



3 out of 4 Rats in Vancouver have secretive stomach worms

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 lab rats (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.

A few researchers in the 1920's investigated stomachs of wild rats and found that rarely, rats develop benign tumors in association with worm infections. This led scientists, including the 1926 Nobel Prize winner Johannes Fibiger, to study stomach worms in lab rats.



Other than these studies, very little is known about stomach disease in wild rats, including how common worm infections are, which rats are likely to be infected and what changes worms cause to the tissue.

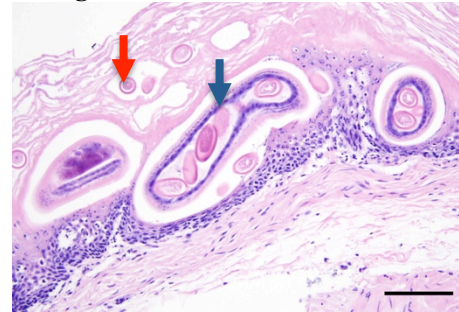
How was the study done?

The goal of the study was to determine if rats collected in Vancouver's Downtown Eastside (DTES) are infected with the worm, *Eucoleus* sp., if there are changes to the stomach lining associated with

infection and to characterise the distribution of *Eucoleus* sp. in these rats.

Using humane methods, we trapped 725 rats from back alleys in the DTES and from a nearby international shipping port.

We looked at small tissue samples of tongue, pharynx, esophagus and stomach with a microscope to confirm the presence of these tiny worms in 183 rats. Stomach linings were also examined for abnormal changes.



Microscopic image of worms (blue arrow) and eggs (red arrow) in the stomach of a wild rat

What did the study find?

Of the 183 rats examined, 79 were infected with *Eucoleus* sp. (43%). Infection with *Eucoleus* sp. was associated with thickening of the stomach lining, stomach "pimples" and inflammation. Taken together, infection and/or stomach changes related to the worm were found in 135 rats (74%). Only 1 rat had a benign stomach tumor.

Mature and heavy rats were more likely to be infected compared to immature, lightweight rats.



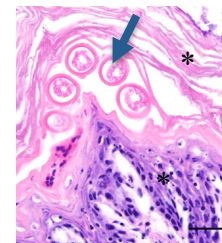
A stomach worm egg from a DTES rat

This suggests that:

Rats are frequently infected with stomach worms and that worms cause substantial changes to the stomach lining.

Since this worm is tiny, previous studies in wild rats may have missed it. This study shows that microscopy is an effective way to identify rats that are infected.

Exactly which species of worm this is, how it is transmitted among rats and its impact on rat populations remains to be determined. Natural disease in rats, including stomach worms, may be an important cause of illness and death in rats and is an area that needs further study.



Microscopic image of worm eggs (blue arrow) and thickened stomach lining (*) in the stomach of a wild rat

This document is a summary of the article:

Rothenburger JL *et al.* Lesions associated with *Eucoleus* sp. in the non-glandular stomach of wild urban rats (*Rattus norvegicus*). International Journal for Parasitology: Parasites and Wildlife. 2014. DOI: <http://dx.doi.org/10.1016/j.ijppaw.2014.04.003>