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RESPIRATORY DISEASE IN EXOTICS AND SMALL MAMMALS

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Introduction

RESPIRATORY disease is a common problem in exotic species in general practice, whether avian, reptilian or small mammal.

Different species have different disease susceptibilities. These vary according to:

- **Anatomy**

The complicated sinus system of birds coupled with a tendency to form solid pus means that upper respiratory disease (URD) and sinusitis are common problems in many avian species. Reptiles lack a muco-ciliary escalator meaning they find it hard to remove respiratory discharges. This is one factor contributing to lower respiratory disease (LRD) in snakes. Rabbits suffer from compression of lungs and upper respiratory passages. Breeding to produce extremes of shape (especially "squashed nose" breeds) is a major factor in both upper and lower respiratory disease.

- **Immunity and "pathogens"**

There are few primary pathogens found in respiratory syndromes. Snake *paramyxovirus* may be an exception as may *Bordetella bronciseptica* in guinea-pigs. Other infectious agents may appear to act as pathogens in stressed or immunologically naïve animals, eg *Pasteurella* in rabbits or chelonid herpesvirus in tortoises. Mixing of species in households may, therefore, hold dangers, eg mixing tortoise species will allow exchange of herpesviruses and *Mycoplasma* spp between these species. While one tortoise may cope with its own adapted organisms, another may not. Mixing of rabbits and guinea-pigs allows rabbits (who will often carry *Bordetella* as part of the normal respiratory flora) to pass these organisms to guinea-pigs that don't. The susceptibility of different species to different organisms is amply illustrated by the incidence of aspergillosis in different bird species. *Aspergillus* spp spores are found in the environment and disease represents either lowered immunity to the organism or overwhelming infection. Grey parrots, Gyr falcons and Goshawks are some of the species that appear very susceptible and disease is commonly seen in them. Peregrines and cockatoos are much more resistant so disease is rarely seen in these species.

- **Husbandry**

When we think of husbandry-related disease we often think of reptile problems and this is often the case in respiratory disease. These problems (especially URD in tortoises and LRD in snakes) are often the results of low temperatures. Inappropriate humidity levels will contribute to respiratory disease in a range of species, both reptilian and avian. Exposure to irritants, especially cigarette smoke, air fresheners, cooking fumes, etc will often cause direct irritant effects or predispose to infection especially aspergillosis in birds. Some may be linked to the development of allergy and/or asthma although this diagnosis remains controversial in exotic animal medicine. Other irritants may include dusty bedding in rabbit or rodent hutches/ cages. Rotting organic matter in bird aviaries provides a direct source of *Aspergillus* stores. Sudden changes in husbandry, eg rapid temperature changes or mixing of individuals, will cause stress and therefore, affect immunity. Underlying systemic infection may also play a part - the young Grey parrot with an airsac aspergilloma may seem a clear diagnosis. However, if on haematology there are few if any white blood cells then be aware that it may be suffering from immunosuppression caused by circovirus infection.

- **Diet**

Hypovitaminosis A is a well-known cause of respiratory disease in birds. Lack of this vitamin results in keratinisation of glands in the mucous membranes with subsequent abscessation and infection. Quality of overall diet should also be considered. Many seed diets for parrots are of extremely poor quality and often stored badly as well. Opening seed hulls will often reveal fungal growth within - a common source of *Aspergillus* spores. As a physical effect, inhaled seeds may be a cause of tracheal blockage in parrots. In rabbits there is a very thin layer of bone between tooth roots and nasal cavity - many cases of URTD result from tooth root abscesses. **(Fig. 1)**

Figure 1. Cross-section through a rabbit maxilla at the level of the molars. Note the thin section of bone separating teeth from nasal cavity. It is easy to see how easily dental infection will penetrate the nasal cavity.

Diagnosis

A range of causes cause a range of diseases, often with similar symptoms. Accurate diagnosis is, therefore, essential and often complicated - after all, the best therapeutic agents in the world cannot work if used for the wrong condition! It is also vital to explore the many underlying causes. As stated earlier, there are few primary pathogens and, while your diagnosis of a bacterial pneumonia in a boa constrictor may be correct and you may be using an appropriate antibacterial, there is no chance of success unless the snake is provided accommodation with appropriate temperature ranges, appropriate humidity ranges, and the ability to climb (arboreal snakes often require this so gravity can assist in the clearance of respiratory discharges). The most common

question asked in exotics practice is not so much "what has it got?", but "why has it got it?"

The following are often required as part of a comprehensive respiratory investigation:

- **History/signalment**

This often provides many of the clues as to "why". Full details of husbandry and diet are required.

- **Clinical examination**

Some cases are easy to pick as respiratory problems there may be abscesses in the nasal area or an obvious oculo-nasal discharge **(Fig 2)**. Alternatively dyspnoea or cyanosis may be easily identified. However, it must be remembered that many of these species have a great respiratory "reserve" so advanced disease may be present without obvious effects on respiration. Instead, generalised signs may be present - weight loss, malaise or simple failure to thrive may all be linked to LRTD in many species. Rabbits and rodents may have very extensive lung abscessation without any obvious signs at all - until you anaesthestise them! Auscultation is, of course, essential. However, it is extremely hard to perform in reptiles (and impossible in chelonia!) due to the scales. Damping these sounds by auscultating through a damp cloth applied to the skin. However, this does considerably reduce the sensitivity of the technique and electronic stethoscopes may be more sensitive as scale sounds can, to some extent, be filtered out. In birds auscultation should be performed over a range of sites around the body to detect airflow through the lungs and the airsacs. It is also important in smaller species to use an appropriate size stethoscope paediatric or infant scopes are invaluable!

Figure 2. Some diagnoses are easier than others. It is plain that this lorikeet has a greatly distended sinus. However, underlying factors as well as infectious agents must be evaluated - this can be difficult to cure.

- **Further investigation**

Almost always necessary and many tests may be required. The following should be considered:

Radiography

The mainstay of respiratory diagnosis, especially for LRTD. It is important to use at least two views at 90º to each other- in the case of reptiles this means horizontal beam lateral or cranio-caudal views of the lung fields as well as the easier dorso-ventral views. Anaesthesia is often essential to allow accurate positioning. **(Fig 3)**.

Endoscopy

An essential in avian medicine! Aside from allowing visualisation of the upper respiratory passages (via nares or choana **(Fig 4)**) trachea and syrinx a small rigid scope is vital for assessment of the lower tract by insertion into an airsac. Aside from direct visualisation, endoscopy allows direct sampling from lesions and is a much more sensitive technique than radiography. Don't feel, however, that endoscopy is restricted to avian medicine. It is an excellent technique in reptiles (direct penetration and assessment of lung field in chelonia **(Figs 5a & b)**) or snakes as well as upper respiratory investigations, and small mammals where it is rhinoscopy and tracheoscopy are excellent tools. In terms of therapy this technique allows abscesses to be opened and drugs to be applied directly to lesions.

Figure 3. Aspergilloma in the air sacs of a grey parrot. Note the large consolidated area. Therapy will typically take six to eight months using a combination of systemic anti-fungals, nebulisation and surgery.

Figure 4. Endoscopy of the choanal slit of a grey parrot.

Figure 5a. This Hermanns tortoise has pneumonia with consolidated lungs. A hole is drilled in the carapace over the consolidated area (as determined by radiography).

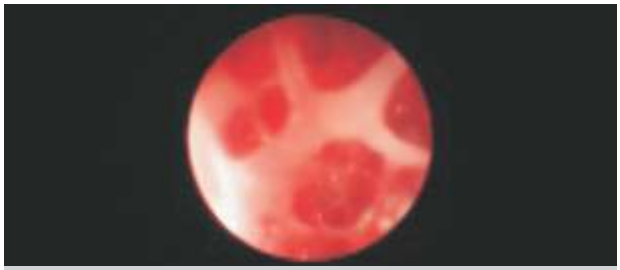

Figure 5b. An endoscope can be inserted to visualise and sample the affected areas. The hole is also useful to allow entry of drugs during nebulisation. Between treatments it is covered with a wet-to-dry dressing. At the end of therapy it is covered with epoxy resin and allowed to heal.

Cytology and bacteriology/ sensitivity

The upper respiratory tract can be sampled directly via nares or choana (in birds/ reptiles) while tracheal or lung washes are very valuable tools in all species. Endoscopy will often allow direct sampling of lesions giving more precise results especially for abscessated lesions.

Haematology/biochemistry

These provide little direct help in diagnosis of respiratory disease. However, they will give an idea of systemic response to infection, underlying immunosuppression or underlying disease. The latter is important in the tortoise with URTD where respiratory symptoms are often the result of recrudescence of infection in a run-down tortoise haematology will often show lowered white blood cell counts and biochemistry may reveal signs of dehydration, follicular stasis or renal/liver disease. Serology may be useful in some species, especially paramyxovirus in snakes or *Encephalitozoon cuniculi* in rabbits.

Newer tools

MRI and CT are proving to be of great value where accessible. Hopefully increased availability will allow more patients to benefit.Obviously many of these investigations require general anaesthesia and this may constitute a risk in the animal with respiratory compromise. Agents should be chosen that are easily reversed and cause minimal respiratory or cardiovascular compromise. Oxygen must always be provided and mechanical ventilation is frequently necessary. Accurate and constant monitoring is vital and we have found capnography to be an excellent tool.

Therapy

Naturally, therapy should be based on diagnosis. However, therapy may have to be initiated before some test results are available or to stabilise a patient too critical to allow full investigation at that stage. An ideal preliminary therapy should have the following characteristics:

- broad-spectrum activity against a range of infectious agents;
- correction of underlying husbandry defects;
- provide physical relief of symptoms and support of respitory membranes;
- removal of obstructions and relief of dyspnoea; and
- be non-irritant and non-stressful to the patient.

Underlying factors

As described earlier there are many potential underlying factors. These will, hopefully, be identified at examination and during history-taking. Stressors should be removed, as should obvious causes of respiratory irritation. Hospitalisation should be tailored to provide correct temperature and humidity for the species being treated. Snakes should be provided with space to stretch out and, if necessary, to climb. Coupage of snakes allows for physical removal of discharges in the absence of a mucociliary escalator.

Systemic

Broad-spectrum antibiotics are frequently used, however they are rarely effective on their own, especially when abscessation is present or where the main infectious agent is non-bacterial. However, they may be useful where there is a risk of systemic invasion of bacteria or where bacterial infection may be a complicating factor of a fungal or viral infection.

It may also be deemed un-necessary to use systemic antibiosis in URTD where there are no systemic signs, especially as penetration of drugs into the upper respiratory tract may be poor. Antibiotic choice is based ideally on culture and sensitivity but, initially, is based on likely pathogens in that species and tolerance of drug in that species - rabbits and rodents being cases where antibiotic choice may be restricted. It is, of course, very tempting to reach straight for the fluoroquinolone - they are comparatively safe, broad-spectrum and penetrate well into the respiratory tract. However, other anti-bacterials are also useful eg oxytetracycline or potentiated sulphonamides and may be more appropriate where there is abscessation.

Where fungal disease is suspected, itraconazole or terbinafine are extremely useful. It is worth remembering that some Grey parrots appear very sensitive to itraconazole so it is worth avoiding this drug in this species.

Other systemic agents with potential effects on the respiratory system, eg bronchodilators or diuretics have not been properly evaluated in exotic species although in individual cases may be of some benefit to the individual patient.

Corticosteroids may be extremely useful in cases of asthma or respiratory irritation. However, they may also cause profound immunosuppression and a diabetes mellitus-like syndrome in birds. Their use, therefore, must be restricted to cases where it is felt there is no evidence of infectious disease (especially not zoonotic disease a corticosteroid dose is very likely to induce shedding of *Chlamydophila psittaci* in a carrier even if it is not the immediate cause of disease at that time) and ultra-short acting agents only should be used.

Non-steroidal anti-inflammatory agents may be of use in reducing pulmonary inflammation over the longer term in a range of species.

Nasal/ Sinus Flushing

Nasal or sinus flushing is extremely useful in many exotic species. It enables instillation of an antimicrobial directly into the site of infection and will also enable physical flushing of pus and debris and the clearing of nares that may provide a "feelgood" factor. This may be vital in rabbits that have great difficulty in mouth-breathing so may become very distressed if the nasal passages are blocked. Part of the flushing process involves the physical unplugging of the nares and this in itself is often useful.

Almost any non-irritant anti-microbial solution may be used. A mixture of 1ml 2.5 per cent injectable enrofloxacin diluted in 20ml saline is appropriate for a 1kg bird. In tortoise URTD 0.1ml oxytetracycline injectable solution may be flushed into each nostril.

We have now started using a new disinfectant agent from South Africa called F10SC (Health & Hygiene Pty). This is a mixture of disinfectant agents providing a very broad-spectrum of activity against a range of potential agents. When used at a 1:250 dilution it appears to cause little or no irritation to the mucous membranes (it was initially used for the sterilisation of drip lines and catheters). In our clinic we have used it in the following manner for URTD:

- **Sinus flush in birds**

A 1:250 dilution of F10SC is used at a rate of approximately 20ml/kg **(Fig 6)**. It is drawn up into a syringe without a needle. The bird is restrained and held upside-down over a sink. The syringe is held flush against a nostril and the mixture forcibly pushed into the nare. It should flow through the sinuses exiting via the nares, choanal slit and conjunctivae.

Figure 6. Sinus flush of a grey parrot with upper respiratory tract disease.

- **Nasal flush in tortoises**

0.1ml of a 1:250 dilution of F10SC is inserted into each nostril daily. This has the effect of physically clearing discharges and, thanks to the open palate of allowing the disinfectant with anti-viral and anti-bacterial properties to penetrate the oral cavity as well as respiratory passages. In tortoise URTD much of the problem is, in fact, oral.

- **Nasal flush in rabbits with URTD**

When the nasal passages are blocked with pus it is useful to perform a nasal flush. Again a 1:250 dilution of F10SC is used and 1ml is syringed into each nostril.

Nebulisation

This technique is useful for both upper and lower respiratory disease. It enables:

- **Penetration of anti-microbials to the site of infection**

While this is probably true for URTD there is some doubt about this in LRTD. Certainly where there is lung consolidation or abscessation, nebulisation may have little ability to penetrate the lesions. However, other effects of nebulisation may still have benefits in these cases.

- **Expectorant**

Nebulisation acts as an excellent expectorant and aids greatly in the clearing of discharges. In snakes, nebulisation should be combined with coupage as, in the author's experience, it makes loosening of discharges and tracheal blockage more likely unless aid is given in expelling these materials.

- **Hydration of mucous membranes**

As anyone who has suffered from a cold while flying or sitting in air conditioned rooms will tell you, drying of mucous membranes is uncomfortable and has the effect of allowing infection to penetrate deeper. Keeping membranes hydrated provides a "feel good" as well as assisting in membrane integrity.

The simplest means of providing some of these aims is "steaming" and for many rabbits or parrots with problems, being placed in a steamy bathroom provides some short-term relief. This is, however, not along-term answer nor should drugs be "steamed" into patients as the heat and uncertain delivery system will result in underdosing.

Aromatics such as Olbas Oil should also be avoided as it is very easy to overdose these biologically active compounds in small animals.

There are many drugs proposed as suitable for nebulisation. Often, in avian medicine, this have been used as a route for systemically toxic drugs (eg, gentamycin or amphotericin) as absorption from the air sacs is poor. While this is great for the patient it does raise huge Health and Safety issues - someone has to get the patient out of the nebulisation chamber! Also, it is very unwise to send home a bird on nebulisation therapy if the nebulised drugs could be toxic to the owner. As aspergillosis therapy typically lasts at least six months this can mean a very long hospitalisation period.

We have, therefore, used F10SC in this situation as well. In South Africa it has good human safety trial results and appears relatively safe to users. It is also broad-spectrum in activity and surfactant inclusion benefits its properties as an expectorant.

A 1:250 dilution is again used and nebulisation periods of 20-45 minutes 2-3 times daily are used depending on species and condition.

Typical human asthmatics' nebulisers are often effective in this therapy. While many texts advise use of ultrasonic nebulisers producing very small droplets however, for most situations this is un-necessary. Aspergillosis in birds is one of the most common reasons for this type of therapy. The spores of this fungus measure 2-5 microns in diameter. Therefore it is unnecessary for the nebulisers to produce droplets smaller than 2 microns in order for the agents to penetrate as far as the spores. Where fungal spread has entered air passages narrower than this, there will generally be such consolidation that nebulisation alone would not be effective.

Penetration can be aided by providing direct access routes - in birds air sac cannulae can be placed **(Fig 7)**, while in chelonia holes can be drilled into the shell allowing opening of pulmonary abscesses and drug to enter consolidated lungs **(Fig 5a)**.

Figure 7. Air sac tube inserted in a Harris hawk. In this instance it was used to relieve the dyspnoea in a case of syringeal aspergilloma. It allows for anaesthetic maintenance such that the head and trachea are easily accessible for endoscopic removal of the abscess. In other cases it can be used to provide access for nebulised drugs to the caudal airsacs.

A chamber is easy to construct. In the clinic, solid fronted cages or kennels can be used **(Fig 8)** while at home a simple front-opening cat carrier covered in plastic is ideal. It is often apparent that patients "enjoy" nebulisation and actively sit over the unit rather than retreat away from it. In the home environment most owners find that, once the bird is used to the process, it becomes a simple routine rather than a fight.

Figure 8. Grey parrot in a nebulisation chamber. The compressor is outside the chamber while the pot of nebulisers drug is inside with the bird. Such a chamber is also suitable for reptiles and small mammals.

Respiratory problems are often frustrating in diagnosis and therapy. Attention to underlying causes and multimodal therapies have greatly helped in improving treatment success rates.

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