



Commensal Rodents and Associated Zoonoses

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Commensal Rodents

- ◉ Roof Rat (*Rattus rattus*)

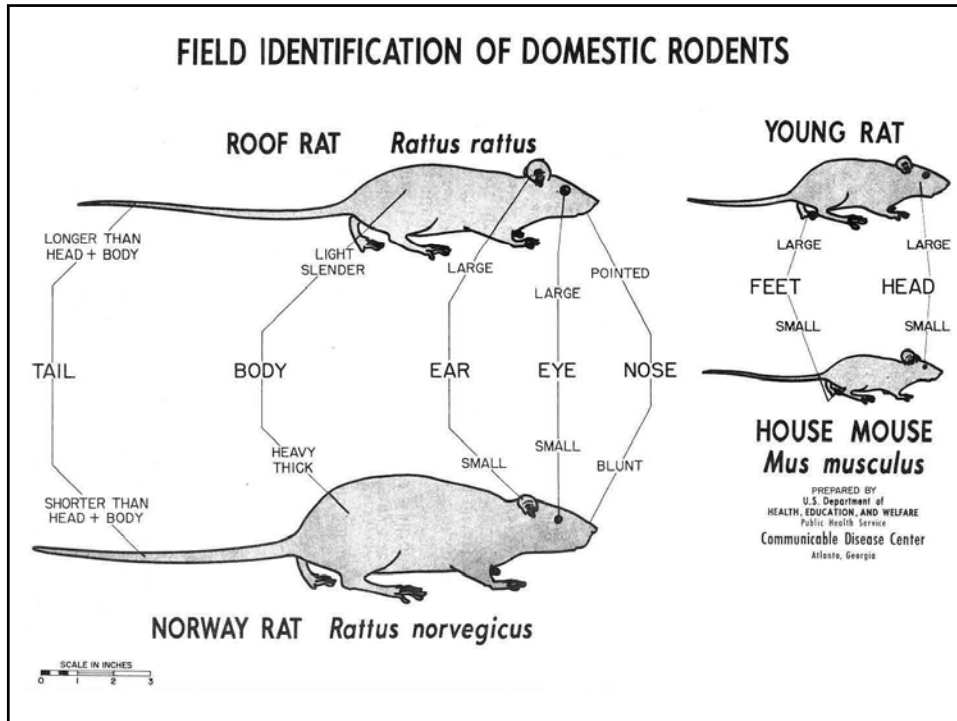


- ◉ Norway Rat (*Rattus norvegicus*)



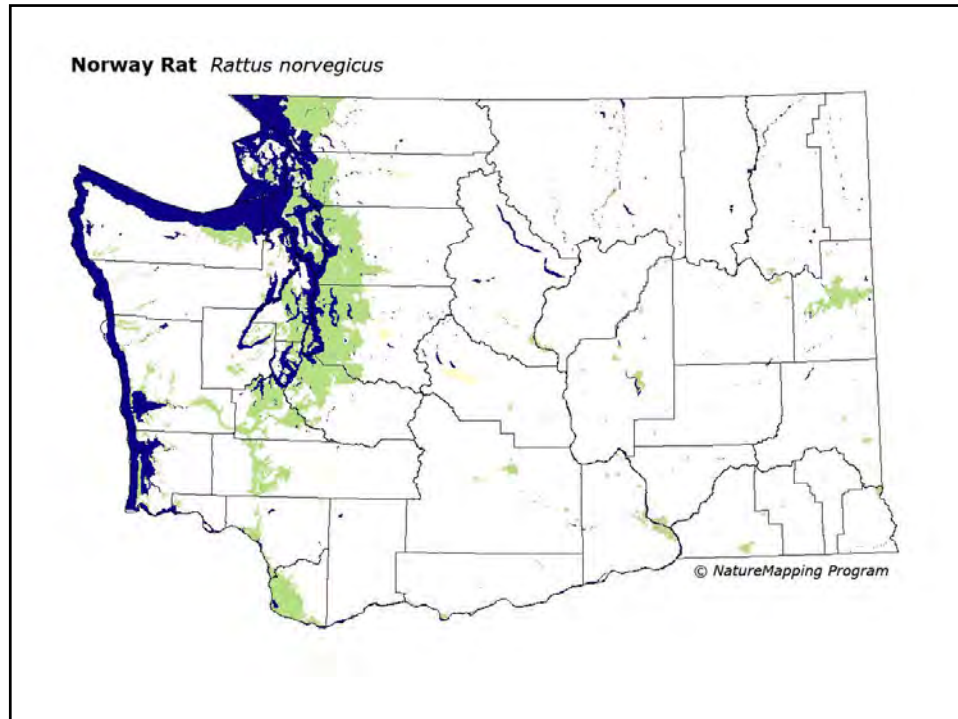
- ◉ House Mouse (*Mus musculus*)





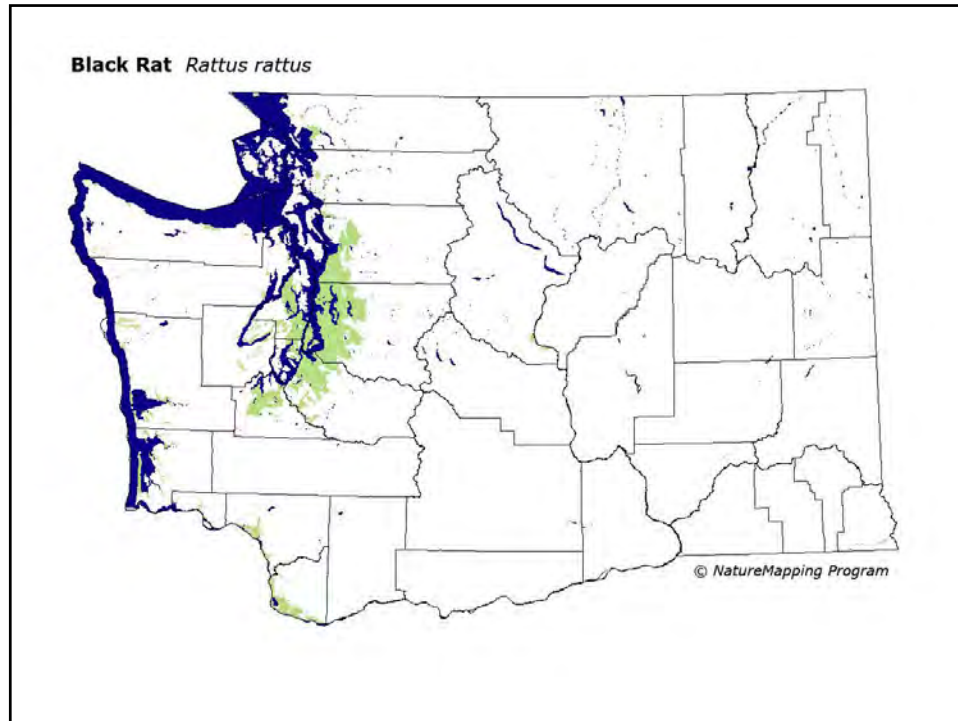
Norway Rat *Rattus norvegicus*

- ◉ Brown rat, Wharf rat
- ◉ Mongolian origins
- ◉ Home Range = 90'-450'
- ◉ Food preferences: omnivores
- ◉ Burrower



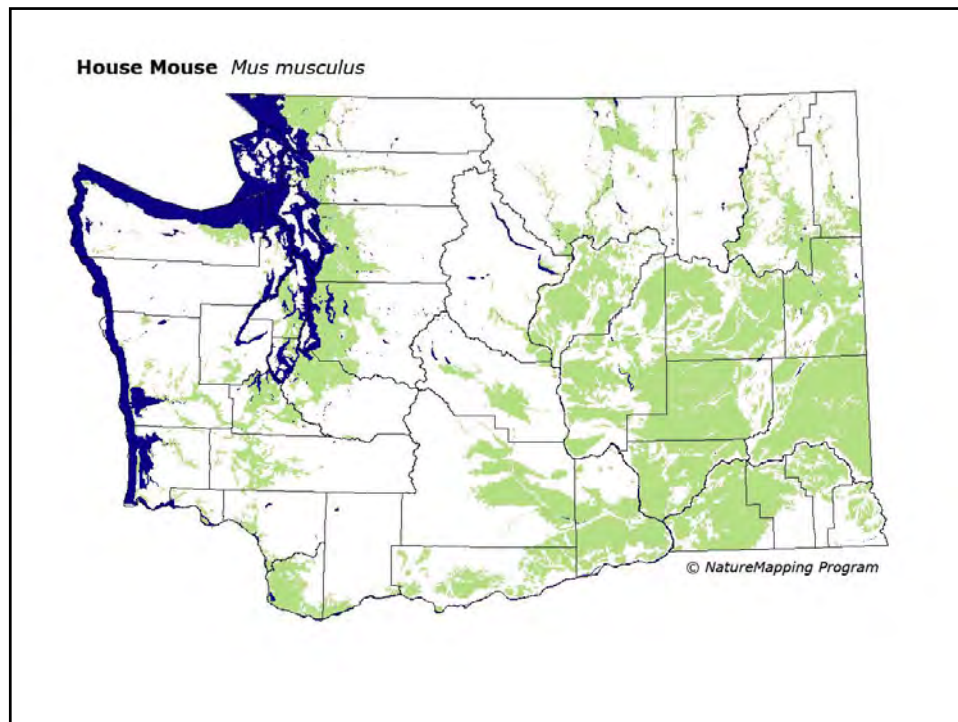
Roof Rat

- ◉ Black rat, Ship rat
- ◉ SE Asia origins
- ◉ Home Range = 100'-300'
- ◉ Food preferences: nuts, fruits, seeds, vegetables, slugs, snails
- ◉ Climber



House Mouse

- Caspian Sea area origins
- Home range – 30'-50'
- Natural food = grass seeds, bird seed
 - Loves German cockroaches
- Gravitates towards warmth



Rat Bites

- Of >2 million animal bites occurring annually in U.S.
 - ~1% are **RAT BITES**
 - 10 bites /100,000 in large cities

- Risk Factors
 - Children ≤5 years
 - Warmer months
 - Substandard housing
 - Face, hands/arms, legs/feet
 - Occurred while victim sleeping

Mouse Allergens

- Important contributing factor to occupational and inner-city childhood asthma
- Risk Factors for increased exposure
 - Type of home
 - High rise apartments, mobile homes, & duplex/triplex residences
 - Date of Construction
 - Older homes
 - Low household income
 - Floor cleaning method
 - Presence of rodents
 - Presence of cockroaches

Arthropods Associated with Commensal Rodents*

Arthropod Group	Roof Rats	Norway Rats	House Mice	All 3 Rodents
Ticks	3	0	0	3
Mites	11	8	5	16
Fleas	8	7	3	8
Sucking Lice	3	3	0	4
Bots	3	0	0	3
TOTAL	28	18	8	34

*Data represents findings in Florida

Zoonoses Associated with Commensal Rodents

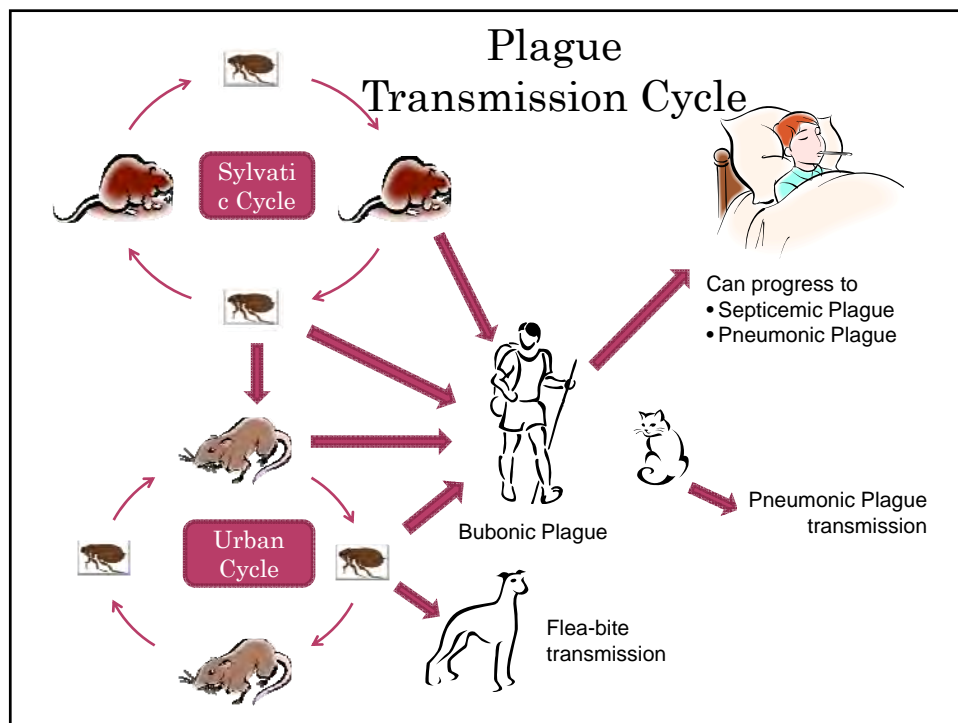
Pathogen	Number of Rodent-Borne Diseases
Virus	17
Rickettsial	9
Bacterial	20
Protozoan	3
Cestodes (Flatworms)	3
Trematodes (Flukes)	1
Nematodes (Roundworms)	3
TOTAL	56

Zoonoses Associated with Commensal Rodents

Disease	Vector – Pathogen
Plague	Fleas – <i>Yersinia pestis</i>
Rat Bite Fever	<i>Streptobacillus moniliformis</i> <i>Spirillum minus</i>
Murine typhus	Fleas - <i>Rickettsia typhi</i> and <i>R. felis</i>
Leptospirosis	<i>Leptospira interrogans</i> serovar <i>icterohaemorrhagiae</i>
Toxoplasmosis	<i>Toxoplasma gondii</i>
Angiostrongylosis	<i>Angiostrongylus cantonensis</i>
Lymphocytic Choriomeningitis	<i>Arenavirus</i>
Rickettsialpox	House Mouse mite – <i>Rickettsia akari</i>
Salmonellosis	<i>Salmonella</i> spp.

Plague

- ◉ Bacteria – *Yersinia pestis*
- ◉ Three forms
 - Bubonic
 - Septicemic
 - Pneumonic
- ◉ Vector – fleas
 - Oriental rat flea
 - Sylvatic Rodent fleas
- ◉ Reservoirs – rodents
 - Primarily wild rodents in U.S.
 - Roof rats, Norway rats



Plague

- ◉ Incubation
 - 2-6 days
- ◉ Symptoms
 - **Bubonic plague:** enlarged, tender lymph nodes, fever, chills and prostration
 - **Septicemic plague:** fever, chills, prostration, abdominal pain, shock and bleeding into skin and other organs
 - **Pneumonic plague:** fever, chills, cough and difficulty breathing; rapid shock and death if not treated early
- ◉ Treatment – antibiotics
- ◉ ~14% (1 in 7) of all plague cases in US are fatal

Plague in Washington

- ◉ 1907
 - 3 confirmed cases in Seattle;
 - 4 additional possible cases
- ◉ 1984
 - 1 case – Yakima, animal trapper
- ◉ November 1907
 - Seattle passes two ordinances to improve sanitary conditions and combat plague.
- ◉ Ordinance #17391
 - One of first rat proofing ordinances enacted anywhere in U.S.

Rat Bite Fever

- ◉ *Streptobacillus moniliformis*
 - North America
 - Streptobacillary rat bite fever
 - First reported in U.S. in 1839
 - >200 cases documented in U.S.
- ◉ Haverhill Fever
 - Milk associated transmission
 - Haverhill, MA 1926
- ◉ *Spirillum minus* (aka Sodoku)
 - Asia
 - Spirillary rat bite fever
- ◉ Reservoirs – Rats

Rat Bite Fever

- ◉ Transmission
 - Bite or scratch from infected rat
 - Handling infected rat
 - Ingestion of contaminated food or water
- ◉ Incubation 2-10 days
- ◉ Symptoms
 - Abrupt onset of fever
 - Vomiting
 - Headache
 - Myalgias & Arthralgias
 - Rash in 20% - 80% of cases
- ◉ Treatment – antibiotics
 - 7-10% case fatality if left untreated

Rat Bite Fever in Washington

- ◉ Washington 2003 – Fatal Case
 - Female, 19 years
 - Dog groomer
 - *S. moniliformis*
 - 9 pet rats in apartment – 2 under antibiotic treatment for respiratory symptoms
- ◉ Prevention
 - Control rodent population
 - Pasteurize milk
 - Protect food from rodents
 - Laboratory mice, rats, and other rodents should be housed in separate environments

Murine Typhus

- ◉ AKA Endemic or Flea-borne Typhus
- ◉ *Rickettsia typhi*
- ◉ Incubation 7-14 days
- ◉ Symptoms – non-specific
 - Fever (3-5 days duration)
 - Headache
 - Rash (20%-80% of cases)
 - Arthralgia
- ◉ Treatment – tetracyclines

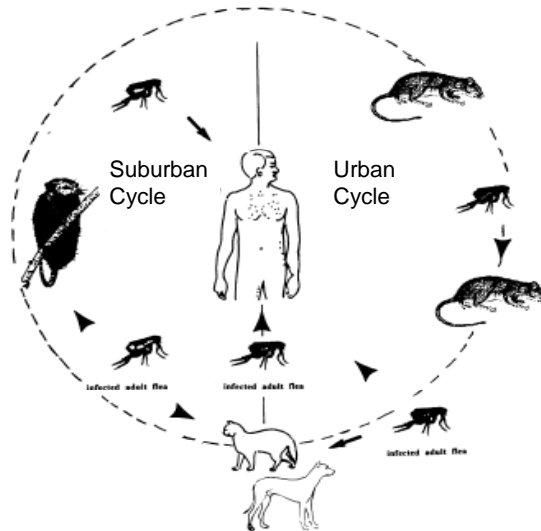
Murine Typhus

Urban Cycle

- ◉ Rats
- ◉ Oriental rat fleas

Suburban Cycle

- ◉ Cats and Opossums
- ◉ Cat fleas
- ◉ Texas
 - April - June
- ◉ California
 - Summer - Fall



Leptospirosis

- ◉ *Leptospira interrogans* var. *icterohemorhagica*
 - ~19% of Washington canine leptospirosis cases reported to Department of Health have “Ictero” titers of $\geq 1:800$
- ◉ Rats – primary reservoir of “Ictero”
- ◉ Transmitted via contaminated urine or water through ingestion, breaks in skin, or mucous membrane
- ◉ 2007 WA Case – Unconfirmed “Ictero” infection
 - Veterinarian urinated on while inspecting a pet rat for fleas
 - Contaminated minor open skin lesions on hands (was not wearing gloves)
 - ER visit followed by hospitalization

Toxoplasmosis

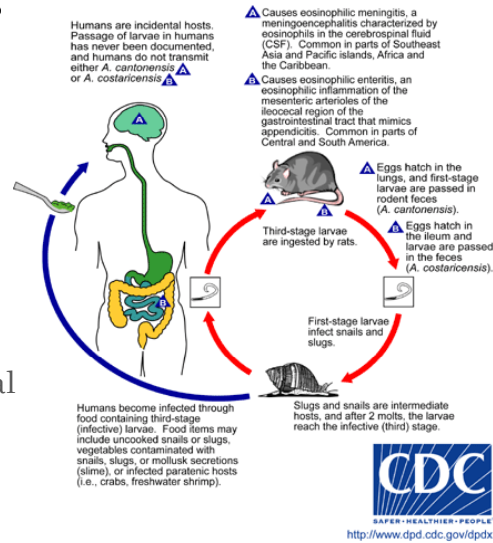
- ◉ *Toxoplasma gondii*
- ◉ Cat family – definitive hosts
 - Shed *T. gondii* eggs in feces
- ◉ Toxoplasmosis is communicable only in cats
- ◉ Rats - intermediate-host reservoir
- ◉ Avg. prevalence 35% in wild rat populations
- ◉ When eggs ingested by rodents, cysts form in various tissues, most commonly the brain
 - Cysts remain viable for life of host
- ◉ *T. gondii* cysts in rats results in increased activity and decreased neophobic behavior

Angiostrongylosis

- ◉ *Angiostrongylus cantonensis* – roundworm
- ◉ Rat lungworm - pulmonary arteries of rats
- ◉ Intermediate hosts – terrestrial snails and slugs
- ◉ Transmission – ingestion of snails or slugs infected with third-stage larvae
 - Raw or undercooked infected snails or slugs
 - Pieces of snails and slugs accidentally chopped up in vegetables, vegetable juices, or salads
 - Foods contaminated by the slime of infected snails or slugs

Angiostrongylosis

- Incubation – 1-3 weeks average
- Symptoms – bacterial meningitis
 - Nausea
 - Vomiting
 - Neck stiffness
 - Headaches - often global and severe
- Illness usually lasts between 2-8 weeks
- No specific treatment



Lymphocytic Choriomeningitis

- Virus
- Natural reservoir – House mouse (*Mus musculus*)
- Virus shed in saliva, nasal secretions, urine, milk, feces, and semen
- Incubation – 5-13 days
- Illness lasts – 1-3 weeks
- Clinical Symptoms
 - Fever, fatigue, malaise, anorexia, headache, sore throat, myalgia, photophobia, nausea, vomiting
 - Coughing, rashes, joint aches, chest pain
- Treatment – supportive

Lymphocytic Choriomeningitis

- ◉ Prenatal infections can result in
 - Abortions, acute neonatal meningitis, developmental defects
- ◉ Prevention
 - Mouse proof home
 - PPE when cleaning rodent-infested premises
 - Safe handling to prevent bites
- ◉ If Pregnant...
 - Avoid touching wild or pet rodents & droppings
 - Avoid rooms where rodents are present
 - PPE if work with rodents (gloves, gowns, face masks)

Rickettsialpox

- ◉ *Rickettsia akari* – SFG Rickettsia
- ◉ Primary reservoir - House mouse
- ◉ Vector – House Mouse mite
- ◉ Occurs primarily in urban areas
 - Crowded living quarters infested with house mice
- ◉ Incubation 9-14 days
- ◉ Often confused with chickenpox
- ◉ Lesion produced at bite site
 - Face, trunk, extremities usual sites
- ◉ Mild, nonfatal; usually resolves within 6-10 days
- ◉ Treatment - antibiotics

Salmonellosis

- ◉ Two *Salmonella* serotypes closely associated with rodents & food poisoning
 - *S. typhimurium*
 - *S. enteritidis*
- ◉ Easily transmitted directly from contaminated surfaces to food
- ◉ Illness results from consumption of water or food contaminated with:
 - *Salmonella* bacteria
 - Feces from infected people or animals
- ◉ Rodents deposit several hundred feces in areas they frequent in the course of 1-2 weeks

Summary

- ◉ Commensal rodents are found throughout the United States
- ◉ Along with destructive behavior, commensal rodents pose a significant disease risk
- ◉ Rodent control and preventative measures are necessary to reduce risk of disease transmission and impact on health
- ◉ For more information on rodent control:
www.doh.wa.gov/ehp/ts/Zoo/rodent.htm

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