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SCIENTIFIC ARTICLE

Murine Respiratory Disease in Rats

Amy Beth Worell, D.V.M., Diplomate A.B.V.P.–Avian Specialist

Rats are common pets in both the classroom and the home. These animals are affectionate, entertaining, and inquisitive. They have a lifespan of approximately 3 years, although an occasional pet rat has been known to live up to 3 1/2 to 4 years of age. Caring for pet rats is not complicated or involved; they are often quite clean. Ideally, they should be fed a laboratory animal rat chow, which is generally in the form of a hard cube. The majority of rats seen by practitioners, however, are being fed high-fat commercial diets consisting of pellets, dried fruits, and sunflower seeds.

Pet rats are most often brought to a veterinarian for medical care involving respiratory infections and palpable tumors. The tumors are generally mammary and appear to have a genetic basis, and many are comprised of neoplastic tissue. The respiratory infections are generally infectious in nature.

Clinical Signs and Presentation

Clinical presentation of the pet rat affected by respiratory disease varies tremendously. Generally, the clinical signs associated with respiratory infections in rats are similar to those noted in other species. Signs may include sneezing, lethargy, ruffled fur, labored breathing, noticeable weight loss, harsh rales on auscultation, nasal or ocular discharge, and varying degrees of anorexia.

During physical examination, the veterinarian will sometimes note that a rat with respiratory disease is thin or has visibly labored breathing. Some rats present with the primary symptom of listlessness or weight loss. Still others may exhibit a red discoloration of the nostrils and the medial canthus of the eyes. These "red tears" are usually porphyrin pigments produced by the harderian glands rather than a bloody discharge. To differentiate, use an ultraviolet light (Wood's light). The secretion will fluoresce with a bloody discharge but not with the porphyrin pigments.

Clinical signs tend to be more severe in older animals. Younger rats may have several mild or clinically inapparent infections that go unnoticed. Then, at an older age, a rat may eventually show signs of clinical disease.

There are two categories of the clinical presentation in affected rats. One involves chronic respiratory disease with a variety of clinical presentations, and the other involves an acute presentation, which may include either upper respiratory signs or acute pneumonia. Commonly, only one rat in a group of pet rats will be clinically affected, even though the other rats may exhibit clinical signs at a later date.

Etiology

The cause of murine respiratory disease is usually multifactorial. The primary agent often is a virus with a significant secondary bacterial component. The common viruses implicated in murine respiratory disease include Sendai virus and sialodacryoadenitis virus, which is a coronavirus. The most commonly implicated bacterial agent is *Mycoplasma pulmonis*. Other frequently involved bacterial agents include *Streptococcus pneumoniae* and *Corynebacterium kutscheri*. A cilia-associated respiratory bacillus may also be involved in murine respiratory disease.

Murine respiratory disease can essentially be considered endemic in pet rat populations as well as in many laboratory colonies. Generally, once a rat has contracted one or a combination of the etiological agents involved in this disease, the animal should be considered persistently infected.

Mode of Transmission

Murine respiratory disease is highly contagious to other rats. The multifactorial etiology of this condition lends itself to slightly varying transmission modes. Frequently, the disease is spread through direct contact with a clinically affected rat as well as through respiratory aerosols. A subclinical carrier state does exist and is an important and

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common mode of transmission. In utero transmission and contraction of the condition during mating are also known to occur. Other small mammals, including mice, rabbits, and guinea pigs, are thought to carry and transmit the condition to rats, even if the former are not exhibiting clinical signs of respiratory disease.

Prevention of murine respiratory disease in a pet rat or collection of pet rats is generally not feasible or possible. In laboratory settings, depopulation and restocking with uninfected rats, and, in some instances, use of cesarean section in rats, may be viable options.

Diagnosis

Isolation of *M. pulmonis* is difficult through use of standard laboratory culturing techniques, as is the identification of the causative viral agents. Therefore, a diagnosis of murine respiratory disease is generally made based on the patient's clinical signs and accompanying physical examination. A clinician may choose to offer supportive laboratory diagnostics to a client with an affected rat, and these could include serum chemistries, culture and radiographic tests, a complete blood count, and enzyme-linked immunoelectron diffusion assay tests for identification of *Mycoplasma*.

Treatment

There are no specific treatment regiments for murine respiratory disease in rats. Elimination of the offending organisms is not possible, and the condition should be considered incurable. Treatment, therefore, is oriented towards the alleviation and suppression of clinical signs in affected pet rats and the improvement of the quality of the rat's life.

Therapy for affected rats is centered on supportive care. Antibiotic therapy including tylosin, tetracycline, doxycycline, chloramphenicol, and enrofloxacin may be helpful. Supportive care including nebulization, fluid therapy, and force-feeding (if the pet is not too dyspnic) are often beneficial to the pet as well.

Antibiotic doses for rats are empirical; however, the dosages in Table 1 are frequently suggested.

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Table 1.—Recommended Antibiotic Dosages

Tetracycline	3 mg/mL in drinking water 5–20 mg/kg bid PO
Tylosin	¼ tsp/gal drinking water
Chloramphenicol	25 mg/kg bid PO
Doxycycline	0.4 mL/100 g IM once weekly (of 20 mg/mL solution) for 4–6 weeks 5–10 mg/kg bid PO
Enrofloxacin	5–10 mg/kg bid PO, IM
Trimethoprim-sulfa	10–25 mg/kg bid PO
Piperacillin	50–100 mg/kg bid IM
Amikacin	2–5 mg/kg bid SC

PRACTICE TIP

Shawn Messonnier, D.V.M.

Save Time When Neutering Rabbits

When neutering rabbits, you have several options in how to deal with the scrotal incisions. It is possible to leave the incisions open to heal, as is commonly done when performing feline neuters. The incisions can also be sutured using thin surgical thread such as 4-0 Vicryl. To minimize the chance of postoperative chewing at the site, an intradermal pattern is recommended. Finally, surgical glue can be applied to the edges of the incision; the edges are then apposed and glued shut. I close the incision and, because suturing takes almost as much time as the surgical procedure, I prefer to quickly glue the incisions.

ROUNDTABLE

Examination of Snakes

Q. What species of snakes are commonly brought in for evaluation?

Dr. Morrisey: *Commonly seen snakes include the Colubridae family (e.g., king snakes, milk snakes, corn snakes, garter snakes) and Boidae family (e.g., boas, pythons).*

Dr. Suedmeyer: *In the Midwest, the exotic snakes most commonly seen include ball pythons (*Python regius*), Burmese pythons (*Python molurus bivitattus*), and boa constrictors (*Constrictor constrictor*). Native snakes seen include various rat snakes (*Elaphe *sp.), garter snakes (*Thamnophis *sp.), and king snakes (*Lampropeltis *sp.).*

Dr. Tynes: *Ball pythons are probably the most common species seen in my practice, with rat snakes and king snakes running a close second. Different species of boa constrictors and other python species are also commonly seen.*

Q. How should an owner transport a snake to the office?

Dr. Morrisey: *Smaller snakes can be carried in their enclosures; larger snakes can be brought in a transport cage or pillowcase or similar bag.*

Dr. Suedmeyer: *I used to advise placing the snake in a pillowcase, with the pillowcase against the owner's body to keep the snake warm. Now, because of potential liability, I advise placing the snake (contained in a pillowcase that is secured at the top) in a cooler with warm water bottles.*

Dr. Tynes: *I suggest that snakes always be transported to the clinic in some type of secure, opaque container. I have heard numerous horror stories of snakes escaping in cars and cars having to be partially dismantled to retrieve the snake. An opaque container ensures that other clients in the waiting area are not frightened by a snake. Pillow cases closed by knotting the open end make excellent containers for most nonvenomous species.*

Q. How should a snake be restrained?

Dr. Morrisey: *This depends on the size of the snake. With smaller, more docile species, the snake can be held with the examiner's hands supporting the snake's body. A technician's assistance is helpful because most snakes will wrap around the examiner's arm. Larger snakes may require several people for restraint. I recommend 1 person for every 2–3 feet of snake. Less docile snakes can have their heads restrained by grasping just caudal to the mandible.*

Dr. Suedmeyer: *Snakes have only 1 occipital condyle, so forceful restraint behind the head could injure the snake. I advise grasping nonvenomous snakes behind the head with just enough pressure to control the snake. The rest of the body can lie flat on the table, with the tail able to wrap around a towel or other object. The hand holding the snake moves as the snake moves. Because snakes fear falling, supporting the animal's entire body is important to prevent injury.*

Dr. Tynes: *My methods of snake restraint depend on the indi-*

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WHAT'S YOUR DIAGNOSIS ???

*A 30-year-old double yellow head Amazon parrot (*Amazona ochrocephala oratrix*) was evaluated for swelling around its neck. The owner also complained that the bird was "panting" and lethargic, had no appetite, and had occasional bouts of diarrhea. The diet was a mixture of dehydrated nuts, seed, and fruits ("trail mix"). Examination confirmed the owner's history; the "swelling around the neck" was determined to be subcutaneous emphysema.*

Questions

1. What diagnostic tests do you recommend?
2. What treatment do you recommend?
3. What is the cause of the subcutaneous emphysema?

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Examination of Snakes

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vidual animal I am handling and the procedure I am trying to perform. First, I always ask the owner if his or her snake is used to being handled. If it is, I usually simply approach it slowly but steadily and grasp it gently behind the head so that it cannot turn its head around. Sudden movements should be avoided because a startled snake may feel threatened and strike. A sudden movement may also simulate the movement of prey and cause the snake to strike. When giving injections or performing a procedure such as a cloacal wash or lung wash, I usually have an assistant hold the snake gently at the base of its skull while I restrain the particular section that I am working on. A large python may require 2 or 3 people to restrain it.

Q. Describe your technique for the clinical examination of the snake.

Dr. Morrisey: *I start my systematic approach at the head and open the mouth with the edge of a rubber spatula or other flat, soft device. I usually do not perform cardiac auscultation. The entire body should be palpated looking for normal and abnormal structures. Be sure to assess hydration and color of the mucous membranes, and pay attention to epaxial muscle mass.*

Dr. Suedmeyer: *I perform an ophthalmic examination with an ophthalmoscope, inspection of the cloaca with an otoscope, abdominal palpation for eggs, masses, or foreign bodies, auscultation of the lung(s) and heart with a dampened towel wrapping the snake (or I perform Doppler auscultation), oropharyngeal examination with a folded piece of radiographic film to open the mouth, and visual examination for external parasites and skin color or iridescence.*

Dr. Tynes: *It is similar to my technique for examining any animal. I begin by observing the head, eyes, nostrils, etc., then proceed backwards, examining the snake from one end to the other. Next I open the snake's mouth with the assistance of a small rubber or plastic spatula while pulling gently on the skin under the throat. I weigh and measure all reptiles during the physical examination, and I probe to determine the animal's sex if the owner does not already know for certain.*

Q. Which laboratory procedures do you recommend on the healthy snake vs. the sick snake?

Dr. Morrisey: *I recommend a CBC, serum biochemistry profile, and fecal examination on healthy snakes and sick snakes. Further tests depend on the history and physical examination, but could include radiographic tests, tracheal or lung washes, and colonic washes.*

Dr. Suedmeyer: *For a healthy snake, I advise a cloacal wash for parasites, blood testing (CBC, biochemical profile), weight check, and aerobic/anaerobic cloacal culture. For owners of boas and pythons, a renal or hepatic biopsy can be done to check for inclusion body disease. For ill snakes, I also often include radiographic tests.*

Dr. Tynes: *Fecal floats are a common procedure performed on healthy and ill snakes alike. Other procedures performed on ill snakes vary depending on the clinical signs. I frequently do stomach washes on vomiting or regurgitating snakes and lung washes on snakes with apparent respiratory infections. Whenever possible, I like to draw blood for a CBC and serum chemistries. If the patient is a healthy one, these data can serve as an excellent basis for future reference.*

Q. Do you recommend an annual examination? If so, what do you charge, what do you do during the visit, and how do you get owners to come in for the visit?

Dr. Morrisey: *I always recommend an annual visit, even though many owners do not heed my advice. We charge between $20 and $25. We do a physical examination and recommend diagnostic testing as indicated. If the snake is healthy, we might do blood testing every other year. Owners must understand the annual examination is the basis of preventative health care and is more successful and less expensive than an emergency "sick" visit.*

Dr. Suedmeyer: *Although owners are often unlikely to return for an annual visit, I encourage these from a preventive health care standpoint. I do a physical examination and evaluate the feces or perform a cloacal wash.*

Dr. Tynes: *I would like to examine snakes once yearly, if for no other reason than to monitor their weight. An annual fecal exam would also be an excellent idea. In the practice where I currently work, an exotic animal exam is approximately $5 to $7 more than a dog or cat exam. I have poor success convincing my clients to bring their exotic pets in for annual physicals.*

FROM THE LITERATURE

Psychogenic Feather Picking in Birds

Haloperidol (Haldol) may be effective in some cases of feather picking, particularly in cockatoos. The drug is dosed at 0.08 mg/kg q24hr. It takes approximately 2 days to stabilize the dose. Side effects include anorexia, vomiting, and incoordination. Cockatoos and Quaker Parakeets may require only one half of the dose used for other birds. The dose can be adjusted by increasing or decreasing by 0.02 mg every 2 days.

Ritchie BW, Harrison LR, Harrison GJ: *Avian Medicine: Principles and Applications.* Lake Worth, Fla, Wingers, 1994, p 636.

Editor's Note: Psychogenic feather picking is usually diagnosed after ruling out physical causes based on results from extensive laboratory testing. Treatment is difficult and may be unrewarding. Some birds are never successfully "cured" of this problem. Environmental enrichment and drug therapy can be tried, but there is no one treatment that is successful in all cases.

HOW I ...

Diagnose Intestinal Foreign Bodies in Ferrets

Shawn Messonnier, D.V.M.

A common cause of vomiting in ferrets, especially younger ferrets, is a gastrointestinal foreign body. Ferrets are curious animals and can easily ingest foreign objects. Because of the short length and small diameter of the ferret intestinal tract, even tiny objects can easily become lodged in the intestines. Rubber foreign bodies, such as pieces of shoes, are commonly ingested by young ferrets.

Vomiting is the classic sign in ferrets with foreign body ingestion. However, foreign bodies are not the only cause of vomiting in ferrets. A complete workup (consisting of a urinalysis, a CBC and biochemical profile, plain radiographs of the abdomen, and a thorough physical examination to detect abdominal pain or palpation-induced vomiting) is needed. Occasionally, follow-up radiographs are needed 24 hours later if signs have not improved despite symptomatic therapy. Radiographic signs suggestive of intestinal foreign bodies in ferrets include ileus and intestinal dilation. Occasionally the foreign body is visible.

It is possible that the diagnosis of an intestinal foreign body may only be made during exploratory laparotomy because other diagnostic tests are inconclusive. Often, convincing the owner of the need for exploratory surgery is difficult. It is easier to convince the owner if you point out that all of the other tests have ruled out other causes of vomiting and that the ferret has not improved despite proper treatment. Owners should be forewarned that the surgery is a diagnostic test, and it is possible that no foreign body will be found. If the foreign body is found, removal by means of an enterotomy is curative. If no foreign body is found, take biopsies of the spleen, liver, stomach, and intestines. Examine the pancreas and adrenal glands for signs of enlargement or neoplasia.

What's Your Diagnosis ???

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Answers

1. Recommended tests include CBC and blood profile, chlamydiosis testing, and Gram's stains. Abnormal laboratory results: whole blood cell count, 24,000; alinine aminotransferase, 773 IU/L; total protein, 4.3 g/dL; albumin, 1.5 g/dL; creatine phosphokinase, 1,199 IU/L; chlamydiosis, EBA-negative. Gram's stains of the cloaca and choana indicated approximately 50% each of Gram's positive and negative bacteria.
2. With the bird under isoflurane anesthesia, a small area of skin in the cranioventral cervical area was incised using electrosurgery. The wall of the hyperinflated air sac was likewise incised, and the air sac was deflated. The opening was left to heal by secondary intention. The bird greatly improved after 1 day of hospitalization and was discharged. The owner continued oral trimethoprim-sulfa (100 mg/kg). The air sac fistula was reopened as needed (twice using an 18-gauge needle) to allow air sac deflation. The bird made a complete recovery, and the air sacs have not reinflated. Repeated blood tests were not rescheduled by the owner.
3. Subcutaneous emphysema is caused by leakage or rupture of an air sac (commonly the cervicocephalic sac). The large palpable swelling allows the diagnosis to be made quite easily. The condition is usually not an emergency; often the cause is not identified. Treatment with needle aspiration usually fails as the sac continues to leak, and the emphysema returns quickly. Using electrosurgery while the animal is under anesthesia, a small opening can be made in the skin and air sac. If the emphysema returns, the opening can be enlarged. Clients can easily maintain the fistula at home by opening the area with a large sterile needle. This needs to be done as long as the emphysema continues. Alternatively, permanent repair using a Teflon stent (McAllister Technical Services, Coeur d'Alene, ID) can be performed.

Client Teaching Guide

Ferret CARE SHEET

Michael A. Dutton, D.V.M., Dipl. A.B.V.P.–Companion Animal Practice

Adrenal Tumors in Ferrets

Adrenal tumors are common in ferrets. Ninety percent of ferrets with this kind of tumor have one only in the left adrenal gland. The other 10% have a tumor in only the right gland or in both glands. Abdominal ultrasound may be used to determine which gland is affected.

✔ Diagnosis

Diagnosis may be made based on the physical examination and a high degree of suspicion. Symptoms include:

- Hair loss on the tail, rump, and along the backbone.
- Swollen vulvas in spayed female ferrets. Male ferrets may become aggressive.
- Male ferrets may also have prostate enlargement that can lead to urinary tract infections or urinary obstruction (a life threatening disease).

A blood test is available to prove the diagnosis; abdominal ultrasound can also be used. Many ferrets have usable involvement of only one adrenal gland. Because both glands may be affected, each gland should be thoroughly inspected.

✔ **Treatment:** The current recommendation is to surgically remove the affected adrenal glands of the ferret. Either the left or right adrenal gland may be affected. The left gland is relatively easy to isolate and remove. The right adrenal gland is more difficult to remove surgically. In some ferrets, the adrenal tumor grows into the vena cava, which is the main route of blood returning from the lower body to the heart. In this case, gland removal may require advanced surgical procedures. The tumor may recur in the other gland up to two years after removal of the first. Similar treatment is recommended.

✔ Medical Treatment

A medication called Lysodren (Bristol-Myers) can shrink the abnormal gland or glands. It does not work in all cases and may cause severe vomiting in the pet. It is usually a lifelong medication. Because most ferrets are cured by surgery and require no further treatment, we reserve using the Lysodren for the cases that involve both adrenal glands or if the disease recurs. Because of the low success rate and high incidence of side effects, it is not currently recommended.

CASE REPORT

Limb Amputation in a Tokay Gecko (*Gekko gecko*)

Wm. Kirk Suedmeyer, D.V.M.

An adult female 130-g tokay gecko was brought in with a 2-day history of being caught in a commercial "glue" trap designed to catch insect pests. The gecko was part of a large group of free-roaming geckos housed in a "free-flight" aviary building with numerous species of birds. Several small groups of mammals were also housed in the building.

Physical examination revealed the right front leg firmly adhered to the trap. The lizard had twisted the leg 180 degrees at the cubital joint, effectively occluding the circulation to the distal aspect of the limb. The limb was removed from the trap with topical application of mineral oil. Radiographs revealed a fully luxated cubital joint. No other physical abnormalities were noted, and a CBC and selected serum chemistry tests were within normal limits.

The gecko was anesthetized by mask induction with 3% isoflurane, intubated with a modified Tom-cat brand cath-eter and placed on a non-rebreathing circuit with intermittent positive pressure ventilation. Once a surgical plane of anesthesia was noted (as judged by the "tail-righting" reflex), the gecko was placed in left lateral recumbency on a warm water blanket and taped in place with masking tape. The surgical area for amputation was determined to be a scapulohumeral removal, based on tissue viability and general recommendations.[1]

The limb was elevated, prepared, and draped using a standard surgical method. Diluted chlorhexidine solution (Nolvasan, Fort Dodge Laboratories, Overland Park, KS) and povidone-iodine (Betadine) were used to thoroughly cleanse the area. The limb was removed with an approach similar to that used for domestic dogs and cats.[2] Dexon, a synthetic absorbable suture, was used to close the muscle layers, and to ligate vessels. Nylon sutures were used to close the skin in a slightly everting, simple interrupted pattern. The gecko was maintained on 100% oxygen for several minutes after surgery, and 1 injection of 0.25-mg/kg doxapram hydrochloride (Dopram) was administered intravenously. The gecko recovered uneventfully, and suture removal was performed 6 weeks later.

Limb amputations are generally well tolerated by lizards, chelonians, and crocodilians.[2] In this case, the gecko could still climb well and obtained food without difficulty. Sutures degraded by hydrolysis should be used because, unlike mammals, reptiles lack the lysozymes that degrade inflammatory material.[1] In addition, an everting suture pattern should be used to assure proper apposition of skin margins. A reptile's metabolism is slower than that of mammals, thus the healing process is comparatively longer. Six weeks is generally recommended for suture removal in most surgical wounds.[2]

Dopram is a centrally acting respiratory stimulant used in domestic animals. It appears to work equally as well in most reptile patients, and in combination with a warm water blanket it accelerates recovery times after surgical procedures.

In this case surgery was the only option, but the gecko responded well and is clinically normal 2 years after surgery.

References

1. Frye FL: *Biomedical and Surgical Aspects of Captive Reptile Husbandry*, ed 2. Malabar, Fla, Kreiger Publishing, 1991.
2. Mader DR: *Reptile Medicine and Surgery*. Philadelphia, WB Saunders, 1996.

Murine Respiratory Disease in Rats

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My personal preference for treatment of rats with murine respiratory disease is as follows:

1. If the rat is eating and active, exhibits no noticeable weight loss or sneezing, and has dried porphyrin discharge from eyes and nostrils, >>> *No treatment is recommended.*
2. If the rat is eating and active and shows slight weight loss or sneezing, with or without nasal/ocular discharge, >>> *Treatment with an antibiotic such as oral enrofloxacin and weekly injections of doxycycline are recommended.*
3. If the rat is active, still feeds itself to some degree, and has some noticeable weight loss and harsh lung sounds on auscultation, >>> *Treat-ment with injectable antibiotics such as enrofloxacin or a combination of pipracillin and amikacin is recommended. Hospitalization and daily or twice daily nebulization with a broad spectrum antibiotic are recommended. Subcutaneous fluid injections of lactated Ringer's solution may also be used if not too stressful for the rat. Weekly injections with doxycycline are recommended.*
4. If the rat is listless and probably anorexic, shows significant weight loss, is visibly dyspnic, and has harsh lung sounds on auscultation, >>> *Treatment can be offered, but the outlook for a reasonable quality of life is minimal. Euthanasia should be offered as a treatment option.*

Suggested Reading

1. Hillyer EV, Quesenberry KE: *Ferrets, Rabbits, and Rodents: Clinical Medicine and Surgery*. Philadelphia, WB Saunders, 1997.
2. Harkness JE, Wagner JE: *The Biology and Medicine of Rabbits and Rodents*. Philadelphia, Lea and Febiger, 1983.
3. Laber-Laird K, Swindle MM, Flecknell P (eds): *Handbook of Rodent and Rabbit Medicine*. Tarryton, NY, Elsevier Science, 1996.

Q&A

Answer by Shawn Messonnier, D.V.M.

Is there a genetic basis for dental problems in rabbits or rodents?

According to Dr. Russell at University of Missouri–Columbia College of Veterinary Medicine, a genetic basis for malocclusion is suspected in many cases, but not absolutely proven, in rabbits and rodents. Hereditary prognathism in the rabbit (which has a genetic component) appears to be the cause of most malocclusive disease.[1]

Reference

1. Brown SA: Rabbit dentistry. Proceedings of the Small Mammal–Reptile Medicine and Surgery for the Practitioner. Middleton, Wis, 1990.

UPCOMING MEETINGS

Association of Avian Veterinarians Annual Conference and Expo, St. Paul, MN; August 25–29. (303) 756-8380.

Central Veterinary Conference, Bartle Hall Convention Center, Kansas City, MO; August 29–31. (800) 255-6864. *Dr. Shawn Messonnier will be speaking.*

Mid-Western Exotic Animal Medicine Conference, Manhattan, KS; October 10–11. Contact Dr. James Carpenter, (785) 532-5690. *Dr. Shawn Messonnier will be speaking.*

Readers: We welcome your questions, practice tips, and case reports. Please submit any materials to Tania Banak, Mosby, Inc., 11830 Westline Industrial Drive, St. Louis, MO 63146; tania.banak@mosby.com; (800)325-4177; fax (314)453-4191.

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