

General Pest Knowledge: Rodent Pest Management

ACE PREPARATION COURSE



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)



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Rodent's teeth grow continually



- 2% of daily activity is gnawing
- teeth grow at rate of 0.4 mm per day
- tooth hardness index is greater than iron
- up to 7,000 PSI biting pressure



Fires of unknown origin

- Rodents estimated to cause 25% of building fires of unknown origin



School building destroyed by fire

Food contamination



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



Rats and mice implicated in Over 55 Different Diseases

- Viruses (17)
- Rickettsial (9)
- Bacterial (20)
- Protozoan (3)
- Cestodes (3)
- Trematodes (1)
- Nematodes (3)
- Asthma
- Hantavirus
- Salmonella
- Asthma
- Lymphocytic coriomeningitis



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



photo by Tom Myers

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.)

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Most common commensal rodents



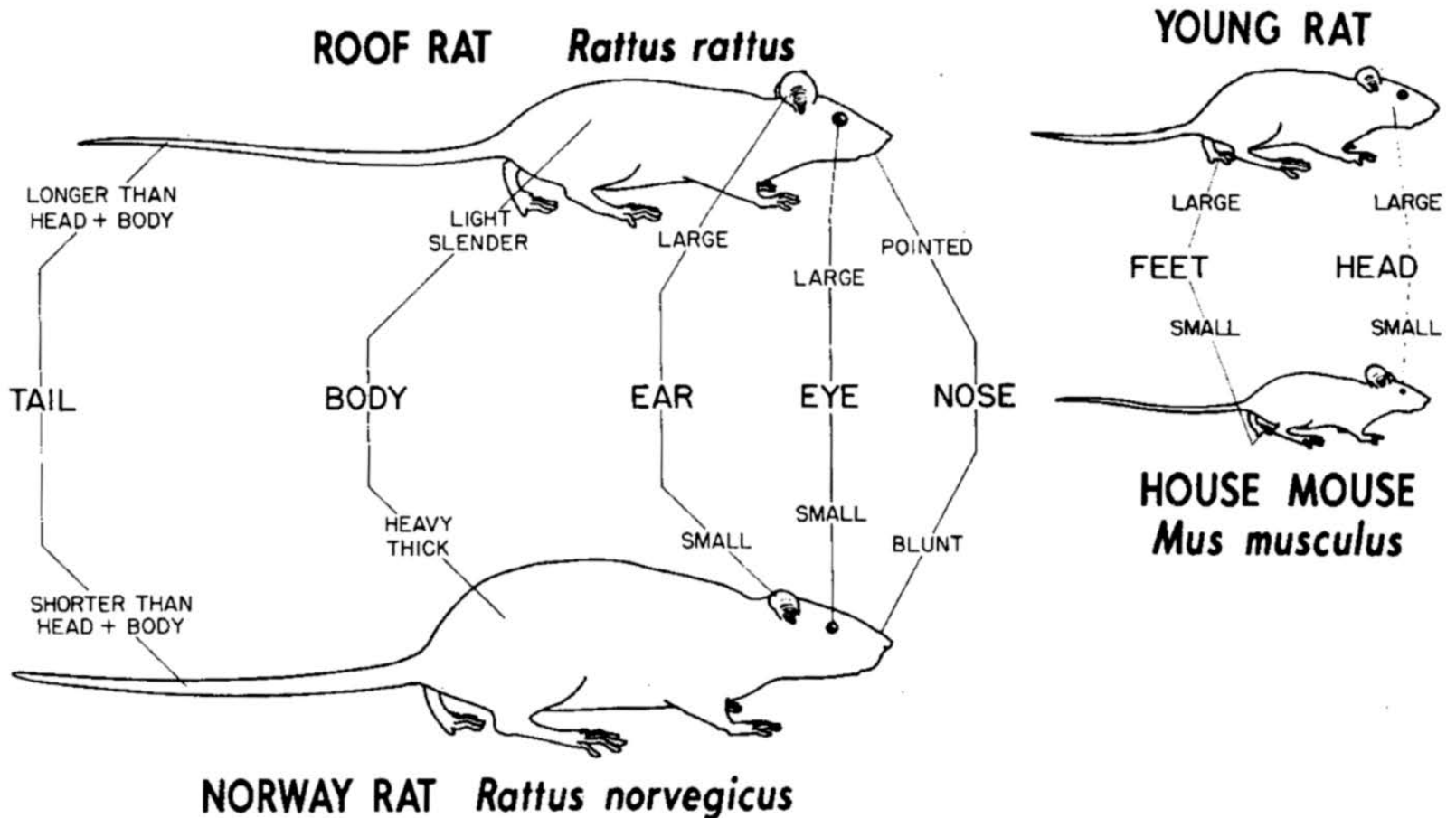
Rodents Are Nocturnal



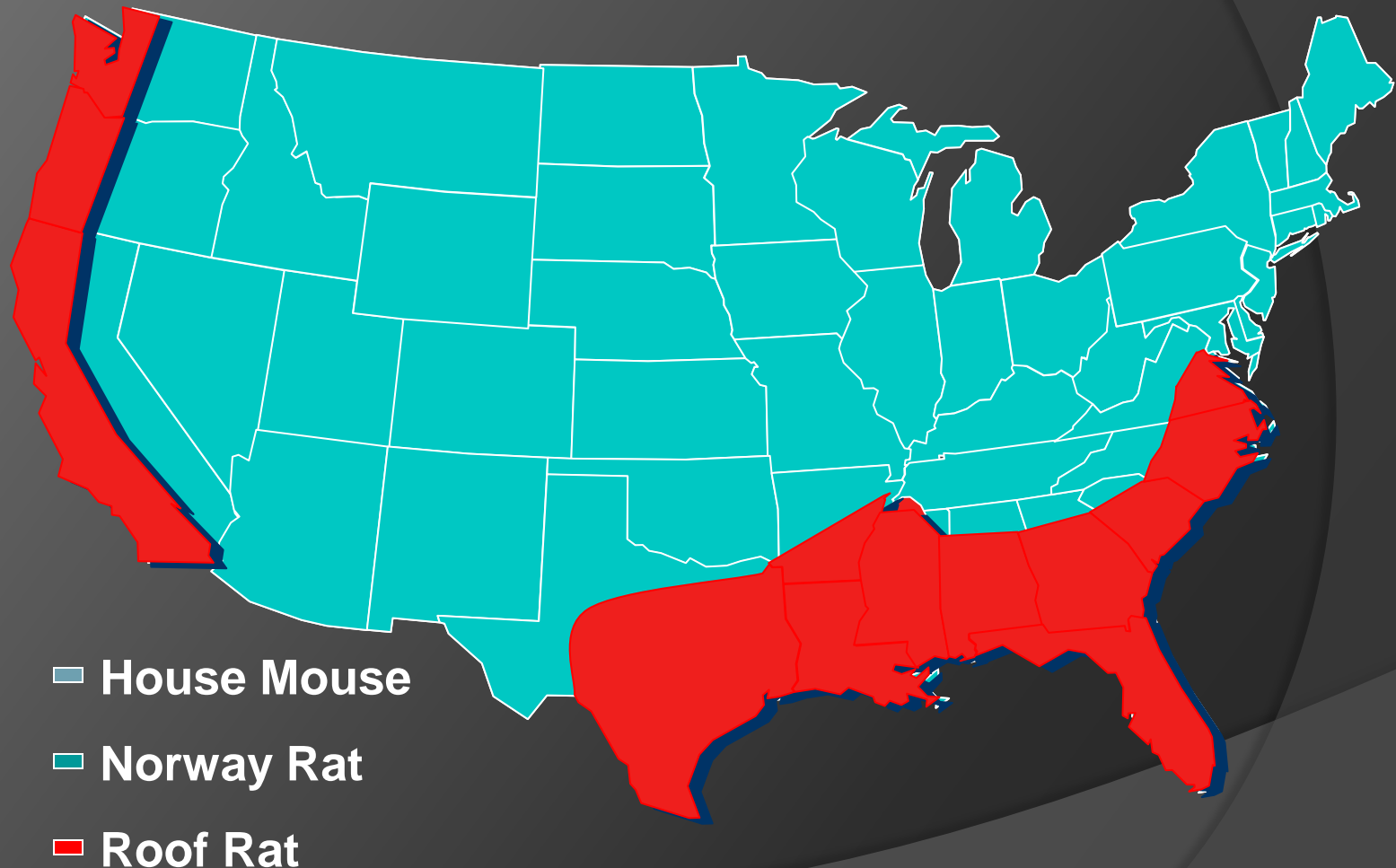
- Mode of self defense for rodents as most of their enemies are inactive during night hours
- Most dominant rodents feed at night, daytime activity is a sign of a large infestation

Identification

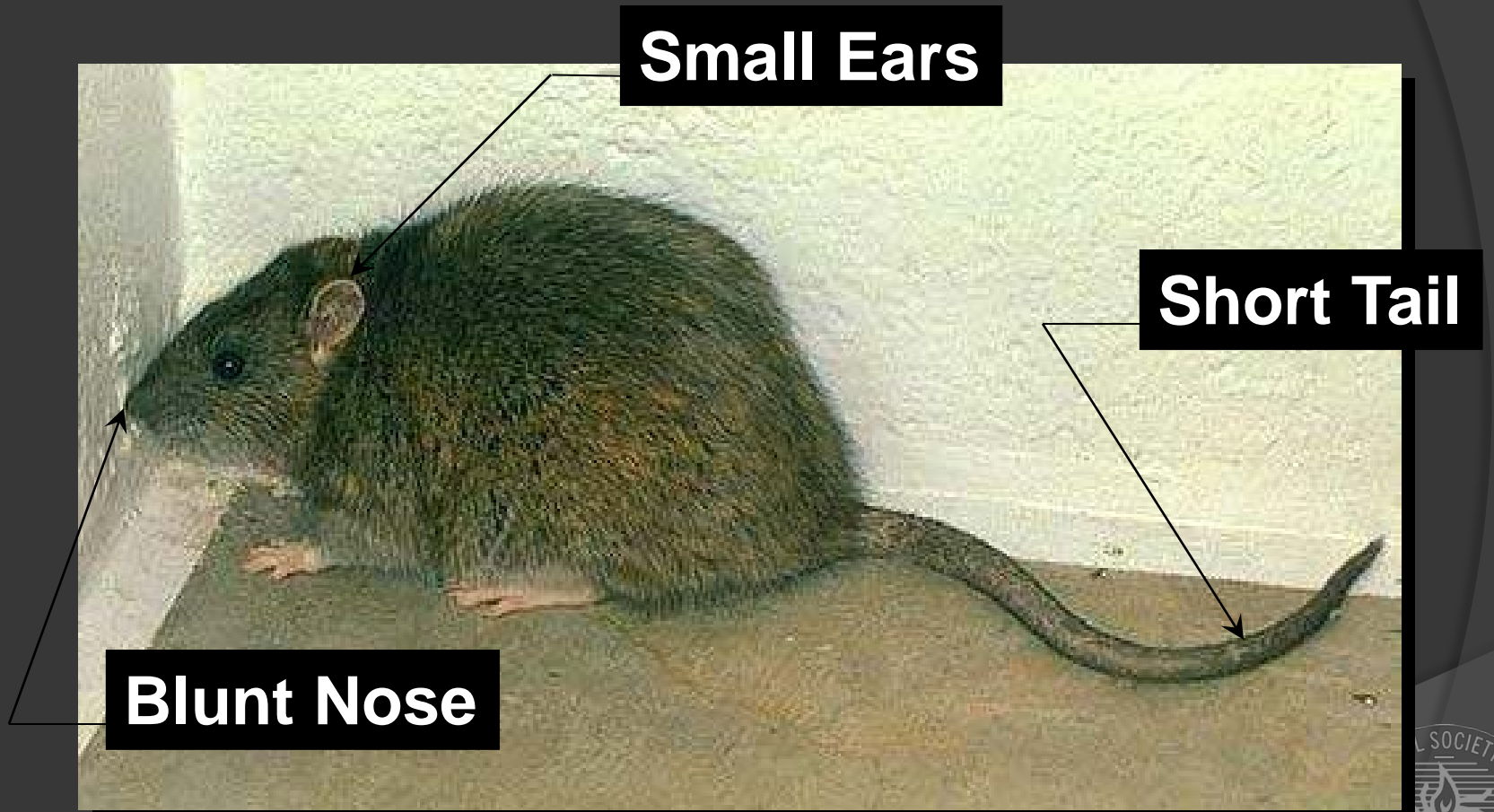
FIELD IDENTIFICATION OF DOMESTIC RODENTS



Distribution of House Mice, Norway Rats, and Roof Rats



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



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



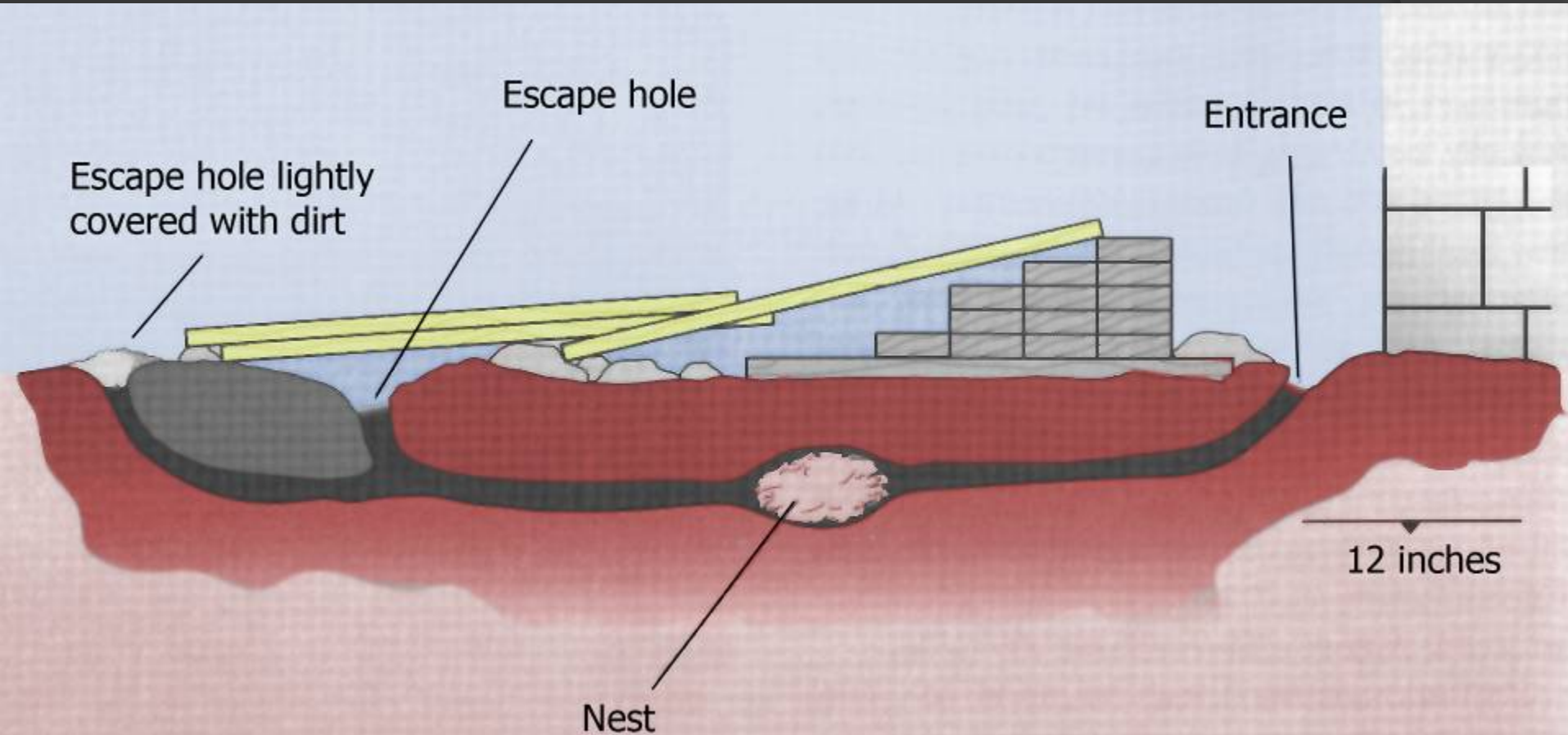
Biology of the Norway rat



- 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)



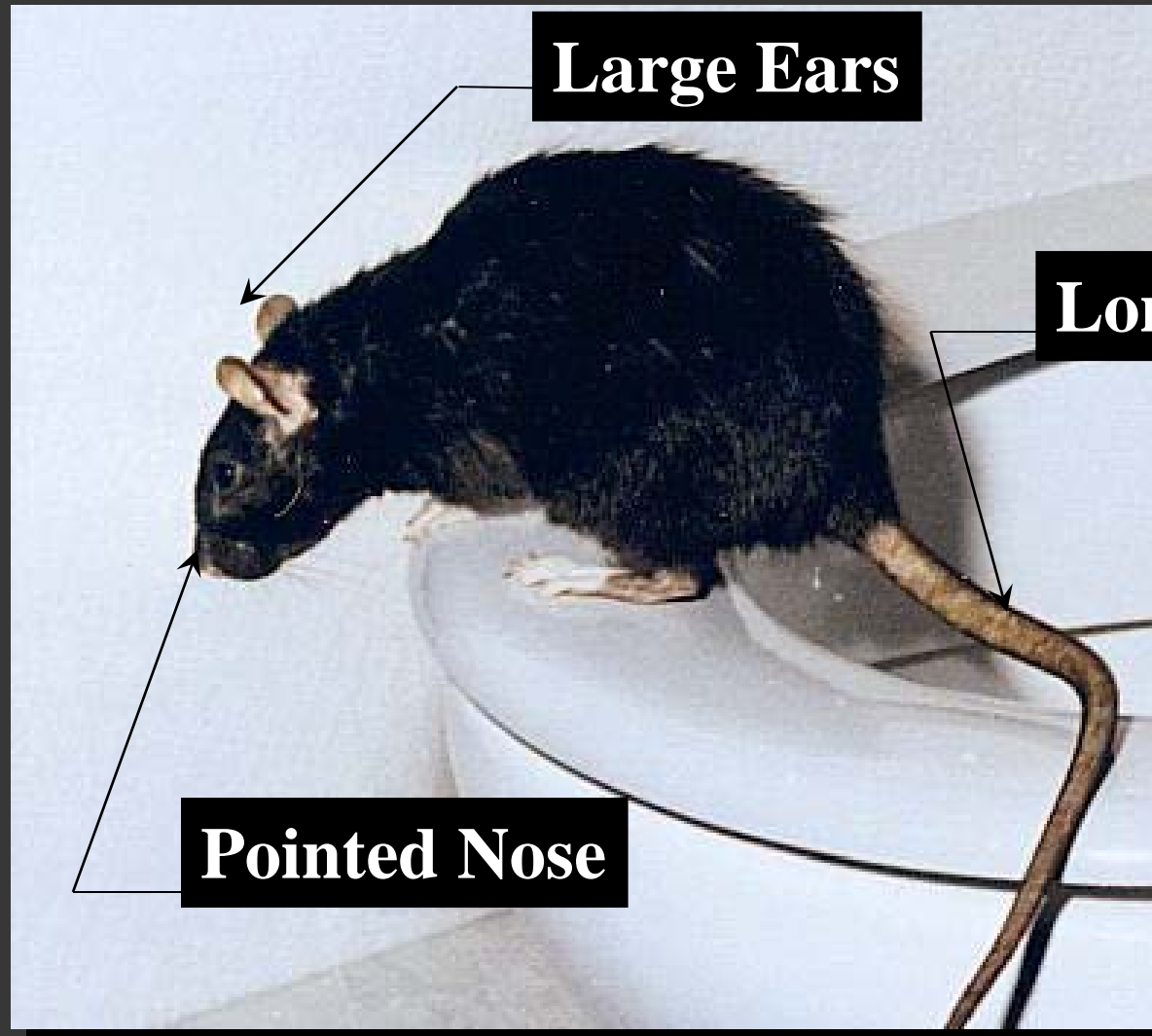
Norway rat burrow



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



Roof Rat (wharf rat, black rat) *Rattus rattus*



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



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



house mouse, *Mus musculus*



photo by Vic Wild

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

Laura Erickson for binoculars.com

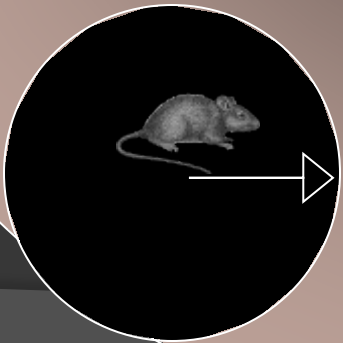


Home ranges

Norway rat range 100 ft



house mouse range 20 ft



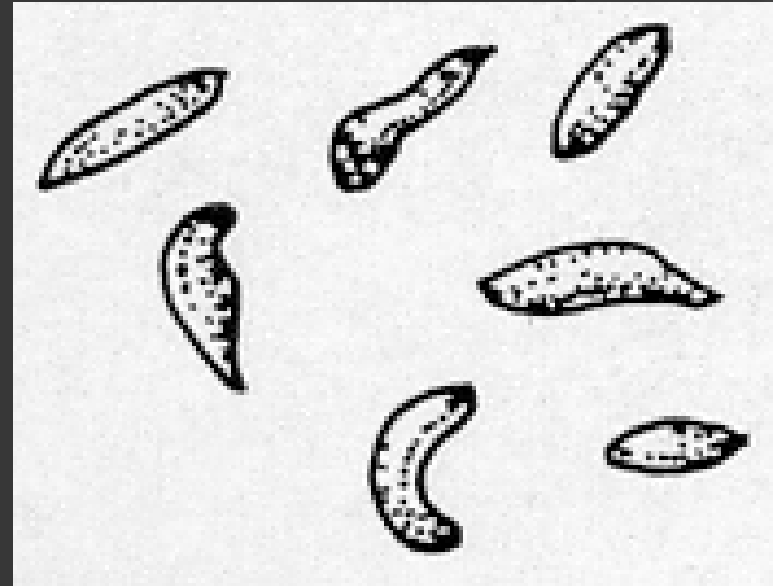
Biology of house mouse (cont.)

- 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)



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.)

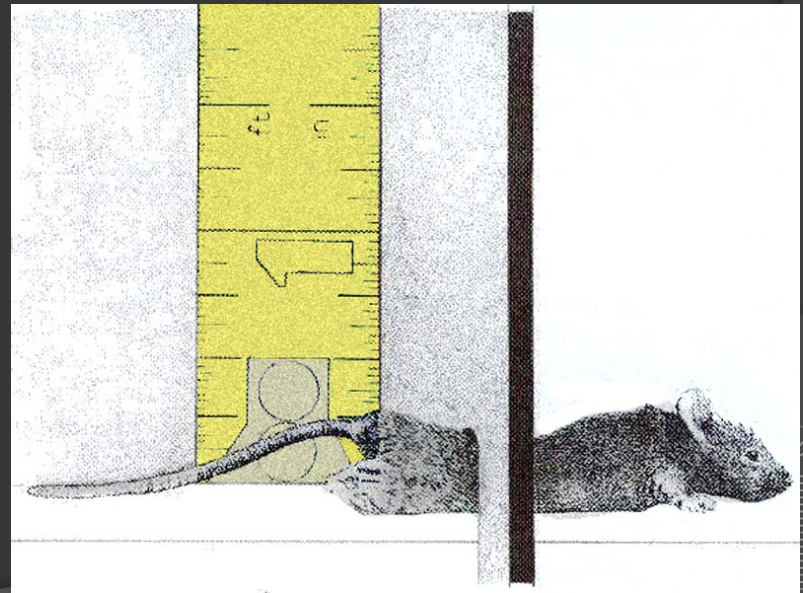


- ◉ Thigmotactic
 - vibrissae
 - rely on touch to navigate
- ◉ Curious but tends to avoid lighted areas
- ◉ Requires little water
- ◉ Fast
 - speeds up to 12 ft per second
 - jump over obstacles

How do mice enter buildings?

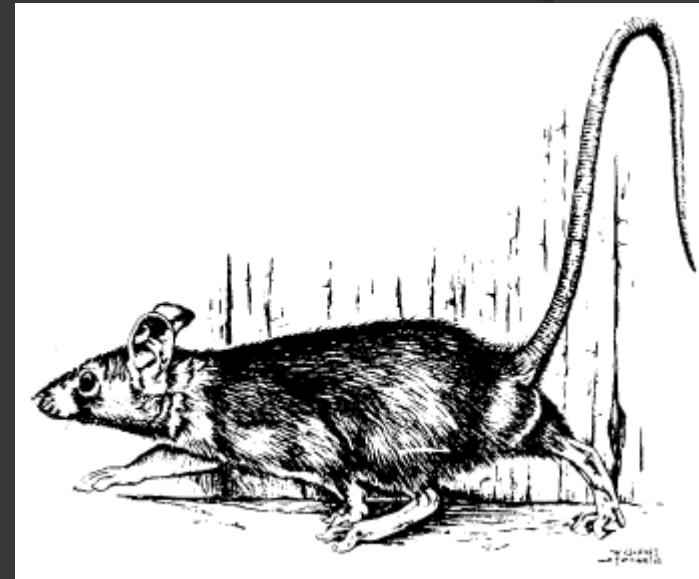


- Dime-sized hole
- Crack $\frac{1}{4}$ inch or more



Rodent management tactics

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



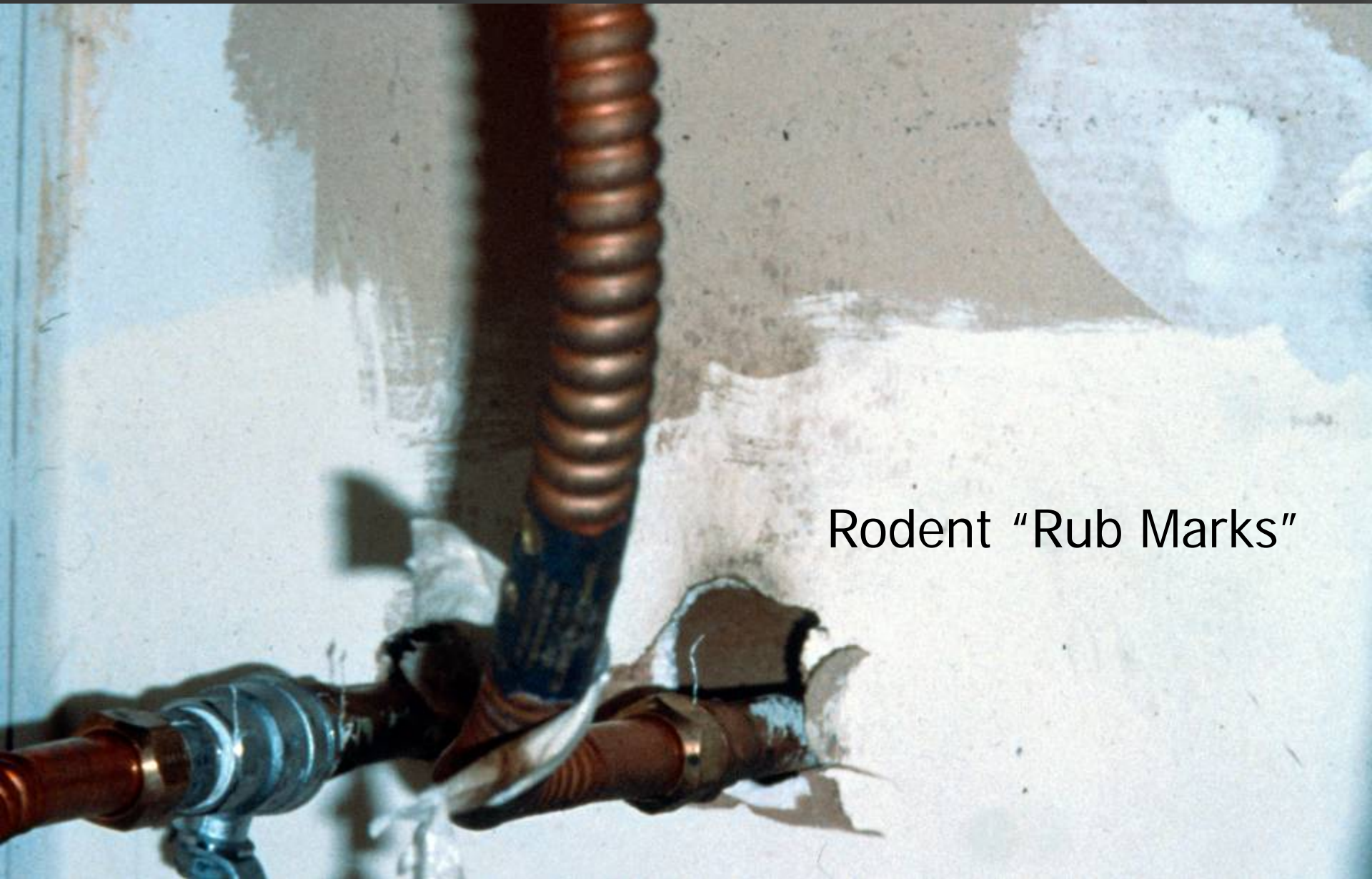
artist: Charles W. Schwartz



Rodent signs

- ⦿ Number one sign of rodents: droppings
- ⦿ chew marks
- ⦿ rub marks
- ⦿ urine stains and urine pillars





Rodent "Rub Marks"

Sanitation

- Food in tamper-resistant containers
- Clutter control
- Eliminate insect and other natural foods
- Vegetation control



photo by M. Merchant

Trapping



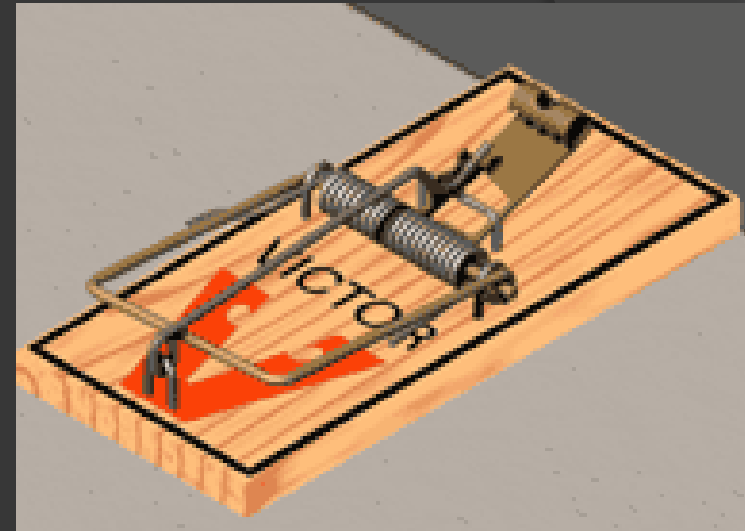
photo by M. Merchant

Juvenile roof rat: note large feet, long tail and ears



Advantages and disadvantages of trapping

- Relatively fast and effective
 - humane concerns with some
- Eliminates risk of odors from dead rodents
- Labor intensive
 - requires almost daily maintenance
- Does not eliminate need for a pesticide license in schools, apartments, restaurants
- Best for smaller rodent populations

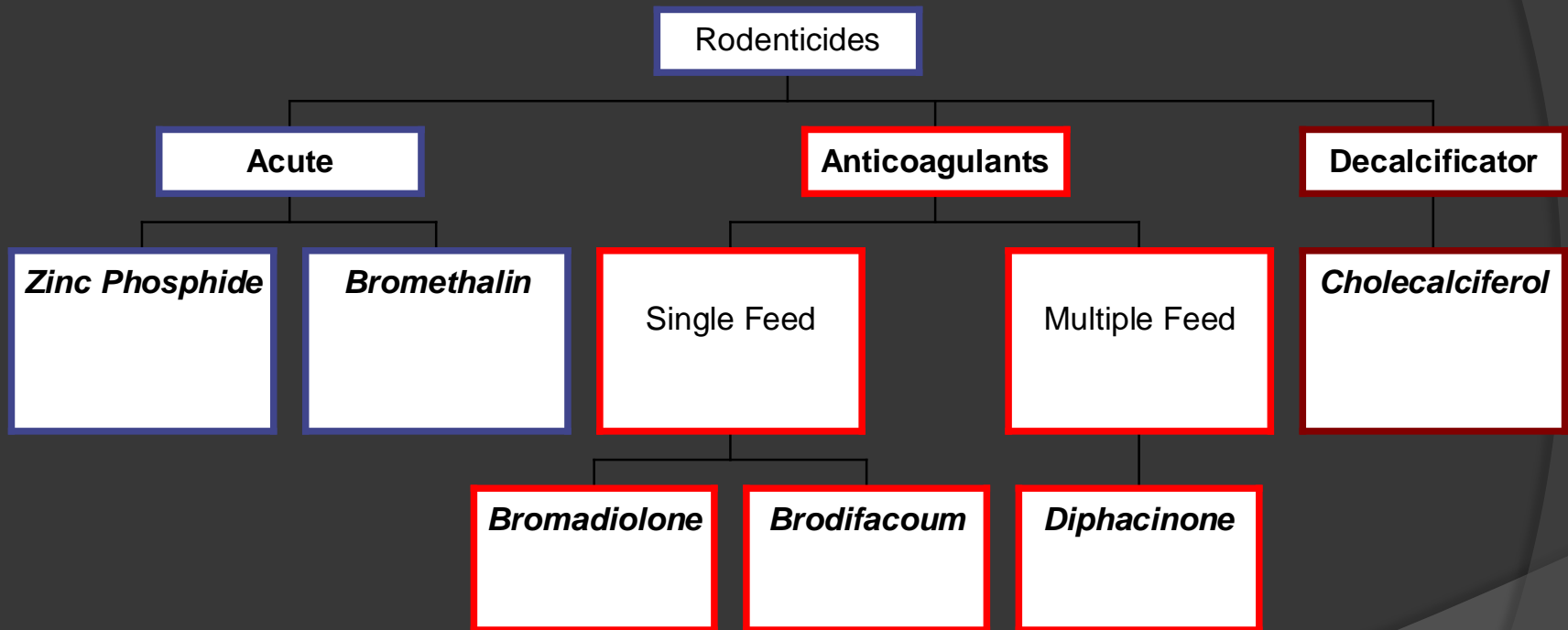


Pre-baiting/Pre-trapping

- 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



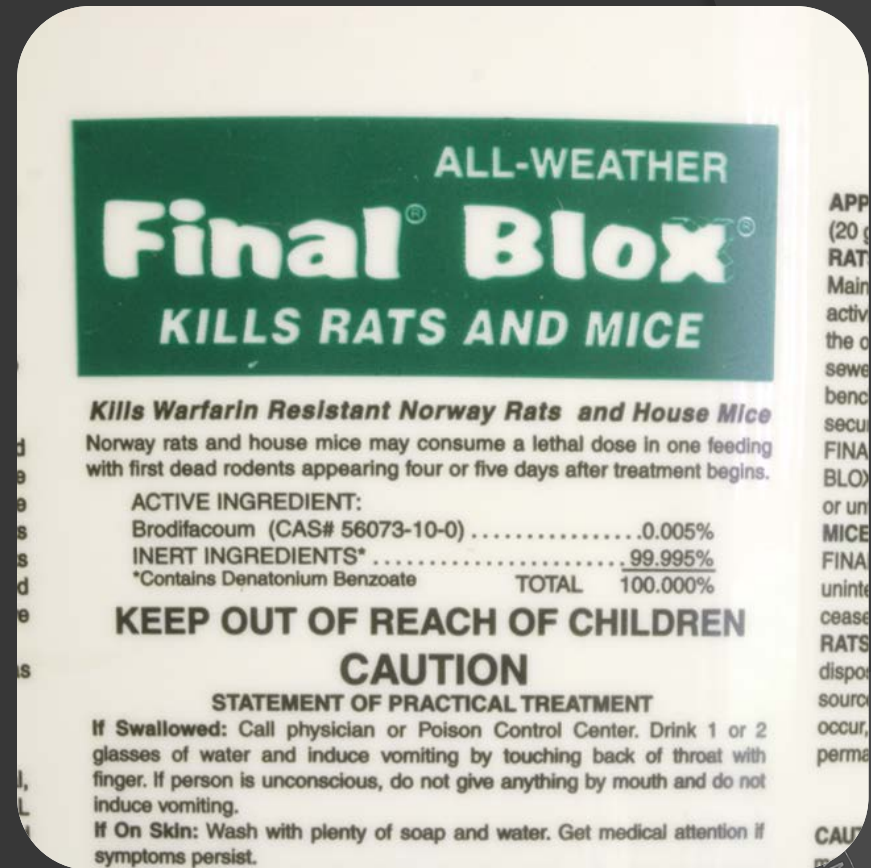
Types of rodenticides

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



Types of rodenticides

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



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



Rodenticide concerns



photo by M. Merchant

- 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



Sample Test Questions

- 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

a) Norway rats have thick tails and thick bodies with small ears



Sample Test Questions

- Rodent diseases of concern do not include which of the following:
 - a) Plague
 - b) Tuberculosis
 - c) Arenavirus
 - d) Hantavirus

b) Tuberculosis is not a rodent-borne disease



Sample Test Questions

- Anticoagulants are rodenticides that:
 - a) Kill as a single-dose toxicant
 - b) Slow blood clotting, causing the animal to bleed to death
 - c) Are highly hazardous to humans

b) Anticoagulants kill by slowing the clotting of blood

