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TRACHEAL LAVAGE – A METHOD OF SAMPLING THE LOWER RESPIRATORY TRACT IN SNAKES

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ABSTRACT

The snake's respiratory infections are briefly reviewed and discussed. Prior to treatment, it is essential to determine the causative agent of the respiratory infection.

The tracheal lavage is described as a preferred method to obtain material for examinations and detecting pathogens from the respiratory system. The aspirates can be used for parasitological, virological, cytological, microbiological, molecular and other examinations.

A patient with chronic respiratory disturbances was used for the purpose of this pilot study.

Key words: tracheal lavage, respiratory infection, snake, radiography, ultrasonography.

Introduction

Respiratory infections are commonly diagnosed in captive snakes, because environmental requirements for each species are very specific and sometimes difficult to encounter in captivity. Any deviation from optimal conditions, such as too high or too low temperatures and humidity, inadequate diet or chronic stress, will result in an immunocompromised patient. A variety of infectious agents, including viral, bacterial, fungal and parasitic agents have been detected and associated with respiratory disease in reptiles (Schumacher, 2003).

Tracheal lavage is the preferred method for sampling of pathogens from the lower respiratory tract. In debilitated patients the method can be performed by using manual restrain or under light sedation in others – taking in consideration the type of procedure, risk, specific requirements and adequate analgesia should be assessed individually.

Notes on snake's respiratory system

Snakes normally breathe with closed mouth, with air entering the upper respiratory tract through the external nares. The lower respiratory tract starts with a small opening just behind the tongue called glottis, which opens into the trachea. Unlike mammals, the reptile glottis is always closed, forming a vertical slit, unless the snake takes a breath. In all snakes the right lung is larger than the left, with the left lung being fairly well developed in Boids and only vestigial in other snakes. The trachea usually terminates and splits in primary bronchi just cranially of the heart. With a few exceptions, all snakes have single chambered lungs. The cranial part of the lung has respiratory function, while the caudal part of the lung, which is like air sack, act like a reservoir for oxygen (Jacobson, 2007).

Tracheal lavage

Tracheal lavage in snakes could be performed by sterile cylindrical catheter with a proper size and length. The catheter should enter into the open glottis without difficulty and should reach the end of the trachea (cranially of the heart). We recommend to accurately establish the location of the

heart, which lies under the bifurcation (Georgiev et al., 2018). It will help to appropriately choose the correct length of catheter and mark it before introducing it through the glottis.

Figure 1: Ultrasound guidance the penetration of the catheter (Mustafa et al.)

The patient had a chronic respiratory infection so tracheal lavage was performed by manual immobilization after premedication for analgesia with with Tramadol Hydrochloride, 10 mg/kg, per os (Tramadol 10%, KRKA©) for analgesic purpose.

A sterile flexible cylindrical catheter (70 cm, 2.7 mm, Colorplast©) was measured by ultrasound guidance (7,5 MHz frequency of the probe) from the ventral body wall to determine the heart topography and the depth of penetration of the catheter (Fig. 1). Several breathing movements were observed before the catheter was carefully inserted through the glottis. The penetration depth was reached and further radiographic examination was performed to visualize the location of the catheter in the trachea (Fig. 2). Five ml of warm saline solution (NaCl 0.9%, Braun©) were infused using a syringe and the snake's body was massaged to aid in loosening any pulmonary exudates (Fig. 3). The snake's body was tilted downward and fluid was aspirated back in another syringes. The catheter was gently removed after completion of the procedure and the snake was placed in a preheated cage.

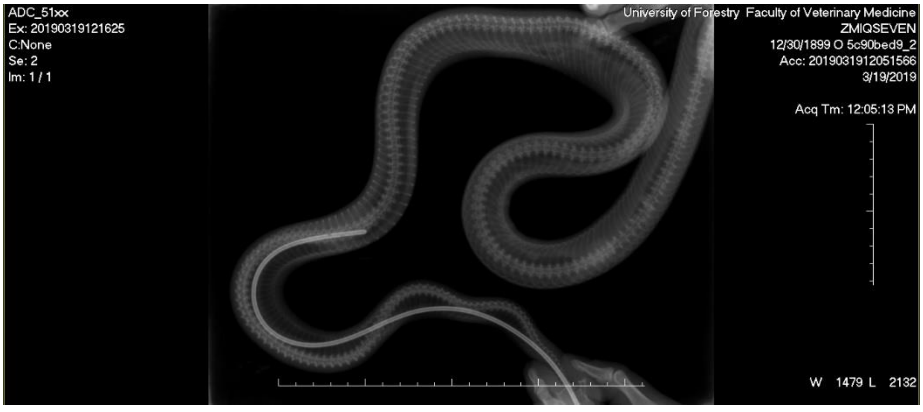

Figure 2: X-Ray image of depth of penetration of the catheter (Mustafa et al.)

Figure 3: Tracheal lavage of the snake's lungs (Mustafa et al.)

Discussion

Snake's respiratory infections generally have slowly progressive clinical signs which are often missed. Therefore, most of them are presented with chronic respiratory disease, although acute respiratory distress may occur (Mitchell et al., 2016). The signs of respiratory infection include open-mouth breathing (Fig. 4.A), bubbly mucus in and along the sides of the mouth (Fig. 4.B), a raised head, loss of appetite, inactivity, gaping and forced exhalations (De Vosjoli, 2004; Rossi et al., 2006). In many cases respiratory infections are accompanied with stomatitis - due to lack of diaphragm and cough reflex, snakes are trying to compensate the breathing difficulties by open-mouth breathing and this in turn is a prerequisite for entry of a large number of pathogenic microorganisms (Schumacher, 2003).

Figure 4. Respiratory infection clinical signs.
A – Green tree python (Morelia viridis) with open mouth breathing (Mustafa et al.);
B – Carpet python (Morelia spilota) with bubbly mucus (Mustafa et al.);

The anatomy of the reptile lung is relatively simple, so using the above mentioned method for sample collection also helps the evacuation of inflammatory fluids from the lungs. It is considered a safe method – reptiles are widely known for their ability to tolerate hypoxia, due to the caudal portion of the lung, where no gas exchange is observed (Ballard et al., 2016).

Performing tracheal lavage in snakes with respiratory infections is characterized with two advantages – it provides the ability for sample collection as well as evacuation of the intrapulmonary and tracheal fluids. Snakes have a poorly developed mucociliary apparatus so are not able to clear their respiratory tract by themselves (Mitchell et al., 2009).

Conclusion

Tracheal lavage is a reliable procedure for samples obtaining. Additional imaging and ultrasonography diagnostic technique could be useful for examination of the respiratory tract and also could be a guideline for determination of the exact location of the heart. Tracheal lavage can also be used as a healing method for eliminating exudate from trachea and bronchi, especially in chronic and non-responsive to initial symptomatic treatment respiratory infections in snakes.

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