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Respiratory Disease in Rats: An Overview

Written for CavyRescue by:

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Introduction:

Respiratory disease is one of the most frequently encountered problems in rat medicine. It is a complex syndrome with many contributing factors in the aetiopathogenesis. Aggressive early treatment is required to control the situation. This includes environmental correction as well as supportive therapy with appropriate chemotherapeutic agents. This article aims to identify the trigger factors, give an indication of appropriate diagnostic steps and discuss treatment options.

Environmental Factors:

Domesticated rats are kept in a confined environment relative to their wild counterparts. This exposes the animals to potential factors associated with the development of respiratory disease. It is known from studies in intensively reared pigs that high ammonia levels thicken the respiratory secretions and make these animals more susceptible to respiratory disease. The same can be true for the environment of rats if poor sanitation is an issue. Rat urine can have a high ammonia content especially if the protein levels in rations are high. Regular cleaning of cages is therefore advised.

Also of great importance is the substrate used as the rats bedding. It is essential to avoid any substrate with high dust content. One of the worst culprits is sawdust or wood shavings. The irritant effect of dust on the respiratory epithelium can cause an inflammatory response which will weaken the protective barrier of the respiratory system, thereby allowing infectious agents to colonise the respiratory tract and initiate disease. Dust-extracted bedding is therefore recommended. Several products are available and include cardboard chips and Care Fresh.

Nutritional considerations:

An animal's nutritional status is an important factor in the development of disease. Captive rats eat only what we feed them and so there-in lies a moral responsibility for owners to get the nutrition right. Any animal suffering from a relative deficiency in trace elements or vitamins will be more susceptible to disease. This is especially true for young animals. Therefore a balanced commercial rat food with appropriate vitamin supplementation is required. It is important to note that a feed that has been opened for an extended period of time will lose vitamin content and may become contaminated with fungal spores. Therefore it is important to maintain freshness of the food and clean the feed bins and bowls on a regular basis to prevent fungal contamination.

Infectious agents:

The most important infectious agents associated with respiratory disease in rats are: *Mycoplasma pulmonis*, Sendai virus, Cilia-Associated Respiratory (CAR) Bacillus and *Streptococcus pneumoniae*. In practice mixed infections are common. Most often *M. pulmonis* and either Sendai virus or CAR bacillus are implicated. Other less important pathogens include: Rat coronavirus, *Corynebacterium kutscheri*, Sialodacroadenitis virus and *Klebsiella pneumoniae*.

Sendai virus is an RNA virus of the genus Paramyxovirus. The virus is one of the most contagious infections of rodents. Natural infection is via the respiratory tract. Airborne transmission is possible over 5 to 6 feet. The virus is usually confined to the respiratory tract. Infection of Sendai virus alone in rats is of little clinical significance (unlike mice where sole infection with the virus can cause significant disease).

Mycoplasma pulmonis is a gram negative bacterium that is of high significance in rat respiratory disease. Rats and mice are considered natural hosts of the organism. Transmission is thought to be by the intrauterine route and also via aerosols. The organism exhibits poor survival outside the natural host and is particularly sensitive to drying. Clinical signs of infection include: weight loss, dyspnoea, porphyrin staining around the eyes, head tilt and a hunched stance. Strains of the organism differ in their pathogenicity. However, under ideal conditions for the host, the organism is probably a commensal (normal inhabitant). The organism becomes pathogenic if there is concurrent infection with respiratory viruses (especially Sendai virus) and rising ammonia levels (19 micrograms/litre or greater).

Cilia-Associated Respiratory Bacillus is a Gram negative rod shaped bacillus. Rats are the natural hosts. The clinical picture associated with infection is similar to severe *M. pulmonis* infection (dyspnoea, porphyrin staining, and weight loss). Pulmonary abscesses and bronchiectasis are frequently seen with CAR bacillus infection often in very young rats. Disease is almost always associated with concurrent *M. pulmonis* infection though outbreaks have also been reported following Sendai virus infection.

Streptococcus pneumoniae is a Gram positive bacterium. Humans are the natural hosts. The agent is rarely seen in rats but can cause non-specific signs of respiratory disease (dyspnoea, hunched up stance) usually associated with other concurrent infections.

Clinical Evaluation and Diagnosis.

Diagnosis of respiratory disease in rats is relatively straightforward. Affected animals show a hunched posture. Weight loss is commonly encountered due to increased respiratory effort and abdominal breathing. Sneezing may be present. Red (porphyrin) staining may be present around the eyes and nares. Often the breathing is clearly audible as a rattle. The coat assumes an unkempt appearance. A head tilt may be present often due to the involvement of the balance apparatus in the middle ear. On auscultation the chest will sound harsh. Differential diagnoses include other chest pathology (e.g. cardiac disease), other causes of weight loss (e.g. neoplasia) and other causes of head tilt (e.g. pituitary neoplasms).

Radiography is a useful aid to diagnosis. Two views of the thoracic cavity are required. Radiography may reveal areas of consolidation or abscessation and give a useful idea of prognosis. A helpful tip is to tape the forelimbs foreward on the lateral view to avoid musculature obscuring the cranial thoracic cavity. Radiography should be carried out under general anaesthesia to obtain the best quality pictures. Anaesthesia can easily and safely be induced using isoflurane or sevoflurane. Important is to assess the trachea (which may be elevated in instances of cardiac disease) and to differentiate exudates/abscesses from pulmonary oedema.

Culture of organisms is usually only carried out in laboratory situations but may be of some use.

Treatment options

Treatment of respiratory disease in rats has its challenges. While it is possible in some cases to exact a cure with early aggressive treatment, many cases go on to require life long therapy or are not controlled at all. In part this is often the result of failure to provide the appropriate therapy by the appropriate route at the appropriate dose at the initial presentation of disease. **An important point to stress is that in-water medication often leads to unsatisfactory results. Often the dose taken in by the rat is insufficient leading to antibiotic resistance and a failure to improve.** Direct oral medication of liquids and tablets is possible by resourceful rat owners.

Antibacterial drugs

Antibacterials form the cornerstone of therapy for rat respiratory disease. While ineffective against viruses, antibiotics are of use in mixed infections which are very common. *Mycoplasma*-specific agents are often of limited use since more than one bacterium may be involved. Combinations of antibacterial agents are generally more useful in treatment. Some antibacterials have anti-inflammatory effects also (e.g. the tetracyclines). Whether an animal is cured of mycoplasmosis is questionable but chronic severe cases of respiratory disease in rats may be well managed with antibacterials alongside further supportive treatment.

Anti-inflammatory drugs

Anti-inflammatories should be provided in all cases of respiratory disease in rats. Clinical improvement is more rapid and antibiotic penetration improved. Either steroids or non steroidal anti-inflammatory drugs may be used. Steroids are useful for moderate to severe chronic disease as long as antibacterials and other palliative treatment are provided.

Bronchodilators

These drugs act by relaxing smooth muscle thereby increasing oxygen perfusion. Many also increase mucociliary clearance and diaphragm contractility and therefore are useful in the management of chronic disease.

Mucolytics

Breaking down respiratory secretions will aid in the penetration of antibiotics and increase mucociliary clearance. Mucolytic drugs are available for oral use. Also nebulisation plays an important mucolytic role as well as having the potential to carry drugs (e.g. antibacterials) to the upper respiratory passages.

Environmental alteration

At the time of the first visit, environmental issues need to be addressed. Changing the substrate to a dust free alternative, regular air changes and regular sanitisation are all very important steps that the owners can deal with straight away.

Response to treatment should be closely monitored. Scoring the breathing on a regular basis along with monitoring of weight will give the clinician an idea of the response to therapy and highlight the need if necessary of further diagnostic tests or a change in the treatment plan. Quality of life should be regularly assessed. Once on an appropriate therapeutic program however, many rats can happily survive moderate to severe chronic respiratory disease with little or no loss of life quality for a reasonable period of time.

Formulary

The following is a list of drugs the author finds useful in treating respiratory disease in rats. It is important to realise that many of these drugs are off licence but used from references and personal experience.

Antibacterials

Amoxicillin/clavulanate	2ml/kg p.o. sid
Ciprofloxacin	10mg/kg p.o. bid
Doxycycline	5mg/kg p.o. bid (use with a fluroquinolone)
Enrofloxacin	5-10mg/kg p.o., i.m bid
Marbofloxacin	10mg/kg sc, p.o sid
Oxytetracycline	10-20mg/kg p.o. tid
Trimethoprim/sulfa	30mg/kg sc,p.o bid

Anti-inflammatories

Meloxicam	2mg/kg sc, p.o sid
Carprofen	5mg/kg sc bid
Prednisolone	0.5-2mg/kg p.o. bid

Bronchodilators

Terbutaline	0.2mg/kg p.o. bid
Theophylline	10-20mg/kg p.o. bid

Mucolytics

Bromohexine	tiny pinch on food daily
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Nebulisation mixtures

Enrofloxacin	100mg in 10mls saline
Tylosin	100mg in 10mls saline

References

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