
BACTERIAL RESISTANCE IN STOMATITIS AND PNEUMONIA OF *Boa constrictor*

N.P. Azevedo, DVM,¹ L.B.M. Araujo, DVM, PhD,^{2*} and B. F. Carneiro¹

¹non – affiliated; ²Preventive Veterinary Medicine Department, School of Veterinary Medicine and Animal Science, Federal University of Goiás, Campus II, Samambaia, Goiania, Goiás, Brazil, 74001-970 . E-mail: batalha@vet.ufg.br

ABSTRACT

During clinical examination of an adult female *Boa constrictor*, submandibular edema and reddish diffuse plaques were observed in the oral mucosa, indicative of stomatitis. Pneumonia was diagnosed by observation of clinical signs and detection of respiratory parameters. Strains of *Pseudomonas* spp. and *Staphylococcus epidermidis*, obtained by tracheal swab were resistant to 12 different antibiotics, tested by Kirby-Bauer technique. Despite antibiotic therapy, the animal did not improve. Instead, the reptile suffered from pathological fractures in some vertebrae and ultimately died.

Introduction

Snakes are included in the order Squamata and compose the suborder Ophidia, with about 2900 species distributed worldwide. There are nine families, 75 genera and 321 species in Brazil. Some families are more interesting for captive breeding programs for commercial purposes, for example, some specimens of Boidae (*Boa constrictor* and *Eunectes* spp.), Viperidae (*Crotalus* spp. and *Bothrops* spp.), Colubridae (*Spilotes pullatus* and *Chironius exoletus*) and Elapidae (*Micrurus* spp.).⁷

Poorly designed environments in privately kept reptiles contribute to the high incidence of diseases and injuries in these animals. Agents of viral, bacterial, fungal, protozoal and metazoan diseases can be directly linked to lack of hygiene, therefore disposing the onset of infectious emergency condition such as gastroenteric processes, severe pneumonia and septicemia.⁶ Stomatitis is a relatively common disorder of the upper gastrointestinal tract and is characterized by inflammation and infection of the oral cavity, causing anorexia and weakness in the affected animals. It is usually associated with management errors, such as temperature changes, wrong or poor nutrition, and stress, which can depress the immune system leading to susceptibility to diseases and death.⁹ Several pathogenic bacteria have been isolated in cases of stomatitis in reptiles, mostly gram negative.⁴ The most common bacterial pathogens are *Aeromonas* spp. and *Pseudomonas* spp.; others less frequent are *Klebsiella* spp., *Staphylococcus* spp., *Corynebacterium* spp.⁹ Fungi, neoplasia, and mandibular fractures can also cause stomatitis.³ Pneumonia is a relatively common disease in captive reptiles, and its development, as well as stomatitis, is associated with management problems, such as hygiene and nutrition as well. The main agents that are present in bacterial pneumonia in reptiles are *Escherichia coli*, *Klebsiella* sp., *Pseudomonas* sp., *Proteus* sp., *Aeromonas* sp., *Staphylococcus* sp., *Pasteurella testudinis*, and also reported the presence of *Bacterioides*, *Peptostreptococcus*, *Fusobacterium*,

Clostridium, *Mycoplasma* sp. and *Chlamydophila* sp.⁹ Regarding stomatitis, the same author recommended a complete oral examination and sample collection for cytological examination, especially in cases where there is caseous material. The diagnosis of pneumonia in reptiles should be based on cytology and culture, and further tests as fecal flotation, hematology, x-rays and bronchoscopy.²

Bacterial resistance to antibiotics can be classified as natural or acquired.⁸ So-called natural resistance is an indispensable feature of self-defense of micro-organisms usually caused by competition with other strains in the same habitat.^{1,5} Natural resistance has no predictable and consistent clinical significance to know the spectrum of action of the antibiotic to prevent it. Acquired resistance, on the other hand, is responsible for significant medical problems in view of the extensive participation of microorganisms with the antimicrobial sensitivity modified in the etiology of infection.¹¹

Antibiotics apparently have no action on mutagen sensitive or resistant strains. However, they may select resistant strains already present, killing the sensitive strains.¹⁰ This study evaluated the resistance of strains of *Pseudomonas* spp. and *Staphylococcus epidermidis* to 12 different antibacterial agents in a *Boa constrictor* specimen.

Clinical Report

A 10-yr-old female *Boa constrictor* specimen weighing 10 kg presented with anorexia, foamed secretions in the oral cavity and submandibular edema was brought to clinical care (Figure 1). On clinical examination, reddish plaques were observed in the mucosa of the oral cavity, indicating stomatitis. Pneumonia was diagnosed by clinical signs observation (oral discharge, anorexia, wheezing sounds during auscultation and submandibular edema) and detection of respiratory parameters.

Therapies were implemented based on clinical signs of progression of the disease, since the owner did not permit any diagnostic evaluation (blood, x-ray, microbiological or antibiogram). At first, the local cleaning of the oral cavity was established with antiseptics such as hydrogen peroxide (Peroxide 10 vol. 1 L, Farmax Ltda., Brazil) and 0.2% Clorexidine (0.2% Riohex, 1L, Rioquímica Laboratories, Brazil) and topical application of 10 mg of Silver Sulfadiazine cream (30 g Sulfadiazine Silver, União Química Ltda., Brazil) every 24 hours for 45 days.

Intramuscular treatments of 4 mg/kg of Gentamicine (10 ml Gentatec, Chemitec Agro-Veterinária, Brazil) were administered every 72 hours three times, followed by 3.6 mg/kg Ceftriaxone (Ceftriaxone Ariston 1 g, Ariston Laboratories, Brazil) every 72 hours five times. Fluid therapy was given for general support with 20 ml/kg of 0.9% saline solution (500 ml Baxter Hospitalar Ltda., Brazil) subcutaneously every 72 hours for the duration of the antibiotic therapy. From the thirtieth day, nebulization was started using 4 mg/kg of Gentamicine (10 ml Gentatec, Chemitec Agro-Veterinária, Brazil) diluted in 9 ml of 0.9% saline solution (500 ml Baxter Hospitalar Ltda., Brazil) and 24 mg/kg of 24% aminophylline (Aminophylline vial 10 ml, União Química Ltda., Brazil) BID for 30 minutes for 15 days. There was no response to the therapy implemented and the animal died on the 45th day. Necropsy was not authorized by

the owner. Only the *post mortem* collection of tracheal swabs for microbiological identification and antibiogram were allowed.

Materials and Methods

After the animal death, tracheal secretion was collected with sterile swab and sent for processing to the Laboratory of Bacteriology, Preventive Veterinary Medicine Department at School of Veterinary Medicine and Animal Science, Federal University of Goiás. Kirby-Bauer technique, known to the disk-diffusion method for determination of bacterial agents and their sensitivity to antibiotics, was used testing 12 different drugs: amoxicillin, florfenicol, ampicillin, cephalixin, ciprofloxacin, doxycycline, enrofloxacin, neomycin, tetracycline, sulfonamide, gentamicin and trimethoprim – sulphametaxazol. The inhibitory halos were measured with a caliper after incubation at 36° C for 24 h, and assessed according to the interpretative zone side chart for Kirby-Bauer test.

Results

Pseudomonas spp. and *Staphylococcus epidermidis* strains were isolated, and both showed 100% resistance to all antibiotics tested.

Discussion and Conclusion

This case was not successfully treated mainly due to the inability to perform diagnostic tests that could have directed the therapy. Acquisition of resistance of microorganisms to antimicrobial agents is a constant concern in clinical routine. Allied to this concern, there is relatively little information regarding the pharmacokinetic and pharmacodynamic aspects of antibiotic in different reptile species, generating doubts about the proper way to use them on those species.⁶ The microorganisms strains isolated, *Pseudomonas* spp. and *Staphylococcus epidermidis*, are commonly described in stomatitis and pneumonia in snakes,⁹ but their resistance to all 12 antimicrobial agents tested cause concern about the effectiveness of treatments in other animals.

The medical history indicated previous use of other antibiotics during the life of the animal. The description of the active principles previously used and the administration form was not precise, implying that there may have been, at some point, selection in the normal flora of microorganisms in the *Boa constrictor* specimen. This may explain the lack of response of isolated microorganisms to the tested drugs, as demonstrated by the Kirby-Bauer technique.

LITERATURE CITED

1. Aymes SGB, Gemmell CG. Antibiotic resistance. *J Med. Microbiol*; v. 46. 1997. p. 436-470.
2. Birchard SJ, Sherding RG. Manual Saunders. Clínica de pequenos animais. 2º ed. São Paulo: Roca, 2003. p. 1694 – 1700.
3. Cooper JE, Sainsbury AW. Espécies Exóticas. São Paulo: Manole. 1997. p.167
4. Cubas PH, Baptistine C. Chelonia (Tartaruga, Cágado, Jabuti). In: Cubas ZS, Silva JCR, Catão – Dias JL. Tratado de Animais Selvagens – Medicina Veterinária. São Paulo: Roca,

-
-
2007. p. 86 – 119.
5. De Lima DC, Alvarez AP, De Freitas CC, Santos DO, Borges RO, Dos Santos TC, Mendes C L, Rodrigues CR, Castro HC. Snake Venom: Any Clue for Antibiotics, CA. *Evid. Based Complement. Alternat. Med*; v. 2: 2005. p. 39-47.
 6. Goulart CES. Ordem Squamata – Subordem Sauria (Lagarto, Teiú, Iguana). In: Cubas ZS, Silva JCR, Catão – Dias, JL. Tratado de Animais Selvagens – Medicina Veterinária. São Paulo: Roca, 2007. p. 58 – 67.
 7. Kolesnikovas CKM, Greco KF, Albuquerque LCR. Ordem Squamata – Subordem Ophidia (Serpente). In: Cubas ZS, Silva JCR, Catão – Dias JL. Tratado de Animais Selvagens – Medicina Veterinária. São Paulo: Roca, 2007. p. 68 – 85.
 8. Levy SB. The challenge of antibiotic resistance. *Scien. Am*; v. 398. 1998. p. 1-10.
 9. Mader DR. Reptile Medicine and Surgery. 2ª ed. Califórnia: W. B. Saunders Company, 2006. p. 631–664, 865 – 876, 924 – 930.
 10. Majiduddin FK, Materon IC, Palzkill TG. Molecular analysis of beta-lactamase structure and function. *Int J Med Microbiol*; v. 292: 2002. p.127- 137.
 11. Rolain JM, Rault D. Genome comparison analysis of molecular mechanisms of resistance to antibiotics in *Richettsia* genus. *Ann N Y Acad Sci*; v. 1063: 2005. p. 222-300.



Figure 1. Lateral picture of an adult female *Boa constrictor* head with submandibular edema.