

STOMATITIS (MOUTH ROT) IN SNAKES

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INTRODUCTION

Necrotic or ulcerative stomatitis (mouth rot) remains a major problem in captive reptile populations. Mouth rot can affect all major reptile groups (Table 1), including the crocodylia, chelonina, sauria (lizards), serpentes (snakes), however the snakes are most often affected and therefore this article will concentrate on this group. Nevertheless, any reptile exhibiting signs of dysphagia (difficulty eating), buccal/mandibular (mouth/jaw) swelling and anorexia should be examined for stomatitis.

Stomatitis is infectious in nature being caused by a variety of gram-negative (and uncommonly gram-positive) bacteria, viruses, fungi and parasites. Stomatitis is essentially an inflammation of the mucous membranes of the mouth (gums, throat etc) but is seldom a primary infection. Most cases are secondary to stress, mouth damage, weakness, malnutrition and poor husbandry (for example, bad vivarium design, inappropriate temperatures). The successful diagnosis and treatment of mouth rot requires a compliant owner who is willing to permit the veterinary surgeon to carry out essential laboratory and ancillary diagnostic tests. This article aims to increase owner awareness of this potentially fatal condition which will maximise the chances of early detection and a successful outcome.

FACTORS PREDISPOSING TO STOMATITIS

The major predisposing cause of mouth rot in snakes is damage to the mouth. Active or nervous snakes not provided with a hide box may relentlessly cruise around the vivarium and make repeated attempts to escape by rubbing their snouts against edges and corners. Such specimens will often rub and damage their mouths which can subsequently become infected. In these circumstances, greater seclusion is required by covering the glass with paper. Even calm specimens may succumb to mouth damage if maintained in badly designed (sharp or rough edges), unhygienic vivaria without hide boxes. Floor substrate, such as corn cob, can also cause an acute stomatitis if it becomes trapped within the mouth.

Snakes that are force-fed in a rough manner will also incur mouth damage, as can snakes fed live prey which have been inadequately constricted or stunned. Force feeding should only be carried out by experienced persons using well lubricated prey. If feeding forceps are used the prey must be gripped behind the head to ensure that the points of the forceps do not protrude in front of the prey and perforate the mouth or oesophagus. Frozen rodents should always be considered ahead of live prey due to the potential problems of parasitism and the risk of the prey animal biting the snake. There are also welfare issues that need addressing when feeding live prey.

The immune system of any reptile is temperature dependent and their sub-optimal temperatures will lead to immunosuppression and opportunistic infections. Temperatures exceeding the preferred optimum temperature zone for a particular species will result in attempts to escape from the vivarium, again resulting in rostral mouth damage. Recently imported snakes may have parasites that can cause stomatitis (for example, *Kalicephalus* spp) and therefore worming would be an essential part of any treatment plan if recurrence is to be avoided. There has also been some evidence to suggest that a deficiency of vitamin C may predispose to stomatitis, and although not conclusively proven this may represent another reason for routinely using a multi-vitamin supplement (Ark-Vits, Vetark). Husbandry, nutrition and captive status must all be addressed and corrected if there is to be any hope of preventing disease or achieving a permanent cure. When stomatitis is noticed it is important to take the snake to a veterinary surgeon as soon as possible. Any home treatment, such as cleaning the mouth with an antiseptic, can adversely affect any bacteriological tests, and although an important part of treatment it should not be started until after a veterinary consultation.



Plate 1. The untreated stomatitis in this Boa Constrictor (*Boa constrictor*) has progressed to a chronic infection which has invaded the bones of the head to cause deformity of the normal anatomy of the head. This animal had to be euthanased on humane grounds.

VETERINARY INVESTIGATION

Upon presentation, the owner's records are scrutinised and a detailed history is obtained on the snake and its environment (husbandry and nutrition). The snake can then be examined from head to tail to obtain a general overview before examining the mouth in detail and employing diagnostic aids.

Clinical Examination: Severe cases of mouth rot will often be visible externally as the snake may not be able to close its mouth due to the swelling. Swelling may also interfere



Plate 2. Boa Constrictor (*Boa constrictor*) presented with a severe necrotic stomatitis.

with breathing and cause respiratory noise. The mouth of a snake is a delicate and complicated structure which is opened gently to permit visualisation of any lesions. Blunt instruments can be used to keep the mouth open, but in very large or poisonous snakes a sedative or anaesthetic may be required before examination. If presented early there may only be inflammation of the mouth, either diffuse or focal. However, if left untreated infection will become established resulting in a build up of necrotic (devitalised) tissue and caseous pus.

Laboratory Tests: In mild cases, all that may be required is a swab for culture (bacterial and fungal) and antibiotic sensitivity. However, if the snake's parasite status is in question, particularly in the case of wild caught specimens, then buccal scrapings for microscopy are advisable. In severe cases, a blood sample for both haematology and biochemistry is useful to determine any systemic involvement as bacteria may spread and cause a septicæmia, while bacterial toxins can have a profound affect on liver and kidney function which will have important implications on the choice of medication. Repeat blood samples are often taken to monitor the response to therapy.

Ancillary Diagnostics: In severe or long term cases of stomatitis it is important to evaluate any bony involvement of the mouth as osteomyelitis (bone infection) carries a much poorer prognosis than infection of the soft tissues alone. Radiography is used routinely to examine the bones of the head and, if diseased, great care is required to prevent any fractures during handling and cleaning of the mouth.

In some cases stomatitis may merely be a reflection of a much greater problem involving the oesophagus and perhaps even the stomach. Therefore, where the lesions extend down the throat the use of endoscopy (fibre-optics) to examine the oesophagus is warranted.

Table 1. Cases of Stomatitis Recorded by the Author
Between 1 December 1994 - 31 March 1995

Reptile Order	Species	Number of cases	Microbiological Investigation
Crocodylia	<i>Caiman crocodilus</i>	2	<i>Pseudomonas aeruginosa</i> , <i>Aeromonas hydrophila</i>
	Sub-Total	2	
Chelonia	<i>Testudo graeca</i>	5	<i>Pseudomonas</i> (2), <i>Aeromonas</i> (2), <i>Proteus</i> (1), <i>Herpesvirus</i>
	<i>Trachemys scripta elegans</i>	1	<i>Aeromonas hydrophila</i>
	<i>Terrapene carolina</i>	1	<i>Aeromonas hydrophila</i>
	<i>Trionyx spiniferus</i>	1	<i>Aeromonas aerophila</i>
	<i>Geochelone pardalis</i>	1	<i>Neisseria</i>
	Sub-Total	12	
Squamata Sauria	<i>Iguana iguana</i>	2	<i>Pseudomonas aeruginosa</i>
	<i>Eublepharis macularius</i>	2	<i>Pseudomonas aeruginosa</i> , <i>Proteus</i>
	<i>Physignathus cocincinus</i>	1	<i>Pasturella</i>
	<i>Chamaeleo calypttratus</i>	1	<i>Pseudomonas aeruginosa</i>
	<i>Chamaeleo parsoni</i>	1	<i>Proteus</i>
	<i>Corucia zebrata</i>	1	<i>Pseudomonas aeruginosa</i>
	<i>Varanus exanthematicus</i>	1	<i>Aeromonas hydrophila</i>
	Sub-Total	10	
Squamata Serpentes	<i>Boa constrictor</i>	9	<i>Pseudomonas aeruginosa</i> (4), <i>Aeromonas hydrophila</i> (3) <i>Haemophilus</i> (1), <i>Proteus vulgaris</i> (1), <i>Herpesvirus</i>
	<i>Python molurus bivittatus</i>	7	<i>Pseudomonas aeruginosa</i> (4), <i>Aeromonas hydrophila</i> (3)
	<i>Elaphe spp</i>	6	<i>Pseudomonas aeruginosa</i> (3), <i>Aeromonas aerophila</i> (2), <i>Candida albicans</i> (1)
	<i>Python regius</i>	5	<i>Pseudomonas aeruginosa</i> (2), <i>Aeromonas hydrophila</i> and <i>Kalicephalus</i> (3)
	<i>Lampropeltis spp</i>	5	<i>Pseudomonas aeruginosa</i> (2), <i>Aeromonas hydrophila</i> (2), <i>Streptococcus</i> (1)
	<i>Epicrates cenchria</i>	3	<i>Pseudomonas aeruginosa</i>
	<i>Drymarchon corais</i>	2	<i>Pseudomonas aeruginosa</i> , <i>Aeromonas hydrophila</i>
	<i>Thamnophis spp</i>	2	<i>Aeromonas hydrophila</i>
	<i>Chondropython viridis</i>	1	<i>Pseudomonas aeruginosa</i>
	<i>Python curtus</i>	1	<i>Pseudomonas aeruginosa</i>
	<i>Heterodon nasicus</i>	1	<i>Staphylococcus epidermis</i>
	<i>Crotalus atrox</i>	1	<i>Aeromonas hydrophila</i>
	Sub-Total	44	

Surgical Debridement: Once all necessary laboratory and diagnostic tests have been carried out the snake is sedated or anaesthetised and the mouth lesions thoroughly debrided. The mouth is then washed and cleaned using a povidone-iodine antiseptic, such as Tamodine (Vetark). Once the mouth has been debrided it is important that the mouth is cleaned once or twice daily at the direction of the veterinary surgeon to prevent the future accumulation of pus.

Medication: The choice of treatment will depend upon the cause of the stomatitis (bacteria, viruses, fungi, parasites), the severity of the disease and the snake's systemic health status. Antibacterials such as enrofloxacin, ceftazidime and amikacin may be employed initially but the antibiotic choice may change once a bacterial culture and sensitivity is obtained. Anti-viral drugs such as acyclovir and anti-fungal drugs such as ketoconazole have been used where indicated. Various other medications including non-steroidal anti-inflammatory drugs and vitamin C may also be used at the veterinary surgeon's discretion. An essential part of any treatment is the identification of the underlying cause, which must be corrected if recurrence is to be avoided.

Prognosis: If a case of stomatitis is presented early and a thorough veterinary investigation permitted the chances of a complete recovery are excellent. Chronic, severe infections, particularly fungal and viral in origin can be difficult and time consuming to treat, while those involving the bones of the mouth carry the worst prognosis.

Table 2. Stomatitis (Mouth Rot) In Snakes: Summary

Prevention	Owner Detection	Veterinary Diagnosis	Veterinary Treatment	Prognosis
Vivarium design, materials and furnishings	Focal or diffuse inflammation	Detailed history and clinical examination	Surgical debridement	Varies from excellent (simple infection and cause identified) to poor (chronic bone infection).
Nutrition	Swelling of jaw	Microbiology	Regular cleaning	
Temperature, lighting and humidity	Anorexia	Radiography and endoscopy	Antibiotics	Viral and fungal diseases are particularly difficult to treat.
Regular inspection	Caseous pus in mouth	Microscopy	Anti-fungals	
Captive status			Anti-virals	
			Anti-inflammatories	
			Vitamin C	
			Identification and correction of predisposing factors	

SUMMARY

Stomatitis remains one of the most commonly presented diseases of snakes today, but with proper veterinary and owner care this disease can be treated and prevented. Snakes are a fascinating and increasingly popular pet, and both owners and vets owe it to these animals to provide the best possible captive care and veterinary treatment.