgery. Biopsy results demonstrated complete resection of the mass with clean surgical margins and her prognosis for long-term survival is quite good.

“Caring for patients with multiple problems can be challenging, especially when some of the conditions require contradictory strategies. We had to keep Brandy’s heart disease, her kidneys, her pain relief, and her fluid status in mind, and also try to cure her cancer,” Dr. Adin said. “Fortunately, it worked out great.”

Respiratory Diagnosis and Care in Food Animal Medicine

The Food and Fiber Animal section of the Ohio State Veterinary Hospital is available 24 hours a day seven days a week, year round. When a case is referred to us, your patients are examined by multiple veterinarians in the food animal service, and when needed, a variety of specialists throughout the Veterinary Hospital.

One case that provides an example of the collaboration of specialists across the Veterinary Hospital is that of a heifer named “Anita” referred from Kentucky for a fever of unknown origin. Anita calved in February and seemed to be healthy – her call was gaining weight and Anita was producing up to 70 pounds of milk per day. About two weeks into her lactation, Anita’s appetite slowed, her milk production dropped and she appeared mildly dehydrated. She improved with oral medications but two days later her symptoms returned. The owner consulted his veterinarian, who determined that Anita had a fever of 106 degrees and suspected pneumonia. She was referred to Ohio State.

On her arrival, the examination revealed evidence of pneumonia and possibly pericarditis. The radiology department was consulted and images of her lungs indicated marked consolidation consistent with acute pneumonia and possibly abscesses. Blood samples submitted to the clinical pathology service revealed marked inflammation suggesting bacterial infection. The changes were so severe, it was likely Anita had a bacterial infection that progressed to her bloodstream.

Anita also had abnormal heart sounds, so their cardiology service was consulted. Their examination revealed a loud friction rub that indicated pericardial inflammation. In addition, they confirmed the clinically evident pulmonary consolidation and potential lung abscesses.

Anita’s examination was furthered by conducting endoscopic evaluation with the assistance of the internists in the Veterinary Hospital’s Galbreath Equine Center. These samples were submitted to our microbiologist for culture and clinical pathologists for cytologic examinations. These samples revealed acute inflammation and several bacterial pathogens.

The owner indicated he really wanted to help Anita, so over the next three weeks fluids, antibiotics and anti-inflammatory therapies were provided. Anita regained her strength and recovered. Anita is still in the producer’s herd and delivered a second healthy calf 14 months after discharge.

Anita’s case had a positive outcome due to the early detection and referral by the primary veterinarian, the owner’s desire and commitment to Anita, and the number and quality of cases seen at Ohio State. In addition, the collaborative environment allows experienced veterinarians to work together on the diagnosis and treatment of every animal’s problem.

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614-292-3551 Companion Animal
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Viper, a 9 year old male mixed breed dog, presented to his local veterinarian in early June with acute vomiting after ingesting several stuffed animals. A laparotomy was performed to remove the obstructions, but one of the enterotomy sites underwent dehiscence and he developed septic peritonitis. After surgical treatment of the dehiscence, Viper was referred to the Ohio State Veterinary Critical Care service for management of sepsis, hypoproteinemia, peripheral edema and disseminated intravascular coagulation. Upon hospital admission, he was also determined to have developed acute respiratory distress syndrome (ARDS).

ARDS is a syndrome often associated with sepsis or any other systemic inflammatory condition. Initially, there is an acute, exudative stage when the hyaline membrane is damaged and an overwhelming systemic inflammatory response causes vasculitis. This leads to protein-rich pulmonary edema. Following the edema, immune activation causes migration of white blood cells and leakage of red blood cells into the alveoli. Inflammatory injury to the capillary endothelium and alveolar epithelium combined with interstitial edema perpetuate the pulmonary damage. Many patients with ARDS require mechanical ventilation to survive this phase, but this can also worsen the alveolar damage. If the animal survives the exudative phase of the disease, the healing and recovery process begins and the animal enters the alveolar/fibrosing phase. During this phase, granulation tissue forms in the airspaces and collagen is deposited in the interstitium. Ultimately, the pulmonary remodeling is complete, leaving the patient with a thickened interstitium and diffusion impairment secondary to pulmonary fibrosis.

Viper was stabilized by the intern on duty that weekend. Dr. Kelly Carlsten. After the initial stabilization, Dr. Michelle Goodnight, second-year resident in Emergency and Critical Care, supervised by Critical Care faculty member Dr. Amy Butler, assumed primary management and care of Viper. “There is no single treatment for ARDS that is proven to be beneficial; we must rely 100 percent on supportive care,” Dr. Goodnight said. “Viper was oxygen dependent for a week. In fact, his oxygenation fell to the point where we typically recommend placing animals on a mechanical ventilator. However, we elected to give him more time, and Viper rallied and went home after eight days of being here.”

As expected, Viper has developed some pulmonary fibrosis, which is a result of the lung parynchema developing scar tissue as part of the healing process. His oxygen levels are now comparable to those of a dog living in Denver, but below normal for a dog living at sea level. He comes back regularly for re-evaluation. He is gaining weight and in general is doing very well. He is definitely considered one of the Emergency and Critical Care service's success stories. On a side note, his owners have since thrown out all of his stuffed dog toys as a precautionary measure.

“He will probably not run the Iditarod,” Dr. Goodnight said, “but he is alive and has an excellent quality of life for a pet.”

For more information about our Emergency and Critical Care service, open 24 hours day, seven days a week, see vet.osu.edu/770.htm

### Respiratory Recovery in Critical Care

**by Kristine McComis**

Respiratory Diseases and X-rays are Infamous Partners

For animals with breathing problems, thoracic radiographs (chest X-rays) are an important diagnostic tool. Veterinarians can differentiate many diseases using this non-invasive imaging test. Whether an animal has pneumonia, a failing heart or spread of cancer to the lungs, thoracic radiographs are used to detect the disease in question. In the last few years, radiography moved away from using film and instead uses digital detectors to capture disease information. The digital radiographs are viewed on a computer monitor and veterinarians can adjust the brightness and contrast of the image to help them evaluate the lungs in more detail. Additionally, veterinarians can quickly transmit the digital radiographs for consultation to veterinary radiologists, who can typically send a report in hours instead of days.

Another use for X-rays in the detection of animal respiratory disease is through the use of computed tomography (CT). The CT makes many “slices” of the animal’s thorax (chest). Using the CT images, veterinary radiologists are better able to localize the disease because anatomical structures are no longer superimposed on each other as they are in a thoracic radiograph. CT images are reformatted into many different planes allowing the radiologist to evaluate the thorax from many different angles. The Ohio State University Veterinary Hospital installed an 8-slice, multi-detector CT last year. This CT scanner operates faster than the old CT machine and produces sharper reformatted images.

The Veterinary Hospital offers teleradiology consulting services through the Veterinary Radiology Service. Answers to frequently asked questions: vet.osu.edu/5337.htm. To sign up, please contact: Dr. Tod Drost @ 614-292-1040 or vet.radiology@cvm.osu.edu

Normal canine lung