



Sniffles and Wheezes: A survey of respiratory pathology in wild urban rats

What was the study about?

Very little is known about wild rat ecology, including causes of illness and death. In general, wild rats live less than 1 year, which is comparatively shorter than laboratory rats, which live up to 3 years!

Understanding why rats die is important since this information can be used to design control strategies and determine if rat deaths are caused by natural disease or something more serious, such as plague.

Respiratory disease may be one of the reasons wild rats die, yet this has never before been thoroughly investigated.

How we did the study:

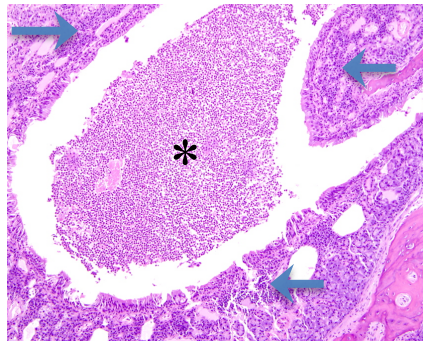
The goal of the study was to determine what types of respiratory diseases were found in rats collected in Vancouver's Downtown Eastside (DTES). We also wanted to identify which microbes cause respiratory infections in these rats.

Using humane methods, we trapped rats from back alleys in the DTES and from a nearby international shipping port. Small tissue samples of the nasal cavity, trachea and lung from 200 rats were examined using light microscopy.

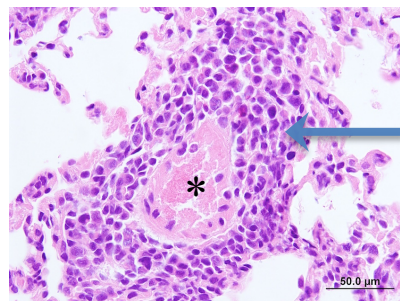
Abnormal changes in these tissues were sorted into categories and counted.

What did we find?

A few rats had severe lung disease including abscesses and tumors. Most of the rats (87%) had inflammation in the nasal cavities and/or trachea. Within the lungs, most rats (76%) had cuffs of white blood cells around microscopic airways and/or blood vessels. These changes were associated with infection by two bacteria: cilia associated respiratory bacillus and *Mycoplasma pulmonis*. Also, heavier rats were more like to have these changes compared to lighter rats.



A microscope image of the nasal cavity of DTES rat. There is pus and bacteria (*) in the lumen with inflammatory cells in the nasal lining tissue (arrows).



A microscope image the lungs of DTES rat. There is a cuff of white blood cells (arrow) around a blood vessel (*).

Roughly half of the rats had microscopic yeast in their lungs called *Pneumocystis* but this was not associated with signs of disease. No rats had evidence of infection with respiratory viruses.

Overall, these findings suggest that:

1) Wild rats are affected by a wide variety of respiratory disease but the most important are associated with bacterial infections.

2) Most rats in this study had some level of inflammation in the respiratory system and heavy rats were more likely to be affected. This may reflect that heavier rats are likely to be older and that these infections are chronic. Also, social interactions among heavier rats may facilitate spread of these microorganisms.

3) Wild rats may be a source of infectious microorganisms to laboratory rats, which are normally kept disease-free.

2) Severe respiratory disease may reduce the number of young a rat has and increase its susceptibility to predation. The effect on individual rats remains unknown but respiratory disease may have an important contribution to the short lifespan of wild rats.

This document is a summary of the article:

Rothenburger JL *et al.* Respiratory pathology and pathogens in wild urban rats (*Rattus norvegicus* and *Rattus rattus*). Veterinary Pathology. Published online 13/07/15 doi:10.1177/0300985815593123