



NEBULISATION

Respiratory Treatment Techniques

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Nebulisation is a valuable technique used to deliver medication directly to the respiratory tract as well as to hydrate mucous membranes and clear debris. The use of F10 as a therapeutic agent has proven to be very successful.

LICENSING

F10 products are licensed for therapeutic use in a range of animal species, which varies in different regions of the world. In many areas, license use is limited to 'minor use in minor species', what most of us would understand as 'exotic pets' or 'animals not conventionally kept as pets (excluding animals kept for food consumption)', whilst in other regions F10 may be used in any species of animal. In this article some treatment methods may be mentioned that relate to species that don't fall into the category of "minor" or "exotic" species and if you live or work in an area where F10 is not licensed for use in such species, it should be noted that use thereof will be off-label. Nebulisation can be used safely in any species but should always be undertaken subsequent to diagnostic testing and under the supervision of a veterinary surgeon.

STANDARD OPERATING PROCEDURE FOR NEBULISATION

By Dr Neil Forbes

Nebulisation involves the aerosolization of a liquid therapeutic agent so as to allow its direct application into the upper and/or lower respiratory tract. It allows instantaneous drug delivery to the required site without the potential lag time which many systemic drugs take to achieve therapeutic tissue concentrations. Nebulisation is a particularly useful adjunct treatment in cases of infectious upper and lower respiratory tract disease. A nebuliser capable of



*Photo: Blue and gold macaw being nebulised.
Photo courtesy of Bryanston Avian, Exotic and Small Animal Clinic*

producing a particle size around 5µm allows good penetration to the alveoli in mammals or the air capillaries in the avian lung.

Many smaller patients can be nebulised within their existing cage, vivarium or enclosure. Alternatively modified plastic tubs, oxygen tents, incubators or travel baskets covered with a towel can be used. Jet nebulisers are robust and generally the most cost-effective, however the compressor can be noisy. A process of gradually habituating the patient to the noise of the compressor may be required. Mesh or ultrasonic nebulisers are quieter and nebulise faster than jet nebulisers. They may be useful for critical or easily stressed patients, including in clinical scenarios where stress is a significant contributory factor to disease presentation.

Typically animals are nebulised for 15-30 minutes two to three times daily with either F10 Antiseptic Ready to Use (RTU) Solution or F10 Antiseptic

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ALL SPECIES
RESPIRATORY TREATMENT
NEBULISATION

Solution Concentrate diluted 1:250 with saline. Owners can continue treatment at home and treatment duration will depend on the condition being treated. Always keep the nebuliser administration cup in an upright position and follow manufacturer guidelines for cleaning and maintenance.

CLINICAL PRESENTATIONS THAT BENEFIT FROM NEBULISATION

By Dr Neil Forbes

Whilst I have great confidence that nebulization will be efficacious in the topical treatment of respiratory infections, owners and clinicians should be mindful that where the respiratory presentation arises as a result of systemic disease e.g. Feline Herpes Virus, then whilst some easing of clinical signs together with reduced spreading of pathogens may be expected, clinical resolution of the systemic disease is unrealistic.

BIRDS

Fungal, viral and bacterial primary or secondary respiratory infection in birds, affecting their sinuses, trachea, lungs or air sacs, including aspergillosis and chlamydiosis. In such cases, **F10 RTU Antiseptic Solution** is used by nebulisation or in cases of sinusitis or rhinitis by direct flushing into the nares (initially whilst intubated under general anaesthesia, then repeated daily by the owner at home, whilst holding the bird's head down and with the mouth open (20ml/kg body weight) into each nare.



Photo: Nebulization of a Gyr Falcon.
Photo courtesy of Afreen Falcon Centre, Doha, Qatar

SMALL MAMMALS

e.g. rabbits, rodents, hedgehogs, ferrets, armadillo etc.

Bacterial upper and lower respiratory tract infections including rhinitis (snuffles), tracheitis and pneumonia including due to *Pseudomonas*, *Klebsiella*, *E. coli*, *Streptococcus*, *Pasturella*, *Bordetella*, *Staphylococcus*, or *Corynebacterium*. Mycoplasma, fungal and viral respiratory infections.



Photo: Modified hide box for nebulisation of a mouse deer

REPTILES

Snakes, chelonians and lizards with infectious upper and lower respiratory tract disease, including *chelonian herpesvirus*, *Mycoplasma*, *Pseudomonas*, *Aeromonas*, *Klebsiella*, *E.coli*, *Streptococcus*, *Pasturella*, *Staphylococcus*, *Corynebacterium* and fungal infections. As with avian patients, as well as nebulisation, direct flushing into the nares can be useful in cases of rhinitis. Maintaining the patient within the species-specific preferred optimum temperature range during nebulisation is essential. Whilst on occasions systemic anti-bacterial therapy may be indicated, reducing the bacterial load by nebulising with F10 will remain beneficial. More specifically, when it comes to fungal infections in reptiles, the patient is often adversely affected by side-effects of systemic medication, hence F10 is even more valuable in the treatment of such cases.



Photo: Reptiles should be maintained at their POTZ during nebulisation



Photo: Tortoise being nebulised.
 Photo courtesy of Johannesburg Wildlife Hospital

ZOO SPECIES

Indications for nebulisation are the same for zoo species and include fungal, viral or bacterial upper and lower respiratory disease such as rhinitis, sinusitis, tracheitis, bronchitis, air sacculitis and pneumonia, including aspiration pneumonia in neonatal mammals.

These days when target and other forms of reward-based training techniques are used, zoo patients may be trained to enter enclosed areas where nebulisation can be carried out, or station for diluted **F10 Antiseptic Solution** to be applied topically. e.g. respiratory infections in aquatic mammals, applied by direct nebulisation into the blow hole.

ANTIMICROBIAL RESISTANCE (AMR)

Disease caused by antimicrobial resistant pathogens, in any situation in any species, e.g. sinusitis in parrots (or even in horses), cystitis in any species, dogs with aspergillosis or inner ear (bulla) infections in rabbits will benefit from the use of **F10 Antiseptic Solution** alongside antibiotics. In such cases, daily flushing with **F10 Antiseptic Solution RTU** or **F10 Antiseptic Solution Concentrate** diluted 1:250 (4 ml/l) with saline will be beneficial.

CASE REPORT

*Aspiration pneumonia in a two-toed sloth, **Choloepus didactylus** by Dr Michelle Barrows*

A six day old neonatal sloth was removed for hand-rearing after concerns that it was not getting sufficient milk from the dam after she developed sepsis secondary to a retained placenta. The neonate was given electrolytes by mouth as well as subcutaneous fluids and gradually transitioned onto goats' milk, delivered by syringe.

Three days later keepers reported increased respiratory effort and discharge of milk from the nostrils after gulping milk down during feeds. Resting respiratory rate at this stage was 26 breaths per minute (bpm). The following day respiratory rate had increased to 32 bpm and the sloth was started on antibiotic injections as well as nebulisation with **F10 Antiseptic Solution Concentrate** diluted 1:250 twice daily for 20 minutes. In between the nebuliser was filled with distilled water to increase humidity within the brooder.

Over the next few days respiratory rate increased to a maximum of 60bpm, audible inspiratory wheezing was present and abnormal respiratory noises (rales/crackles) were noted on thoracic auscultation

The sloth was started on meloxicam and F10 nebulisation was increased to three times daily

Nebulisation with Bromhexine Hydrochloride, a mucolytic was also started. Thoracic radiographs showed a bronchoalveolar pattern suggestive of aspiration pneumonia.

Milk intake decreased but improved after 10 days of treatment and antibiotics were discontinued after 18 days. Nebulisation with F10 was continued. By one month of age the pneumonia had resolved and the sloth was feeding well and starting to gain weight. F10 nebulisation is well-tolerated by neonatal mammals and a useful adjunct treatment for aspiration pneumonia.



Photo: Treatment of a two-toed sloth

CASE REPORT

*Nebulization of Marine Mammals
by Dr Fred Chua (Allpets & Aqualife Vets, Singapore)*

Preamble : Delivery of fine mist of **F10 Antiseptic Solution Concentrate** diluted 1:250 deep into the infected airways, allows the direct contact of a tissue-safe and broad spectrum antiseptic with infective material. We have employed this method to treat respiratory infections of a variety of animals for over 8 years, and found (anecdotally) that it provides more rapid therapy and relief compared with oral antibiotics. We may use nebulisation either as a primary treatment or as an adjunct to systemic antibiotics, along with mycolytics or bronchodilators.

F10 Antiseptic Solution Concentrate 1:250 diluted either in saline or clean water for 15-30 min depending on the tolerance of the animal. We have at times used 1:500 dilution instead in neonate or juvenile patients out of an abundance of caution, although we have no evidence that the 1:250 dilution causes distress or pathology. This is usually done by attaching an over-the-pharmacy-counter nebuliser to a cage or carrier covered with impervious material (eg plastic sheets), with a gap in the opposite side to allow for some ventilation. This is carried out once or twice a daily, for 5 to 7 days or more.

In situations where animals might be too distressed for restraint, too large for containment in a carrier or cage, a fogger can be deployed. I have used it successfully to treat experimental pigs suffering *Staphylococcus aureus* (MRSA) pneumonia which were undergoing a long-term orthopaedic trial, by directing the F10 mist towards the head of infected pigs in a pens twice a day. This was deployed without systemic antibiotics and resulted in resolution of the disease within a week.

In marine mammals such as dolphins, a hollow ring-shaped tube attached to the nebulizer, is placed upon the blowhole of a pretrained animal which will inhale on cue. The nebuliser is attached to a port and when turned on, fills the tube with a mist of aerosolized F10 Antiseptic Solution Concentrate diluted 1:250 in saline. The dolphin inhales into a second port placed over the blowhole. As part of medical training, the dolphins are trained to exhale and inhale on cue (required for routine blowhole sampling), then desensitised to do so with the device over its blowhole. Conditioned while they are still healthy, this has provided an important adjunct to treating dolphins with *Pseudomonas* respiratory infections. This is done twice a day for a week.

In our practice in Singapore we have used F10 nebulisation to treat: Dogs and cats (including juveniles); various avian species, chelonians and other reptiles ; non-human primates and dolphins.

We believe as the mist of F10 is delivered deep into the airways, it kills the microbes within the biofilm of bronchioles and alveoli. Compared with antibiotics delivered systemically, this direct contact with microbes causes more effective destruction of microbes, while also clearing airway obstruction with an expectorant effect.



Just for cuteness! Photo courtesy of Dr Fred Chua

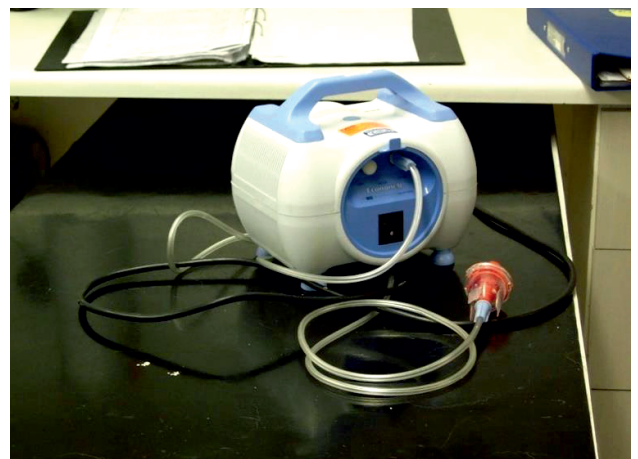


Photo: Standard nebuliser

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