Rodent Pneumocystis Information

**Agent**

*Pneumocystis carinii* (PC) is a fungal organism that is an opportunistic pathogen in immunodeficient rats and a transient to low level agent in immunocompetent rats. Recently it was identified as the agent responsible for what had previously been termed “Rat Respiratory Virus.” PC is the cause of Infectious Interstitial Pneumonia in immunocompetent rats and a fulminant fatal pneumonia in immunocompromised animals. The organism was originally thought to be a protozoan and some descriptive terminology still reflects this. Furthermore, the literature is replete with incorrect nomenclature. PC only infects rats and is species while the literature frequently used PC incorrectly in humans, mice, and other animal species.

*Pneumocystis* is considered ubiquitous in the environment with a complicated and poorly understood life cycle. Facilities that receive animals from multiple sources and/or have frequent movement of animals within or between facilities are cautioned to have a strong health monitoring program following appropriate quarantine and testing of new animals.

**Incidence**

Incidence of infection is common.

**Transmission**

Transmission occurs via direct contact with infected animals of the same species as well as via fomites or aerosol. It is important to note that *Pneumocystis* infections are host species-specific and are not zoonotic. *Pneumocystis carinii* and *P. wakefieldiae* affect rats, while *P. murina*, and *P. jirovecii* affects mice and humans, respectively. Even in immunodeficient hosts, interspecies transmission does not occur.

**Pathology**

Grossly, lungs affected with *Pneumocystis* do not deflate, appear rubbery, and may have pinpoint to coalescing grey to red spots visible on the surface. Histologically, there is an interstitial pneumonia with thickening of alveolar walls surrounding pink foam-filled alveoli that sometimes contain numerous round-to-obleng fungal cysts measuring 5-8 microns both free and within alveolar macrophages. Cysts are easily seen with a silver stain (GMS) but can also be seen on a Diff-Quik stained touch imprint.

In endemic colonies, animals exposed to *Pneumocystis* are thought to become infected within hours of exposure which is likely airborne between animals. In immunocompetent animals the organism is typically cleared but it is unclear if some animals may harbor organisms with no clinical signs (asymptomatic carrier). Antibodies are produced but seroconversion may be delayed depending on dose(s) received. Immunity is thought to be maintained and studies have shown protection in animals re-infected after clearance.

**Clinical signs**

Immunodeficient animals may be hunched, with rough, unkempt fur, and become dyspneic with an increased respiratory rate as the pneumonia progresses. Immunocompetent animals generally do not show clinical signs (see anaesthesia exception below).

Anecdotally, there are cases where young animals subjected to injectable anaesthetic protocols (typically ketamine/xylazine IP) have died or experienced respiratory difficulty; which may be related to xylazine’s ability to cause pulmonary oedema even in *Pneumocystis*-free animals. If general anaesthesia is necessary, inhalant anaesthetic protocols with isoflurane in 100% oxygen delivered appropriately via calibrated vaporizer is safer and follows veterinary standards of care. Appropriate anaesthetic monitoring is an essential component of appropriate veterinary care and varies with the complexity and invasiveness of a given surgical or nonsurgical procedure.
Neonatal rats which acquire infection within hours after birth and can harbor the organism without evidence of clinical disease unless subjected to chronic immune suppression. PC has been found in the lungs of clinically healthy commercially produced immunocompetent rats.

**Diagnosis**
A combination of serology in immunocompetent animals and PCR of lung tissue is recommended for optimal sensitivity. Immunocompetent animals that have cleared the organism remain seropositive for some time. Immunodeficient animals will continue to shed indefinitely.

**Treatment and Elimination**
Animals may be treated with trimethoprim/sulfamethoxazole to control infection. Treatment will generally not eliminate PC from a colony and is not recommended for this purpose. Prophylactic treatment of immunocompetent animals before anaesthesia may aid in reducing complications from subclinical pneumonia. Rederivation of the colony is recommended for elimination.

**Queries**
For any queries about *Pneumocystis carinii*, please contact Animal Resources Centre at Email: info@arc.wa.gov.au  Phone: +61 8 9332 5033

**References:**


