Chapter 8
Rodents and Rodent Control

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

Most common commensal rodents
- House mouse
- Norway rat (brown rat)
- Roof rat (black rat)

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

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

Disease transmission by rodents
- House Mouse: 5-1 oz, 5.5-7.5" long
- Norway Rat: 7-18 oz, 13-18" long
- Implicated in 63 different human diseases
- Rodent bodies may be greatest threat
- Disease threat from urine and droppings not well studied
Food contamination

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

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

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

Identification

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

- Omnivorous, opportunistic feeder
- Feed on anything humans eat
- 0.5-1 oz per day (15-30 gm)
- Hoards and transports food
- Bait translocation a problem
- Requires water daily (1-2 oz)
- Typical family unit
- Dominant male
- Breeding female
- Up to 12 juveniles
Biology of the Norway rat

- Reproduction peaks in spring and fall
- Moderately high reproductive rates
- 8–9 pups per litter weaned in about 4 months
- Female may produce 20+ pups
- Sexually mature at 2–3 months
- Wild rats typically live 5–12 months (3 yrs)

Roof rat, *Rattus rattus*

- 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

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

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 1–2 sources of water every day [Norway]
- Will nest close to food and water
- Prefers lines, shadows, cracks, good places to hide
**Biology of house mouse** (cont.)

- 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

**Biology**

- Home ranges
  - Norway rat range 100 ft
  - House mouse range 20 ft

**Mouse droppings**

- 50 to 75 droppings per day
- 1/8 to 1/4 inch-long, pointed
- Sign of high activity areas
- Up to 3,000 urine microdroplets produced daily

**Biology of house mouse (cont.)**

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

**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
  - Jumps over obstacles
Mice

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

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.)

Rodents and Disease

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

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
Surveying and Monitoring for Rodents

Rodent management tactics
- Inspection
- Sanitation
- Rodent-proofing
- Traps
  - snap traps
  - catchalls
  - rat zappers
  - sticky boards
- Baits

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

Think like a detective and use all your senses
- Shadows
- Lines
- Corners
- Warmth
- Holes
- Sebum Trails
- Odors

Paw prints

Runs and nests indoors
Rodent odors

Sebum – grease marks – rub marks

Exclusion

Sealing

Door sweeps

Prevention

Alternatives to Sealants

Exclusion

- Seal any openings greater than 1/4 inch in diameter in foundations, walls, fascia, and eaves
- For example, gaps in doors, escutcheon plates, pipe and conduit penetrations into buildings, any other opening into a building
- Screen vents with 1/4 inch hardware cloth and install door sweeps to prevent access
- If rats are entering through floor drains, seal these with hardware cloth with 1/4 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
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

Catch-all or repeater mouse traps

Glue boards
Trap placement

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

Rodenticide Families

- Anticoagulants
  - First generation
  - Kill by preventing blood from clotting
  - Require multiple feedings
  - Examples: warfarin, chlorophacinone, diphacinone, coumafuryl, pindone
  - Some documented resistance

- Anticoagulants-second generation
  - Faster acting
  - Many are single feed
  - Examples: bromadiolone, brodifacoum, difethialone
  - Heavy use worldwide, no resistance known yet
  - Vitamin K₁ is an effective antidote for anticoagulants

- Non-Anticoagulants
  - Bromethalin (Fastrac®, Gunslinger®, Top Gun®, Vertox®)
  - Cholecalciferol (Quintox®, Selontra®)
  - Vitamin D
  - Zinc Phosphide (ZP® bait and tracking powders)
  - Single or multiple dose
  - No known antidotes

Types of rodenticides

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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

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 pest 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 rodents in a cool, dry place that is not accessible to children or 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.

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.

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

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

Rats are a vector for rabies.
A. True
B. False

Mice, like rats, have relatively poor vision and are color blind.
A. True
B. False

Anticoagulants are rodenticides that:
A. Kill on a single-dose basis
B. Kill by slowing the clotting of blood
C. Should not be used in residences
D. Are used to gas rat burrows