

Exotic Pet

P R A C T I C E

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SCIENTIFIC ARTICLE

Necrotic (Infectious) Stomatitis of Snakes

Wm. Kirk Suedmeyer, D.V.M.

Snakes may be the most commonly kept reptile in the pet trade. The owner must be instructed about the proper management and husbandry, including cage cleaning, suitable substrate, optimal temperature and humidity, lighting, and feeding practices, of the snake to ensure its long and healthy life. Substandard care can lead to health problems, such as necrotic stomatitis, or "mouth rot."

Necrotic stomatitis is a multifactorial disease process, which if left untreated will cause death in the animal. Numerous infectious organisms have been found to be associated with this disease including *Aeromonas* species, *Pseudomonas aeruginosa*, *Proteus* species, *Citrobacter freundii*, and on rare occasions *Mycobacterium* species.

Necrosis of the delicate gingiva of the oral cavity is the hallmark of necrotic stomatitis. Initial presenting signs may include anorexia, hyperemia of the gingiva, excessive accumulation of mucus, petechial hemorrhages, caseated abscessation, loosening of the teeth, and swelling/edema of the head. Practitioners must be careful in diagnosing necrotic stomatitis for any inflammation of the gingiva, as some primary respiratory problems can also present with a thick oral mucus and hyperemia of the gingiva. Visceral gout, simple dehydration, and neoplasia must also be differentiated from a true necrotic stomatitis.

All aspects of the infection must be addressed. Preliminary data should include a CBC, serum chemistries, cultures and sensitivities of the deeper pockets of infection, and radiographic interpretation of bony lesions. Systemic injectable antibiotics, vitamin supplementation, correction of husbandry practices, and intense local therapy should then follow as indicated.

Based on the results of culture and sensitivity, injectable antibiotics commonly used are IM piperacillin (Pipracil, Lederle Pharmaceuticals) at 100 mg/kg every 48 hours, IM cefotaxime (Claforan, Hoechst-Roussel) at 20 mg/kg every 12 to 24 hours, IM ticarcillin (Ticar, Beecham) at 50 mg/kg every 24 hours, or IM gentamicin (Gentocin, Schering-Plough) at 2.5 mg/kg every 72 hours. Hydration must be maintained; I commonly use Tyrodes Ringer's solution (Tyrodes salts, Sigma Chemical Co.). Alternatively, I recommend a 1:1 solution of lactated Ringer's and 2.5% dextrose if Tyrodes Ringer's solution is unavailable. Radiographs demonstrating osteomyelitis signal a poor prognosis, and very aggressive treatment is required. To maintain epithelial integrity and aid in healing, 1,000 IU of vitamin A

(Injacom-100, Roche [currently not available from the manufacturer]) as a one-time injection is usually administered intramuscularly.

Gentle débridement of the gingiva with topical antimicrobial solutions will greatly enhance the healing. Commonly used medications are 2% chlorhexidine (Nolvasan, Fort Dodge Laboratories), applied as a 1:20 or 1:30 solution with sterile water every 24 hours; 1% iodine solution, applied every 24 hours; or hydrogen peroxide, applied topically every 24 hours. Many practitioners prefer diluted chlorhexidine (Nolvasan), as it is very effective and appears less painful when applied than does hydrogen peroxide. In addition, it is routinely effective against *Pseudomonas* species (although it doesn't conform to the specific Association of Official Analytical Chemists

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[A.O.A.C.] standards by which an organism is susceptible to an antimicrobial. *Pseudomonas* species do not conform to these standards, but many strains are susceptible.) Fort Dodge Laboratories supply Nolvasan-sensitivity disks, and I have used them to screen susceptibilities of *Pseudomonas* species to chlorhexidine.

In addition to these procedures, some improvement has also been seen with administration of supplemental vitamins (C and B-complex). Increasing the environmental temperature to the high end of the snake's preferred thermal zone to increase the immune response is also important.

With the rich pathogen flora involved, the practitioner is advised to wear examination gloves and eye protection (goggles) when treating snakes with necrotic stomatitis. Use extreme caution when attempting to open and treat the mouth. Use of tongue depressors, hemostats, or other rigid instruments aggravates the problem. The use of a folded piece of radiograph film or rubber spatulas allows for gentle manipulation of the mouth.

Uncomplicated cases of necrotic stomatitis will usually resolve within 10–14 days, but more complicated cases will require weeks or even months to resolve.

Additional Readings

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

PRACTICE**Biting**

If a pet reptile or amphibian bites you and won't let go, placing a few drops of rubbing alcohol into the pet's nostrils will often cause it to release its grip. This is not foolproof, however, so exercise care.

Use the clipboard method when attempting to grasp and restrain any exotic pet if you fear being bitten. I routinely use this method on snakes and occasionally on various species of lizards. While holding a clipboard in my right hand, I move the board from the tail of the pet toward its head and either gently pin the head to the table (snakes and some lizards) and then grasp it with my free hand or just use the board as a shield at the back of the head and then grasp it. The board prevents the pet from seeing my hand and, in those pets whose heads I can pin to the table, acts as a restraint as well.

**Necropsy on
Chameleons**

When performing a necropsy on a chameleon, keep in mind that a "blackish hue" in the intestinal serosa is normal.

1. Klingenberg R: Enteric cryptosporidiosis in a colony of Indigo snakes, *Drymarchon corais*, a panther chameleon, *Chamaeleo pardalis*, and a Savannah monitor, *Aranus exanthematicus*. *Bull ARAV* 6:6, 1996.

WHAT'S YOUR DIAGNOSIS???

A 2.5-year-old female guinea pig named Goldy was evaluated for a skin problem. The owner noticed several multifocal areas of alopecia that had developed recently. Goldy was fed commercial guinea pig pellets supplemented with vegetables, alfalfa hay, and vitamin C in the drinking water. She was housed with her son, a neutered guinea pig approximately 1 year of age. He did not have any skin lesions. Other than the skin lesions, there were no other historical complaints. Goldy's previous medical examination did not reveal any obvious pathology. Physical examination revealed a 0.5-kg intact guinea pig with several multifocal areas of alopecia. The skin was normal in these areas except for a slight amount of peripheral crusting. The incisors were normal, as was the rest of the examination except that a large, firm abdominal mass was palpated. The mass was most prominent in the right hemiabdomen. Radiographs were taken (Fig 1).

Questions

1. Describe the radiographs (the mass is outlined by the arrows).
2. What is your differential diagnosis?
3. How would you proceed?

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ROUNDTABLE

The Proper Environment for Reptiles

Q. What are your recommendations for the enclosure and hiding box?

Dr. Suedmeyer: *Wooden cages are preferred as they allow better heating, cooling, and air circulation. The larger the enclosure, the better for the pet. Hiding boxes should be provided for all reptiles.*

Dr. Tynes: *Owners should properly identify the species of reptile, then consult sources for information on the proper environment for their particular species. Acceptable sources include a knowledgeable veterinarian, herpetological societies, and various books (such as those by the Advanced Vivarium Society). Many owners misidentify reptiles: I have seen several "green iguanas" that were in fact water dragons, which have different husbandry requirements.*

Dr. Carpenter: *Many reptiles, including the green iguana, most chameleons, and the green tree python, enjoy ample vertical space with real or simulated tree branches. Other cage "props" such as rocks and logs provide an aid to ecdysis and access to basking areas. Almost all reptiles will benefit from having a variety of hiding places as well as open areas.*

Q. What kind of substrate is best?

Dr. Suedmeyer: *Vinyl shelf paper, newspaper, or butcher's paper is suitable; soil, corncob litter, cat litter, and wood shavings should be avoided as they are commonly ingested, easily contaminated, and easily grow pathogens.*

Dr. Carpenter: *The ideal substrate is absorbent, non-toxic, easily cleaned and replaced, and of a type that*

allows the expression of natural behaviors in terrestrial reptiles (burrowing or nesting). I concur with Dr. Suedmeyer's recommendation on the best materials. Indoor/outdoor carpet may also be good, particularly if sections are changed frequently for cleaning. The edges should not be allowed to fray, which can result in ingestion and impaction.

Q. What ranges of temperature

do you recommend for a snake, a box turtle, and an iguana?

Dr. Suedmeyer: *All reptiles should be provided a temperature gradient that is no more than 10° below or above the optimum temperature for that species. Don't forget about proper humidity as well as temperature, as humidity plays an important role in shedding and respiration.*

Dr. Tynes: *If not ill, the iguana should be housed between 80–100°F (26.6–37.8°C) (100°F should be under a basking light). The temperature at night should not drop below 75°F (23.9°C). Box turtles need 70–75°F (21.1–23.9°C) at night and 85–88°F (29.4–31.1°C) during the day. Snakes require various temperatures, depending on the species. Commonly kept species such as ball pythons (*Python regius*) and red-tailed boas (*Boa constrictor imperator*) can be kept between 80–90°F (26.6–32.2°C).*

Dr. Carpenter: *There is a direct link between temperature and immune function, with the maximum antibody production occurring at the species'*

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The Proper Environment for Reptiles

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preferred optimum body temperature. Also, physiologic processes such as digestion and vitamin D₃ synthesis from pre-vitamin D₃ precursors in the skin in some species appear to be temperature-dependent. Ideally, a thermal gradient should exist in the cage to allow the reptile to thermoregulate. Some herbivorous species such as green iguana require temperatures of 96–98°F (35.6–36.7°C) for maximum digestive efficiency and should be given access to a basking light for several hours after feeding. The temperature range for an iguana is 85–103°F (29.5–39.5°C). The range for snakes varies with species; an appropriate reference should be consulted for recommendations. The temperature range for an Eastern box turtle is 75.2–84.2°F (24–29°C).

Q. Do you recommend hot rocks?

Dr. Suedmeyer: Hot rocks do not provide adequate heat and can cause severe, life-threatening thermal burns.

Dr. Tynes: I agree with Dr. Suedmeyer. Additionally, owners often develop a false sense of security with a hot rock and are surprised when I tell them that they do not provide adequate heat (despite the recommendation of the pet store clerk).

Dr. Carpenter: No. However, if a hot rock is used, it should only be considered a secondary source of heat, should be insulated, and should be

checked daily for proper functioning.

Q. What do you recommend to supply heat? How can the owner supply heat at night without leaving on a heat lamp/light?

Dr. Suedmeyer: We use infrared lamps around the clock. Heating pads under one end of the cage and a "bulb in a Kerr jar" that is surrounded by pegboard as the floor also work well.

Dr. Tynes: Heat tape, under-the-tank heating pads, and ceramic infrared heat lamps are better choices. Timers can be used to allow more "realistic" temperature fluctuations.

Dr. Carpenter: I would add incandescent bulbs and flood lamps (as long as the proper photoperiod is provided and these are placed outside the cage for safety) to the list. As an example, a 40–60-W bulb placed above one corner of the cage can supply heat; monitor the basking-site temperature for 1–2 days before allowing access by the reptile. Some species of terrestrial lizards and snakes may prefer warmth radiating from the substrate; a heating pad placed under one slightly raised end of the cage is probably sufficient. Thermal burns from poorly placed or malfunctioning heat sources are a common problem. Clients should monitor the temperature and check heating devices frequently.

Q. Let's discuss ultraviolet (UV) lights. What are your recommendations?

Dr. Suedmeyer: A fluorescent black light (Phillips, General

Electric [GE]) of at least 40 W with a fluorescent white light (Chromo 50, Colortone 50) placed no more than 18 in. (6–12 in. is ideal) from the reptile will provide the necessary 290–320 nm of UVB irradiation to convert vitamin D₃ precursors in the skin to active vitamin D₃. Change the bulb every 6–12 months.

Because we don't really know how many hours of UV light is ideal, the best guess would be to provide UV light according to the natural photoperiod requirements of each species.

Dr. Tynes: I recommend them for all reptiles and amphibians, although they may not be truly necessary for some species of snakes. I tell owners that these are wild animals and we do not always know the exact requirements of each species. Until we know more, I prefer to try and achieve the best possible imitation of their environment in the wild. I have been using the GE F20T12 BL bulb in a 2-bulb fixture with a standard cool-white fluorescent bulb (for natural-looking color). A full-spectrum bulb (such as a Vita-Lite) and the UVB bulb might even be better. There is no substitute for sunlight, and 1–2 hours of unfiltered exposure each day can help the pet. Clients should not place their pets outside in glass or plastic containers and should make sure they have access to shade.



FROM THE LITERATURE

Sex Determination in Ratites

The sex of ratites can be determined manually or by chromosomal analysis (Avian Genetic Sexing Lab, 901-323-4045). Female ostriches begin laying eggs at approximately 2 years of age and lay during summer months (emus lay in winter). The average annual ostrich production is 30–50 eggs, which are incubated an average of 42 days.

In a nutshell. *TexVet* June:20, 1995.

Editor's Note: Blood sexing, commonly done in pet psittacines, is available for ratites. This service can be an important option for ratite owners and is cost-effective. In addition, DNA fingerprinting is available from Zoogen (1756 Picasso Ave., Davis CA 95616).

UPCOMING MEETINGS

Course on Diseases of Warm Water Fish, June 13–14, 1996, Gainesville, Fla (904-392-9617).

Central Veterinary Conference, August 17–20, 1996, Kansas City, Mo (1-800-255-6864, Ext. 148).

Speakers: Messonnier, on Exotic Pets and Veterinary Marketing

What's Your Diagnosis???

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Answers

1. The radiograph shows a large radiodense mass in the right hemiabdomen causing a shift of abdominal contents into the left hemiabdomen. The center of the mass (medullary area) consists of a bony density and radiates in a spicular pattern almost all the way to the periphery (cortex) of the mass.
2. Differential diagnoses for an abdominal mass in an intact adult female guinea pig include uterine neoplasia, cystic calculi, renal calculus, abscessed organ, and neoplasia of any other abdominal organ. Pregnancy is also a cause of an abdominal mass but was unlikely in this case.
3. Surgery was recommended for definitive diagnosis and possible treatment.

Goldy was premedicated with 0.2 mg of butorphanol subcutaneously; isoflurane was administered by anesthetic induction chamber and maintained at 1% to 2% by mask. Surgery revealed a large mass arising from the top of the right uterine horn but not continuous with it. The mass was easily removed. Numerous vessels were ligated with medium hemoclips (Solvay) or 4-0 polyglactin 910 (Vicryl). Because of difficulty exposing the ovaries, an ovariectomy was not performed at the time of tumor removal. The abdomen was closed with 4-0 polyglactin 910; an intradermal pattern of 4-0 polyglactin 910 was used to close the skin, and Nexaband surgical glue was applied topically to the incision. An additional butorphanol injection (0.15 mg subcutaneously) was given before discharge that evening; the pet recovered without complications. Histopathology

showed the mass to be an extraskelatal osteosarcoma. No metastasis was detected at the time of surgery or radiographically before surgery. The prognosis was guarded, but the guinea pig is doing well 4 months postoperatively.

Tumors of the reproductive tract are common in intact female guinea pigs. Extraskelatal osteosarcomas are extremely rare.

The life expectancy of the guinea pig is approximately 5 years. It often surprises owners that a pet they consider "young" would have a disease develop that is often associated with the geriatric years. The normally short life span should be carefully explained to pet owners.

Client Teaching Guide

Ferret

CARE SHEET

James K. Morrissey, D.V.M.

Insulinomas in Ferrets

Insulinomas, tumors of the cells of the pancreas that produce insulin, are commonly seen in ferrets from 3 to 6 years of age. Insulin is a hormone responsible for transporting glucose (sugar) from the blood into cells. Because insulinomas are functional tumors, they produce insulin in large amounts. When there is too much insulin, the blood glucose levels become too low.



Clinical Signs

The clinical signs of insulinomas occur when the blood glucose levels become too low for the brain and nervous system to function normally. These signs include decreased activity, hind-limb weakness, episodes of weakness or collapse, salivation or grinding the teeth, unresponsiveness or coma, and seizures.



Diagnosis

Diagnosis of insulinoma is based on history, physical examination, and blood tests such as blood glucose and concurrent blood insulin levels.



Treatment

There are two types of therapy for insulinoma: medical and surgical. Medical treatment involves using medications that alter blood glucose or blood insulin levels. Prednisone is a corticosteroid that increases blood glucose levels by increasing metabolism. Diazoxide is a drug that decreases insulin release by the pancreas. These drugs may be used individually or in combination, depending on the circumstances of each case. It should be kept in mind that medical therapy does not treat the tumor itself, but rather simply treats the signs caused by the tumor. As the tumor grows, more medication is usually needed. It is very important that you keep in contact with your veterinarian and have regular checkups (every 3 months is recommended) so that medications can be adjusted as needed.

Surgical treatment involves removing the section of pancreas that contains the tumor. Surgery is usually not curative but can significantly slow the progress of the disease. Medication may or may not be needed after surgery, depending on the severity of the disease. Ferrets often need medical therapy eventually, even after surgery.



Home Care

If your ferret has an insulinoma, learn to recognize the signs of low blood glucose levels. If an episode occurs, first make sure the prescribed medication was given in the correct amount. If your ferret can eat, give the normal food, baby food, or other balanced diet. If your ferret is too weak to eat, rub honey, maple syrup, or sugar water on the gums. **DO NOT FORCE MEDICATIONS OR SUGAR SOLUTIONS INTO A COMATOSE FERRET!** Call your veterinarian as soon as possible to discuss further treatment. If there is no response or your ferret is seizing, bring him directly to the hospital. Insulinoma is a serious disease that requires treatment and lifelong monitoring. With proper care, your ferret can have a happy, normal life.

CASE REPORT

Regurgitation in Snakes

Valarie V. Tynes, D.V.M.

A Texas long-nosed snake (*Rhinocheilus lecontei*) was seen for chronic regurgitation of 4–5 months' duration. The snake had been captured from the wild about 5 months previously and had not been taken to the veterinarian in that time. The snake was housed in a 10-gal aquarium with an incandescent bulb in a reflector placed at one end of the aquarium. The snake was provided with a "hot rock" and a plastic "cave" for security. A thermometer was mounted at one end of the cage, and the owner said that most of the time the temperature was "in the 70s." A ceramic bowl of water was available at all times. The owner reported that the snake had been offered freshly killed small adult mice at 1–2-week intervals since capture. It regularly fed on the mice but regurgitated them within 2–5 days. The snake was never handled after eating.

On initial examination, the snake weighed 116 g, was 102 cm long, and appeared extremely emaciated and dehydrated. A fresh fecal flotation revealed a large number of larvated strongyle-type ova. A fresh fecal direct smear did not reveal protozoa. A gastric lavage was performed and submitted to a laboratory for microscopic cytologic evaluation. Because of financial constraints, the owner waited for the results of the gastric lavage before pursuing further diagnostics.

The differential diagnoses that should be considered for regurgitation in a snake include improper environmental temperature, infectious and/or metabolic disease, parasitism (especially *Cryptosporidium* species), intoxication, inappropriate

size of prey, putrefaction of ingested material, foreign body, and abscess or neoplasia in the gastrointestinal tract. Fecal flotations, fecal direct smears, cytologic evaluation of gastric lavage specimens, radiographs, and gastrointestinal endoscopy and biopsy may be useful in diagnosing regurgitation in reptiles.

While awaiting the results of the gastric lavage specimen, treatment for the existing parasitism and dehydration was initiated. A physiologic rehydrating solution at a dose of 15–25 mL/kg/24 hours, preferably given intracoelomically, has been recommended for the rehydration of reptiles. On day 1, this snake was given 2.5 mL of Ringer's solution intracoelomically. Ivermectin was injected subcutaneously at a dose of 200 µg/kg to treat the gastrointestinal parasitism. Antibiotic therapy was initiated using Enrofloxacin (Baytril) subcutaneously at a dose of 5 mg/kg once daily.

The results of the gastric lavage showed a small amount of heterophils and macrophages, indicating low-grade inflammation with no evidence of neoplasia. No *Cryptosporidium* organisms were seen. Treatment with Enrofloxacin and Ringer's solution was continued at the daily dose mentioned for 5 days. Enrofloxacin injections alone were then given every other day for three more doses. On day 8, the snake was fed 2.5 mL of Emerald II (Lafeber) via stomach tube. Emerald II is a product intended for treating caged birds, but it is very useful for supplementing sick and recovering reptiles. The recommended dose for reptiles is 0.5–1.0 mL/40 g of body weight.

The snake did not regurgitate this meal, so it was repeated the next day and the snake was then discharged from the hospital. The owner was instructed to begin feeding by offering the snake pinky or fuzzy mice at weekly intervals.

On follow-up examination 5 months later, the snake weighed 147.4 g. The owner reported that the snake had not regurgitated since discharge from the hospital and that it regularly ate two to three fuzzy mice every 7–10 days.

It is common for the client to place financial constraints on the veterinarian, thus limiting the diagnostic tests that can be performed. Anytime the veterinarian is presented with a wild-caught reptile specimen, the first tests to be performed should be a fecal flotation and a fecal direct smear if possible. If the pet is anorectic or fresh feces are not available, a colonic wash could be performed and the specimen examined microscopically for parasites. In the case of this reptile, if the parasitism had been diagnosed and treated shortly after capture, the animal might not have experienced any further illness. However, when the animal was presented in such a debilitated condition, additional symptomatic therapy with fluids and force-feeding were also necessary and broad-spectrum antibiotic therapy was indicated. The goals were to treat any existing bacterial infection while awaiting the results of the gastric lavage as well as to prevent any secondary bacterial infections.

Note: The Texas long-nosed snake's natural prey is primarily lizards and their eggs and insects, although rodents will be eaten on occasion. Offering a reptile its preferred natural diet may help prevent illnesses.



What are your thoughts on using estrogen or "mood-altering" medications in aggressive male iguanas when neutering is not an option?

Dr. Morrisey has not used medical therapy but believes neutering is more likely to be of benefit before sexual maturity is reached (although it may help once signs have begun). I have had success in controlling breeding-season anorexia by neutering a male iguana. Dr. Dutton has used megestrol acetate (Ovaban, Schering) at 2.5 mg every 7 days without success in one iguana.

Has anyone seen transient lethargy in hedgehogs that have been given ivermectin orally?

Dr. Morrisey has not had this happen to any of the hedgehogs he has treated. He did mention that research in guinea pigs showed inadequate blood levels of ivermectin when it was administered orally or intramuscularly; subcutaneous administration did produce adequate blood levels. Dr. Dutton uses 200 µg/kg without any side effects.

Have you had any problems with vaccinating ferrets for distemper?

According to research conducted by Shelters That Adopt and Rescue Ferrets (STAR Ferrets) and reported in the Independent Voice in the fall of 1993, "problems" associated with distemper vaccination occurred in 28% of cases involving Fervac-D and 6.1% of cases involving FROMM-D. Serious reactions (vomiting, seizures, anaphylaxis) occurred less than 0.1% for both vaccines. A total of 1,372 pet owners, veterinarians, breeders, and rescue shelters were questioned concerning distemper vaccine reactions. The most common reaction was a temporary "stinging" (23.6% frequency with Fervac-D and 4.7% frequency with FROMM-D). Postvaccinal lethargy was less than 2% for both vaccines. Although this is important to know, currently Solvay does not make FROMM-D and has no plans to reintroduce it (as of my last call to the company). Any vaccine can produce side effects; I have not had any problems with Fervac-D other than slight discomfort on administration in a few cases. Warming the vaccine to room temperature, scruffing the ferret by the neck and holding it off of the table, and administering the vaccine subcutaneously in the flank area using a 23-gauge needle have minimized discomfort for the pets in my practice.



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