Texas A&M AgriLife Extension Service
Public Health License Holders Course

# Chapter 8
# Rodents and Rodent Control

1

## Commensal rodents

- Commensalism – a relationship between two organisms in which one obtains food or other benefits from the other (without direct harm or benefiting the other)

2



## Most common commensal rodents

House mouse
Norway rat (brown rat)
Roof rat (black rat)

3

## Why are rodents so successful?

- Ability to survive in a wide range of habitats
- Relatively small body size
- Secretive
- High reproductive potential
- Opportunistic feeder
- Compulsive explorer
- Variable behavior
- Human tolerance

4



## Harmful side of rodents

- Contaminate food areas
- Steal and contaminate food
- Chewing damage
- Burrowing activities
- Rat bites
- Odors
- Generates fear and repugnance
- Transmit disease

5

**House Mouse**
.5-1oz
5.5-7.5" long

**Norway Rat**
7-18oz
13-18" long

Disease transmission by rodents

- Implicated in 63 different human diseases NOT rabies
- Food poisoning may be greatest threat
- Disease threat from urine and droppings not well studied

6

## Food contamination

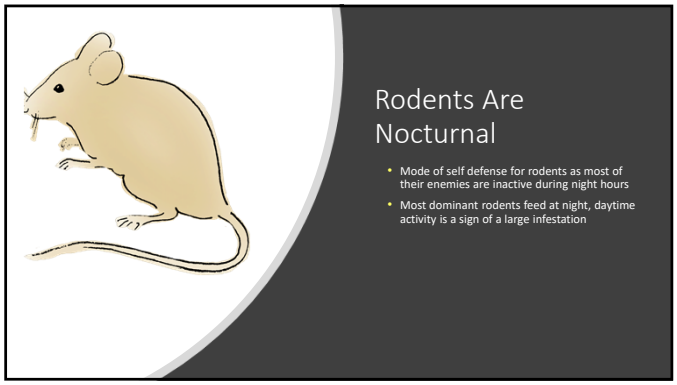
- Rodents destroy 20% of world's food supply annually
- 4% of stored rice and grain

7

## Disease transmission by rodents

- food poisoning may be greatest threat
- disease threat from urine and droppings not well studied
- other diseases of concern: plague, leptospirosis, rat bite fever, arenavirus


8

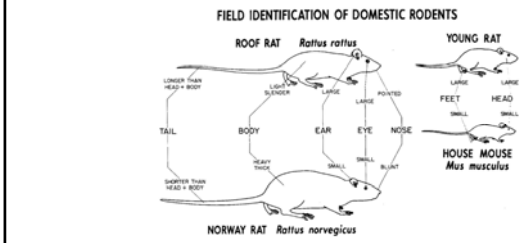


## Rodents Are Nocturnal

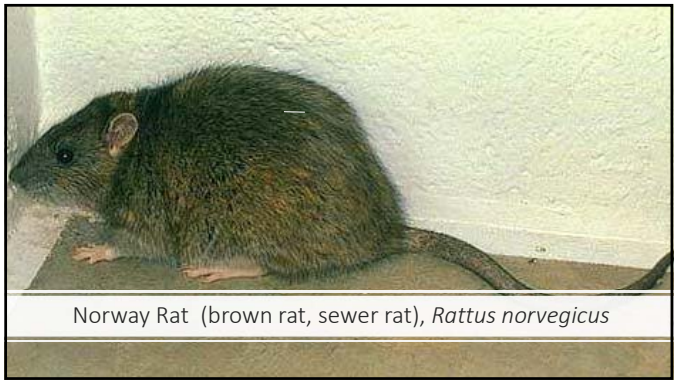
- Mode of self defense for rodents as most of their enemies are inactive during night hours
- Most dominant rodents feed at night, daytime activity is a sign of a large infestation

9

## Identification




10



Norway Rat (brown rat, sewer rat), *Rattus norvegicus*

11

## Biology of the Norway rat (cont.)

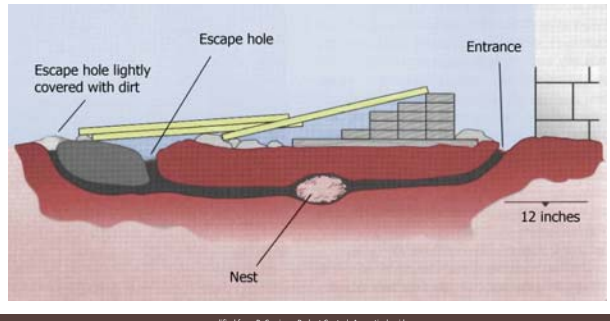
- Omnivorous, opportunistic feeder
  - feed on anything humans eat
  - 0.5-1 oz per day (15-30 gm)
- Hoardes and transports food
  - bait translocation a problem
- Requires water daily (1-2 oz)
- Typical family unit
  - dominant male
  - breeding female
  - up to 12 juveniles

12

## Biology of the Norway rat

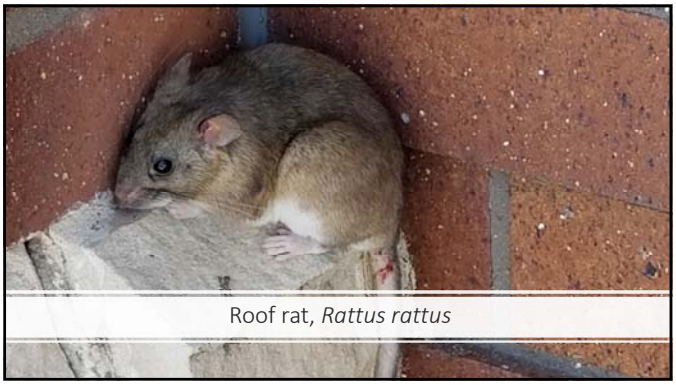
- Reproduction peaks in spring and fall
- Moderately high reproductive rates
  - 8-9 pups per litter weaned in about a month
  - Female may produce 20+ pups
  - Sexually mature at 2-3 months
- Wild rats typically live 5-12 months (3 yrs)

13




modified from R. Corrigan, Rodent Control: A practical guide

14



Roof rat, *Rattus rattus*

15

## Roof rat biology

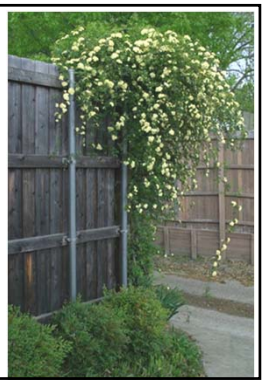
- Excellent climbers
- Moderate reproductive capacity
  - Female produces 3-4 litters of 4-8 pups
  - Sexually mature 2-3 months
- Adults live 5-18 months
- Nocturnal and secretive
  - can remain undetected for long periods

photo by Rosemary Thomas

16

## Roof rat biology (cont.)

- Prefer mature vegetation, vines, trees for harborage
- Most frequently nests above ground
- Opportunistic, self-sufficient
  - seeds, nuts, fruits, berries
  - slugs, snails
  - insects
  - fish, shellfish
  - pet food, bird seed, etc.
- Typical family group of 10 rats

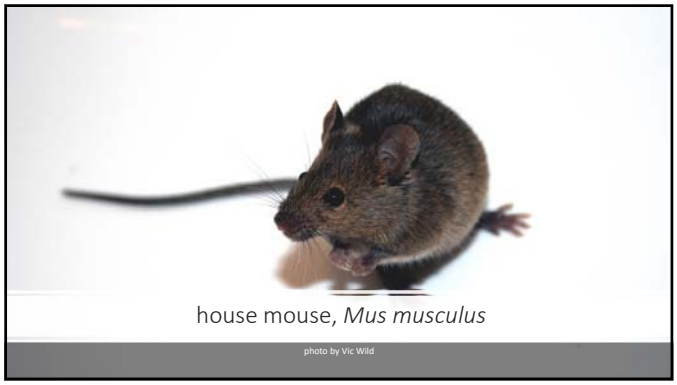


17

## Rats

- Need a hole the size of a quarter or a ½ inch crack beneath a door to enter
- Are very smart, cautious, and afraid of new things
- Require 0.5–2.5 ounces of food each day
- Need ~1 ounces of water every day (Norway)
- Will nest close to food and water
- Prefers lines, shadows, cracks, good places to hide


18



house mouse, *Mus musculus*

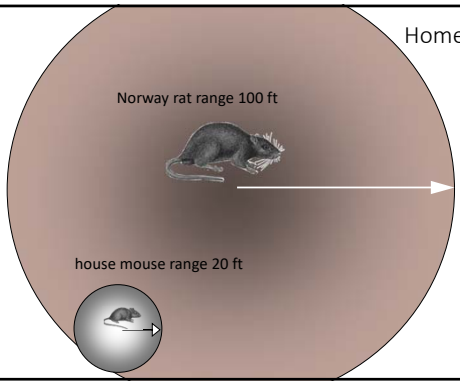
photo by Vic Wild

19

## Biology

- Reproduction
  - 6-10 litters (5-6 babies) per female
  - 18-21-day gestation period
  - weaned @ 21 days, mating @ 6-10 weeks
  - 24 mice produced 2,000 mice in 8 months
- Territoriality
  - family may consist of 15-20 individuals with multiple breeding females

20




21

## Biology of house mouse (cont.)

- When crowded, tend to disperse
- Live outside during summer
- Do not hibernate
- Nest in warm areas close to food
- Need very little water
- Active mostly at night (nocturnal)

22

## Mouse droppings

- 50 to 75 droppings per day
- 1/8 to ¼ inch-long, pointed
- Sign of high activity areas
- Up to 3,000 urine microdroplets produced daily

23

## Biology of house mouse (cont.)

- Thigmotactic
  - vibrissae
  - rely on touch to navigate
- Curious but tends to avoid lighted areas
- Requires little water
- Fast
  - speeds up to 12 ft per second
  - jump over obstacles

24

## Mice

- Need a hole the size of a dime or a ¼ inch crack beneath a door to enter
- Pencil


25


26

Hantavirus pulmonary syndrome

- Deer mice only known carriers of the hantavirus
- Airborne disease transmitted through urine, feces and saliva
- Symptoms difficult to detect (flu-like: fever, vomiting, chills, aches etc.)

27

## Two most prevalent diseases in TX

### Flea-borne typhus

- Murine or endemic typhus, is a rickettsial disease caused by the organism *Rickettsia typhi*
- Rats and their fleas are the natural reservoirs for flea-borne typhus
  - Rats and their fleas are the natural reservoirs (animals that both maintain and transmit the disease organism) for flea-borne typhus
- People get flea-borne typhus from an infected flea.
  - Most fleas defecate while biting; the feces of infected fleas contain the rickettsial organism.
  - The rickettsiae enter the body through the bite wound or from a person scratching the bite area

### Hantavirus pulmonary syndrome

- Hantavirus pulmonary syndrome (HPS) is an infectious disease that can cause death. It is spread to people by rodents, such as rats and mice.
- In North America, the deer mouse, white-footed mouse, rice rat, and cotton rat are the known carriers of this virus.
- Transmission to humans is typically through rodent droppings and urine when it becomes disturbed.

28

## Symptoms of these diseases

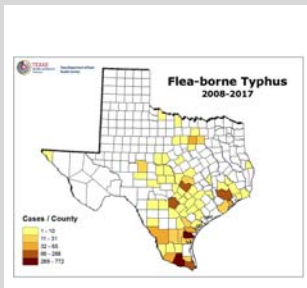
### Flea-borne typhus

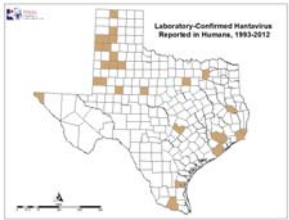
- Incubation period for flea-borne typhus is 6 to 14 days.
- Symptoms of the disease include:
  - headache, fever, nausea, and body aches.
  - 5 - 6 days after the initial symptoms, you may get a rash that starts on the trunk of the body and spreads to arms and legs.
  - Left untreated, the disease may last for several months.
  - Tests can be done to detect flea-borne typhus.

### Hantavirus pulmonary syndrome

- Incubation time is 1 to 5 weeks before they will feel sick
  - Fever
  - Severe muscle aches
  - Fatigue
- After a few days they will have a hard time breathing. Sometimes people will have headaches, dizziness, chills, nausea, vomiting, diarrhea, and stomach pain. Usually, people do not have a runny nose, sore throat, or a rash

29




30

## Surveying and Monitoring for Rodents

31

## Rodent management tactics

- Inspection
- Sanitation
- Rodent-proofing
- Traps
  - snap traps
  - catch-alls
  - rat zappers
  - sticky boards
- Baits

32

## What to Look For

- Fecal pellets
- Gnaw or chew marks
- Rub marks
- Use your sense of smell. Rodent urine has a distinct odor
  - urine stains and urine pillars

33

## Think like detective and use all your senses

- Shadows
- Lines
- Corners
- Warmth
- Holes
- Sebum Trails
- Odors

34


## Paw prints

35

## Runs and nests indoors

36



Rodent odors

37



Sebum – grease marks – rub marks

38

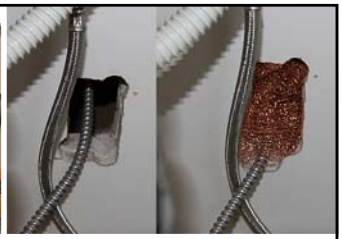
Prevention

- Exclusion
- Sealing
- Door sweeps

39

Exclusion = Prevention

40

Alternatives to Sealants

41

## Exclusion

- Seal any openings greater than 1/4 inch in diameter in foundations, walls, fascia, and roofs
  - For example, gaps in doors, escutcheon plates, pipe and conduit penetrations into buildings, any other opening into a building
- Screen vents with ¼ inch hardware cloth and install door sweeps to prevent access
- If rats are entering through floor drains, seal these with hardware cloth with ¼ inch mesh
- Install heavy-gauge kick plates at the base of any doors with evidence of rodent gnawing.
- Fill in inactive burrows with appropriate filler such as mortar for burrows in or under concrete and soil

42



Sanitation

43



Rodent proofing – garbage management

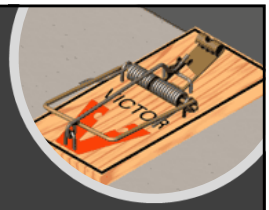
44

Equipment – Trapping

45

Advantages and disadvantages of trapping

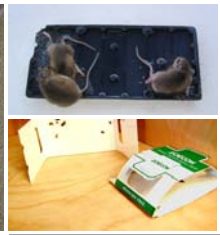
- Relatively fast and effective
  - humane concerns with some
- Eliminates risk of odors from dead rodents
- Best for smaller rodent populations
- Labor intensive
  - requires almost daily maintenance
- As a pest management activity, requires pesticide license



46

Catch-all or repeater mouse traps

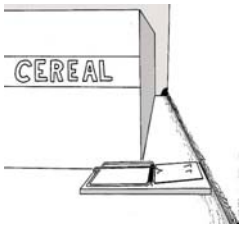

47

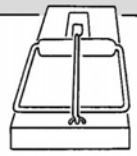

Glue boards

48

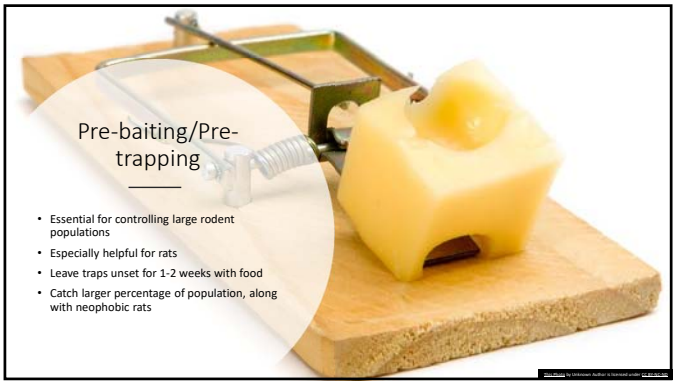
## Trap placement




Proper placement



49

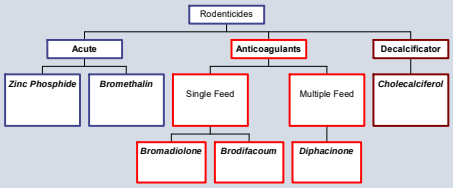


## Pre-baiting/Pre-trapping

- Essential for controlling large rodent populations
- Especially helpful for rats
- Leave traps unset for 1-2 weeks with food
- Catch larger percentage of population, along with neophobic rats

50

## Rodenticide Families




51

## Types of rodenticides

- Anticoagulants-first generation
  - kill by preventing blood from clotting
  - require multiple feedings
  - Examples: warfarin, chlorophacinone, diphacinone, coumafuryl, pindone
  - some documented resistance

52


## Types of rodenticides

- Anticoagulants-second generation
  - faster acting
  - many are single feed
  - Examples: brodifacoum, bromadiolone, difethialone
  - heavy use worldwide, no resistance known yet
- Vitamin $K_1$ is an effective antidote for anticoagulants

53


## Types of rodenticides

- non-Anticoagulants
  - Bromethalin (Fastrac®, Gunslinger®, Top Gun®, Vengeance®)
  - Cholecalciferol (Quintox®, Selontra® )
    - Vitamin D
  - Zinc Phosphide (ZP® bait and tracking powders)
    - single or multiple dose
    - fast kill
- No known antidotes

54

## Rodenticide concerns

- All rodenticides have potential for accidental or secondary poisoning
- Use tamper-resistant bait stations with bait blocks that can be secured in place
- All bait placements should be retrievable
- Special care around companion animals with brodifacoum, cholecalciferol, diphacinone

55

## Keep these tips in mind when using rodenticides:

- If you choose to use rodent bait, always follow the label, it's the law.
- Identify your rodent first. Some bait types are more effective for certain species than others.
- Try a combination of control methods. Consider prevention, sanitation, and exclusion before using a rodenticide. Then try a lower toxicity product first.
- Rodent baits can be attractive and dangerous to kids, pets and wildlife. Always store pesticides in a cool, dry place that's not accessible to children and pets.
- Use bait stations, rather than broadcast rodenticides, to minimize access for children and pets.
- Use gloves when disposing of dead rodents. Secure trash cans to minimize pet or wildlife access to poisoned rodents.
- Many rodenticide baits can be toxic to wildlife if they are eaten, or if an animal eats a rodent that was recently poisoned. If you suspect an animal may have been poisoned, please contact NPIC at 1-800-858-7378 to talk with a Pesticide Specialist

56

## Study Questions

**The three rodents that cause most pest problems are:**

A. Norway rat, roof rat, house mouse
B. House mouse, roof rat, field mouse
C. Norway rat, house mouse, sewer rat

**The territorial range of rats is_____ from the nest.**

A. 30 ft.
B. 100 – 150 ft.
C. Up to 500 ft.

57

## Study Questions

**A house mouse can squeeze through an opening as small as:**

A. ¼ inch
B. 1 inch
C. 2 inch

**The Norway rat (Rattus norvegicus) is distinguished by its:.**

A. Thick body, tail shorter than the body, small ears
B. Slender body, tail longer than the body, large ears
C. Protruding eyes, tail longer than the body, large ears

58

## Study Questions

**Which kinds of foods does a roof rat prefer?**

A. High-protein foods, such as pet food, meats, insects
B. Plant-derived foods, such as seeds, berries
C. High carbohydrate foods, such as bread, pasta, cereals

**An effective rodent control program should begin with:**

A. Exclusion and sanitation
B. Baiting and trapping
C. Repellents, such as noise makers and electrical devices

59

## Study Questions

**Rats are a vector for rabies.**

- True
- False

**Anticoagulants are rodenticides that:**

a) **Kill as a single-dose toxicant**
b) **Kill by slowing the clothing of blood**
c) **Should not be used in residences**
d) **Are used to gas rat burrows**

**Mice, like rats, have relatively poor vision and are color blind.**

- True
- False

60