Respiratory diseases in rats

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ABSTRACT: Respiratory disease due to infectious disease is one of the most common presentations in rats but the cause is in many cases multifactorial. Predisposing factors are generally related to poor husbandry and diet. Respiratory disease is caused primarily by infectious agents such as Mycoplasma pulmonis, Streptococcus pneumoniae, Corynebacterium kutscheri, cilia associated respiratory (CAR) bacillus, Sendai virus and coronavirus. Other causes are cardiovascular diseases, neoplastic diseases and trauma of the upper and lower respiratory tract. A presumptive diagnosis can be made by good history and physical examination. However, many diagnostic tests are best performed under general anaesthesia. Medical treatment generally includes oxygen therapy, fluid therapy, analgesia and administration of antibiotics, the use of mucolytic agents and bronchodilators and supportive care. Medications can be administrated orally, parentally or via nebulisation.
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Respiratory disease due to infectious disease is one of the most common presentations in rats. Although often thought of as a Mycoplasma spp. infection, in fact the cause of respiratory diseases is in many cases multifactorial.

Knowledge of the anatomy of the rat's respiratory tract is important to better understand the complexity of the disease. Rats possess one pair of external nares leading to nasal airways where the turbinates are responsible for filtration, heating and humidification of the air. The vomeronasal organ and several types of nasal glands are found in the nasal cavity and play an important role in olfaction and regulation of humidity and mucus viscosity. The glottis is protected by a long soft palate and rats are obligate nasal breathers as a result. The larynx is connected to the trachea, which is about 3 cm long with a flattened oval shape, and this divides into right and left bronchi, then into bronchioles and finally the alveoli of the lungs. The diameter of the alveoli in a rat is thinner when compared to other mammals in order to facilitate maximum oxygen exchange. The right lung is divided into four lobes; the left lung is smaller and is not divided into lobes. Olfactory epithelium covers 50% of the nasal cavity and is very sensitive and highly functional, but is also highly susceptible to respiratory infections and to regenerative or proliferative lesions. Rats have a respiratory rate of 70-100 breaths per minute, a tidal volume of 0.6-2 ml.

Predisposing factors leading to respiratory disease are generally related to husbandry and diet, such as overcrowding, poor ventilation, poor nutrition, aromatic or scented and dusty bedding, increased ammonia level in the cage, humidity, sudden change of temperature and chronic disease. In cases of stress, irritation of the airways or immunosuppression, the respiratory microbial flora can become pathogenic.

Respiratory disease in rats is caused primarily by infectious agents such as Mycoplasma pulmonis, Streptococcus pneumoniae, Corynebacterium kutscheri, cilia associated respiratory (CAR) bacillus, Sendai virus and coronavirus. It is often reported as chronic respiratory syndrome of multifactorial aetiology where two or more agents are involved.

Other causes are cardiovascular diseases such as congestive heart failure and pericardial effusion, neoplastic diseases such as squamous cell hyperplasia, mucous cell hyperplasia, papilloma, pulmonary adenoma and bronchioloalveolar carcinoma and trauma of the upper and lower respiratory tract due to irritation, foreign bodies and inhalation pneumonia.

In the early stages of respiratory disease, the clinical signs are non-specific. Initial manifestations are anorexia, lethargy, weight loss, fever, discomfort and poor coat condition. Chromodacryorrhoea, known as red tears, is one of the first signs of stress and disease in rats and it should not be overlooked (Fig. 1). Red staining can be found not only around eyes, but also around the nose and on the shoulders after the rat has cleaned itself.

Fig.1: Chromodacryorrhoea, known as red tears, is one of the first signs of stress and disease in rats. Red staining can be found not only around eyes, but also around the nose and on the shoulders.
Specific clinical signs related to respiratory diseases are nasal discharge, ocular discharge, dyspnoea, sneezing, head tilt, wheezing and rattling. Open mouth breathing only develops during very severe disease as rats are obligate nasal breathers.

Severe inflammatory reaction, turbinate atrophy, pulmonary lesions and abscessation are consequences of severe infection that leads to destruction of the respiratory cells and fibrous tissue and lung consolidation ultimately develop.

A presumptive diagnosis of respiratory disease can be made by good history and physical examination. Auscultation of lungs and heart will reveal snuffles, wheezing and crackles. Cardiac diseases are generally difficult to detect at an early stage due to the high heart rate and the difficulty of appreciation of the cardiac rhythm.

Although some investigations can be performed when the animal is conscious (for example thoracic ultrasound), many diagnostic tests are best performed under general anaesthesia. This will reduce the amount of stress to which the sick animal is exposed and reduce the amount of time necessary to perform the procedure. Once the pet has been stabilised, gaseous anaesthesia is generally recommended (Fig. 2). Both sevoflurane and isoflurane are considered safe, although the former is less irritant of the respiratory tract and allows a quicker induction and recovery.

Blood samples can be taken from the lateral tail veins, femoral veins, saphenous veins or jugular veins for haematological and biochemical evaluation. Culture can be performed for Mycoplasma spp. but serology is considered a more reliable test. Nasal washes and tracheal washes can be obtained using 2 ml/kg of sterile saline solution via a small catheter and cytology and bacteriology can be performed. Radiographic examination of the skull gives accurate information not only of the upper airways, but also of possible involvement of the skull and dentition, while radiographs of the thorax show abnormalities of the bronchoalveolar pattern, pulmonary density, mediastinum and cardiac silhouette (Figs. 3 and 4). In the case of suspected thoracic tumours, ultrasound guided fine needle aspiration cytology is used to make a diagnosis.

Computed tomography (CT) is also a useful diagnostic technique when available. Although the size of the animal may be limiting, CT is able to detect anomalies and pathologies of the entire respiratory tract.

In the case of an outbreak in a group of rats, post mortem examinations of individuals may be considered as a diagnostic approach in order to obtain a diagnosis as soon as possible and treat the rest of the group accordingly.

Medical treatment generally includes oxygen therapy (Fig. 5), fluid therapy, analgesia and administration of antibiotics such as enrofloxacin, doxycycline, trimethoprim-sulfamethoxazole or azithromycin (Table 1). Enrofloxacin and doxycycline are generally combined and administered twice daily. The use of mucolytic and bronchodilators agents such as, respectively, acetylcysteine and aminophylline are also recommended to reduce the amount of thick mucus that blocks the airways and to increase airflow to the lungs. Supportive care such as additional heating and assisted feeding should be provided.

Medications can be administrated orally, parenterally or via nebulisation. Nebulisation is an excellent way of administering drugs for large groups or if an animal is particularly difficult to handle (Fig. 6). Nebulisation is well tolerated by rats. Generally the rat is moved to a small plastic carrier or incubator for nebulisation.
Nebulisation creates tiny droplets of medicated saline, which are then inhaled, allowing them to penetrate into the respiratory tract. It is also useful to nebulise with diluted F10®, a broad spectrum disinfectant with activity against bacterial, fungal and viral agents.

Depending on the cause, sometimes medical treatment can be unrewarding and relapses can occur. Respiratory infections often create permanent

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damage with atrophy of the upper airways and fibrosis of the lower airways. Some animals may need to be medicated for the rest of their life. In these cases in order to alleviate clinical signs, long term treatment using daily nebulisation of F10® is a suitable and not stressful alternative. Antibiotics can then be administrated if relapse occurs.

Preventive medicine is often the key to promoting good health of these pets and the measures taken should be focused on optimal husbandry, good diet and reduced stress.

FURTHER READING
DONNELLY, T. M. (2004) Disease problems of small rodents. Ferrets, rabbits and rodents clinical medicine and surgery (Quesenberry K. E. and Carpenter J. W. eds.) Saunders, pp:299-315.
GOODMAN, G. (2009) Rodents: respiratory and cardiovascular system disorders. BSAVA Manual of Rodents and Ferrets. Keeble E. and Meredith A. BSAVA, pp:142-149.
SAYERS, L. and SMITH, S. (2010) Mice, Rats, Hamsters and Gerbils. BSAVA Manual of exotic pets. Meredith A and Johnson-Defaney, 5th edition. BSAVA, pp:1-27.
MITCHELL, A. M. and TULLY, T. N. (2009) Mice and Rats. Manual of Exotic Pet Practice, Saunders, pp 333-351.
SUCKOW, M. A. et al., (2006) Morphophysiology. The laboratory rat. Elsevier, pp 93-126.
O’MALLEY, O. (2005) Rats. Clinical anatomy and physiology of exotic species. Elsevier Saunders, pp:209-225.
KIMMAN, T. G., KAMP, E. M. (1986) Induced atrophic rhinitis in rats. American Journal of Veterinary Research 47(11):2426-30.
SHANK, K. M. and PERCY, D. (1995) Effect of time of exposure to rat coronavirus and M. pulmonis on respiratory tract lesions. Canadian Journal of Veterinary Research. 59, 60-66.
REZN, G. K. Comparative anatomy, physiology, and function of the upper respiratory tract. Institute of Pathology and Toxicology, BYK Gulden Pharmaceuticals, Hamburg, Federal Republic of Germany.

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   a. R: 2 and L: 2
   b. R: 3 and L: 2
   c. R: 4 and L: 1
   d. R: 3 and L: 1

2. Which of the following is not a predisposing factor of respiratory disease?
   a. Newspaper as substrate
   b. Poor nutrition
   c. Poor ventilation
   d. Overcrowding

3. Chromodacryorrhoea is also called:
   a. Red diarrhoea
   b. Red tears
   c. Chromo tears
   d. Dacryocystitis

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NEWS REVIEW
VET SURVEILLANCE REPORT MUST BE FOLLOWED BY COSTED PLANS
The Surveillance Advisory Group (SAG) set up by the Animal Health Veterinary Laboratories Agency to recommend a future delivery model for veterinary surveillance in England and Wales has delivered its report.

The SAG had less than three months (January to March) to gather the views of stakeholders and report to AHVLA with recommendations on criteria to be used in the design of a new model surveillance delivery.

Responding to the SAG report, Carl Padgett, President of the BVA, said: “The report has progressed the thinking about surveillance delivery and overall the Group has set out a very clear direction for the future.

“The number one recommendation to ensure 95% of holdings have access to a post-mortem facility or collection point within an hour is ambitious but essential. If it is achieved we can significantly widen and improve access to the whole surveillance system.

“We welcomed the establishment of the SAG but were concerned that it was a case of the cart being put before the horse as AHVLA had already announced rationalisation plans for veterinary laboratories in England and Wales.

“The SAG has had a very limited time to consider the issues and unfortunately has not had access to the necessary information to flesh out its recommendations.

“This report is just the start of the process, and should have happened before the rationalisation plans were announced. The next stage must be for these proposals to be fully costed in an open and transparent way before decisions are made about the future.

“The overall aim must be to develop and enhance our surveillance system for future animal and human health and we may need to think much more innovatively about how we fund and deliver it.”