

RODENT REFERENCE

HOMBRE • BOOTHILL • GUNSLINGER
ANIMAL HEALTH RODENT CONTROL



LIPHATECH®

Knowledge is the key.

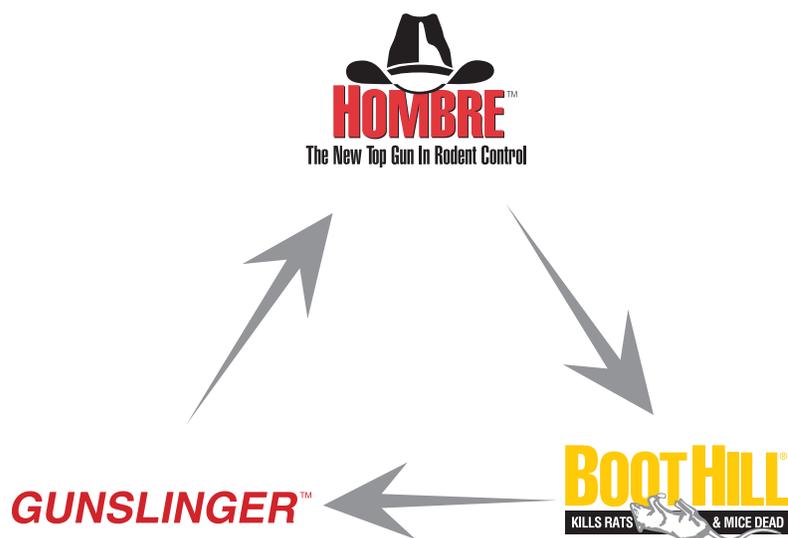
Before you can effectively prevent or control rodent infestations, you must first arm yourself with information. Learning about rodent behavior, control materials and treatment tactics is essential to planning an effective strategy for controlling unwanted rats and mice.

This easy-to-use reference guide compiles in-depth information from numerous experts in the rodent control industry, including scientists, biologists and experienced field technicians. Rodent Reference is designed to help you develop an integrated approach for controlling commensal rodent infestations. This will result in significant reductions in property damage, disease risks and related costs.

Rotate rodenticides for maximum control.

ROTATION

Rodents have no known resistance to any active ingredients in second-generation anticoagulant rodenticides. However, continued use of just one product in areas with ongoing rodent activity could eventually lead to a resistance problem. Mouse populations also often prefer one flavor of rodenticide over another. So it makes sense to use a rodenticide rotation strategy in rodent control programs in poultry and swine facilities.



Determining the extent of your rodent problem and setting up a treatment plan is a complicated matter that can only be described in general

terms here. For a detailed rodent control plan tailored to your needs, consult your Liphatech representative.

EXPERTISE

No rodenticide manufacturer offers as much support as Liphatech.

- A team of experts focused on providing effective rodent control solutions.
- Field representation with extensive, real-world experience in rodent control.
- A history of research and development successes that includes *Hombre*, which contains the newest patented active ingredient – difethialone, available only from Liphatech.
- Personalized technical support, troubleshooting assistance and training.
- Liphatech is the inventor and registrant of three rodenticide active ingredients currently on the market, including chlorophacinone, bromadiolone and difethialone.
- Liphatech is a subsidiary of De Sangosse, France, with worldwide research, development and manufacturing capabilities for agricultural products and rodenticides.

PRODUCTS

Proven performers

All products are authorized by the National Sanitary Foundation (NSF) for use in official establishments operating under major federal inspection programs (e.g., USDA Meat and Poultry). Liphatech rodenticides are packaged in re-sealable plastic pails for maximum product freshness and ease of handling.

Hombre

Begin every rodenticide program with *Hombre*.

- For use in rotational or non-rotational baiting programs.
- *Hombre* technology, the newest single-feed anticoagulant, contains difethialone.
- Great taste – half the active ingredient of competitive baits combined with food-grade grains for maximum rodent acceptance.
- Ounce for ounce, *Hombre* delivers superior rodent control.
- 3/4 oz. or 20 gm (one mini-block) can control 53 mice!
- Convenient, easy-to-use baiting options: 1 lb. block, mini-blocks or pellets (bulk or place packs).
- More placements per container for cost-effective rodent control.



Hombre™ Products



BootHill® Products



Gunslinger™ Products



Aegis® and *Aegis*® RP

BootHill

Trusted and used for more than three decades, BootHill's label flexibility allows you to fight the toughest rats and mice under the meanest conditions.

- Formulated with the original bromadiolone, invented by Liphatech.
- Paraffinized pellets for maximum weatherability (labeled for burrow baiting). Excellent Norway rat control!
- 1 lb. paraffin blocks for the toughest, wettest weather conditions. Easy to place in confinement production sites.
- Convenient baiting options: mini-blocks, 1 lb. blocks or pellets (bulk or place packs).
- Whole food-grade grains for the number-one taste preferred by rats and mice.

Gunslinger

The active ingredient, bromethalin, is an acute rodenticide, not an anticoagulant. *Gunslinger* breaks the anticoagulant baiting cycle.

- Stops resistance by breaking the anticoagulant baiting cycle.
- Stop-feed action kills more rodents with less bait – reduces cost.
- The newest bromethalin brand.
- No known resistance.
- Fast results – rodent death in 1 to 2 days.
- Convenient, easy-to-use baiting options: mini-blocks or pellet place packs.

Aegis and BaitSafe II

Aegis and BaitSafe II Bait Stations are suitable for every application and fit all rodenticide rotation programs. Fast, convenient access to Aegis bait stations allows you to perform quality work in a minimum amount of time.

- Prevents access by non-target pets and people.
- Rat bait stations available with black, white or clear lids.
- Aegis stations offer a clear-lid model for easy viewing of bait and hazards, such as snakes, rodents and spiders.
- Mouse bait stations available in solid black or clear view lid models.
- Versatile modular system accommodates placement of rodenticides, glue boards or rat snap traps.

Aegis RP

The Aegis - RP is the newest addition to the Aegis line.

- The “See the exit before entry” design invites rodents to enter and readily feed.
- The narrow design allows for vertical mounting in tight locations.
- Rounded corners add durability and allow for fast and easy cleanout.



Rodent control for rats and mice.

Liphatech understands the issues facing agriculture today. We constantly strive to develop new technologies and materials to help you fight rodent infestations.

For effective rodent control, the goal is to “work smart” with a comprehensive attack plan that uses the appropriate combination of tools, so you can cost-effectively control rodents with the least amount of risk to the environment.

Elements of a Rodent Control Program include:

- Identifying specific rodents and their populations.
- Inspecting infested buildings and surrounding areas.
- Excluding rodents from buildings.
- Determining sanitation concerns that may be providing rodents with food, water and shelter.

- Recommending control solutions specific to the rodents and their infestation site.
- Implementing control measures tailored to the site.
- Evaluating results and making necessary improvements to the control program.

There is no specific “recipe”. A successful program doesn’t proceed in a prescribed order to the final step. After starting with the logical step of identifying the rodents and the extent of an infestation, the remaining steps will depend on the particular situation. Liphatech’s trained representatives will help you establish a step-by-step rodent control plan.

PROBLEMS

The trouble with commensal rodents.

Commensal is defined as “sharing one’s table.” Commensal rodents, which include Norway rats, roof rats and common house mice, live off humans and animals without returning anything of worth. What they *do* return is the potential for serious problems.

- **Serious illness or death** from rodent-borne diseases.
- **Carry fleas**, ticks and other ectoparasites, which potentially spread other diseases, such as bubonic plague.
- **Consume or contaminate** about 20 percent of the world’s food supply.
- **Rat attacks on animals**, such as newborn pigs and poultry, cause death and mutilation.*
- **Gnaw**, causing expensive structural damage. They also can start fires if they gnaw on electrical wires.
- **Can cause stress** for livestock and anxiety for workers.
- **Pose serious risks for food production facilities.** Rodents can trigger regulatory action, disgruntled employees and lost business.

*Reference: *The Veterinarian’s Guide*, available through Liphatech.

TRAITS

Other Names:

common house mouse and domestic house mouse.

House Mouse

Body. Body is small, pear-shaped and slender; 2 to 3½ inches (5 to 9 cm) long. Average weight is 5/8 to 1 ounce (18 to 28 g).

Teeth. The gnaw pattern of mice is less than 1/16 inch.

Color. Generally grayish-brown on top. The underside is a light cream color.

Tail. The tail is 3 to 4 inches (7 to 10 cm) long, semi-naked and longer than the head and body combined.

Food Preferences and Consumption.

Omnivores. Seeds (preferred food), cereal grains, fruits, vegetables and meats. Mice frequent many feeding sites – often 20 to 30 – during their active period, eating small amounts of food from each site. Daily consumption: 1/10 ounce. Water is not essential to survival if food contains at least 16 percent moisture.

Habits. Excellent climbers. Can be found in cultivated fields, at or below ground level, or in upper stories of skyscrapers. Mice explore their limited home range of less than 30 feet daily for newly introduced objects. Nocturnal. Most activity and feeding takes place between a half hour after sunset and a half hour before sunrise. Strong social hierarchy. Able to swim.

MOUSE FACTS

Mice can survive an 8-foot fall onto a hard surface.

A mouse travels 12 feet per second.

Ears. Relatively large ears for its size. They hear very well in both sonic and ultrasonic ranges.

Eyes. Eyes are small and somewhat protruding. Mice are color-blind and can only recognize objects up to 10 feet away.



Geographic Range

Throughout the United States and south of the boreal forest in Canada.

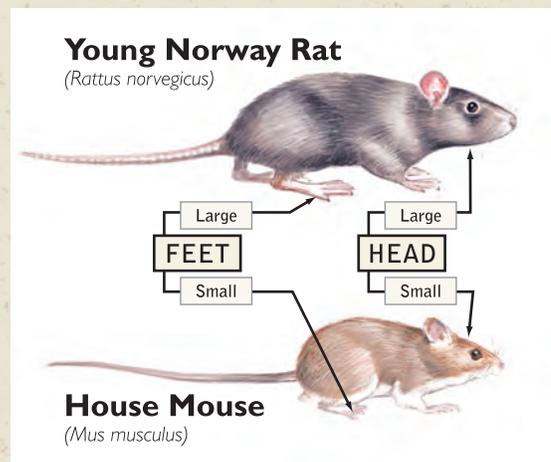
Whiskers. Whiskers on the face and guard hairs on the sides and back help an animal with poor eyesight stay safely against walls, under objects, and in burrows. Whiskers are also used to detect motion and test surfaces, e.g., glue traps, before stepping on them.

Droppings. Droppings have pointed ends and are about 1/4 inch (.64 cm) or less in length. Fresh droppings are soft and dark in color. A house mouse averages 50 droppings per day.



(approximate size)

COMPARISON



Anticoagulants. The preferred rodenticide type among rodent control professionals, anticoagulants inhibit the blood-clotting mechanism, causing rodents to die from internal bleeding. Some of these rodenticides are single-feed and effective within several days. The delayed effects of anticoagulants help reduce bait shyness.

With older, multiple-feed anticoagulants (chlorophacinone, diphacinone and warfarin), rodents must feed more than once before ingesting a lethal dose. Modern, single-feed anticoagulants, such as *Hombre*™ and *BootHill*® (difethialone and bromadiolone) provide a lethal dose in a single day's feeding.

The antidote to human or non-target animal poisoning is Vitamin K₁.

Rodenticide Formulations

Rodenticides are available in several formulations to meet the different needs of various applications.

- Mini-blocks contain food grade ingredients with a multi-edge design for abundant gnawing surfaces, and a center hole for securing to structures or bait rods in bait stations.

- Paraffin bars resist moisture, making them ideal for moist environments. *BootHill* paraffin bars are labeled for sewer applications.
- Paraffin pellets resist moisture and molding for longer-lasting palatability. In bulk, paraffin pellets are an excellent choice for Norway rat burrow baiting.
- Paraffin pellet place packs provide moisture protection. Poly lining preserves bait freshness while allowing rodents to smell the product. The place packs also eliminate premature product exposure and provide important label information.

Rodenticide Rotation Strategy

Rotating different rodenticides can give you the most effective ongoing rodent control. See the inside back cover for details.



APPLICATION TIPS

Rodenticide Application Tips

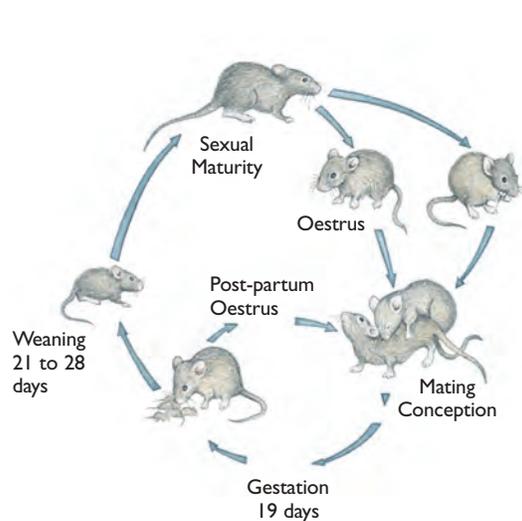
- Neophobia – the fear of new objects – makes roof rats and Norway rats extremely nervous about changes in their territory. It takes several days for rats to accept a new object in their environment, including bait stations.
- Place rodenticides in areas inaccessible to children and non-target animals, preferably in properly installed, tamper-resistant bait stations, such as *Aegis*® bait stations. Bait stations not only provide added security for children and non-target animals, but also protect bait from the elements and provide a comfortable place for rodents to feed and groom.
- Use the proper rodenticide, *Hombre*, *BootHill* or *Gunslinger*™, for the target rodent and the best formulation for the environment. *BootHill* paraffinized pellets work well for burrow treatment. In fact, *BootHill* is the only pelleted rodenticide on the market that is paraffinized to withstand the moist environment in some burrows.
- Using information obtained during the inspection process, place baits in rodent runways as close to their nest as possible.
- Use a sufficient amount of product to assure an uninterrupted supply of bait between service visits.
- In areas of identified mouse activity, rodenticide bait placements should be no further than 8 to 12 feet apart due to their limited home range. Place control material as close to the nest as possible, and between the nest and food source.
- In areas of identified rat activity, rodenticides should be placed every 15 to 30 feet. Concentrate placements in runways and near burrows or gnawed openings.
- Keep a detailed record of bait station placements, rodenticide formulations, amounts used and service dates.
- Pre-baiting is the process of placing non-toxic bait prior to toxic bait in order to increase product acceptance. This practice generally is used for acute baits (e.g., zinc phosphide) with low palatability. Pre-baiting is usually unnecessary with highly palatable *Hombre* or *BootHill* anticoagulant baits.

Reproduction

Mice and rats reproduce rapidly, as is generally the case with small prey animals. Their relatively short life spans, short gestational periods and rapid sexual maturity make effective rodent control critical. The reproductive cycle and number of rodent offspring increases with adequate food, water and harborage.

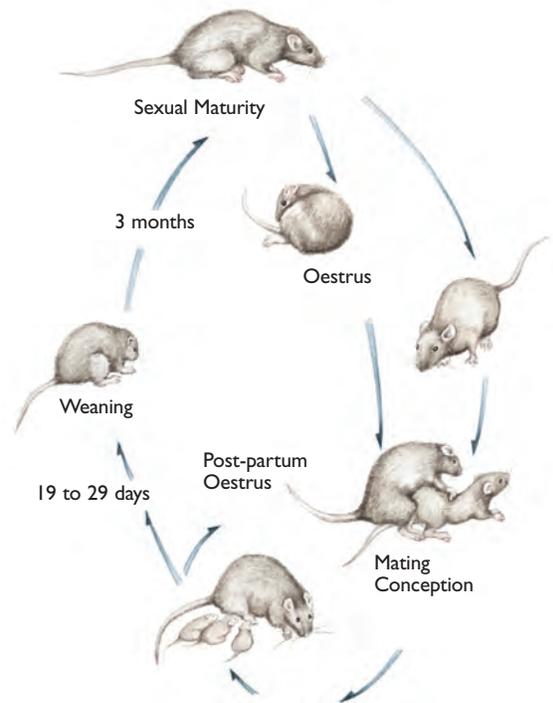
House Mouse Reproduction Cycle

- Mice become sexually mature and able to mate in as little as 5 weeks. Generally, sexual maturity is reached in 5 to 8 weeks.
- Female mice reproduce up to 8 times in their lifespan, with litters averaging 4 to 7 pups. Therefore, a single female may produce up to 56 offspring annually.



Rat Reproduction Cycle

- Norway and roof rats become sexually mature and able to mate at 8 to 12 weeks of age.
- Norway rats average 8 to 12 pups per litter, averaging 4 to 7 litters per year.
- Roof rats average 4 to 8 pups per litter, averaging 4 to 6 litters per year.



RELATED TRAITS

Related Reproductive Characteristics

House mice, Norway rats and roof rats share several reproductive characteristics:

- After giving birth, they can be in heat and become pregnant again in as little as 24 to 48 hours.
- Females can be pregnant and still lactate to feed their current litter of pups. However, the gestational period may be slightly longer in this case.
- They will reproduce year-round in stable environments with adequate food, water and harborage. Less favorable conditions limit reproduction to spring and autumn.
- The normal life expectancy of house mice, Norway rats and roof rats is approximately one year.



The inspection process.

Rodents behave predictably. A rodent control expert is a detective searching for clues that point to an infestation. This knowledge is then used to choose appropriate rodent control tools and techniques, and when to use them.

The Inspection Process

- Interview workers for information about rodent sightings and other evidence of infestation.
 - Perform a thorough inspection, beginning with the exterior premises, if appropriate.
 - Think three-dimensionally, looking both high and low. Rodents have been known to climb 30 feet to gain access to a structure.
 - Identify interior and exterior problem areas including: runways, nests, feeding sites, water supplies, vents and other openings, burrows, harborages, pipe outlets and inlets, and holes or cracks in the structure.
 - Check all dark areas with a flashlight.
- to check droppings – fresh droppings are soft and shiny, while older droppings are gray, crusted and easy to break.
 - **Odor** – A distinctive, musky odor may be present.
 - **Gnaw Marks** – Fresh gnaw marks are light and will darken over time. Scratch-like marks, approximately 1/16-inch, are made by mice. Clear 1/8-inch gnaw marks are made by rats.
 - **Rub Marks** – Rodents leave rub marks from body oil, grease and dirt along their runways. New rub marks will smear. Old rub marks are darker and may flake off.
 - **Tracks** – Footprints and tail drags may be seen in dusty locations. To view difficult-to-see tracks, shine a strong flashlight at a low angle across the dust. A non-toxic tracking powder, such as a mason's line chalk, placed on a suspected rodent trail, and re-inspected the following day, also may assist in identifying tracks.
 - **Upset Pets** – Pets, such as cats and dogs, may become agitated when they sense rodents in the area.

Physical Signs of Infestation

Look for these common signs of rodent infestation:

- **Runways** – Paths will form between feeding and harborage areas. Rodents memorize their territory through kinesthetic (muscle) memory and use the same paths again and again. They prefer to move along objects. Identifying rodent movement patterns helps to effectively place traps and bait stations.
- **Droppings** – Droppings and urine are left wherever rodents travel or rest, especially in corners. Identify the rodent type by the size and shape of droppings. Use a palette knife



Eliminate conducive conditions.

Prevent infestations by changing the physical conditions of the building through exclusion and sanitation.



Exclusion

The best way to keep buildings rodent free is to prevent rats and mice from getting inside. Rodents fit through tiny openings and can gnaw through wood, lead, aluminum, copper, cinder block and uncured concrete. Mice can squeeze through gaps larger than 5/16 inch, and rats can squeeze through gaps larger than 1/2 inch. They will enlarge openings that are too small by gnawing it big enough for their body to fit through. The following measures, with the proper materials, will make buildings less accessible to rodents:

- Patch openings in walls larger than 1/4 inch using gnaw-proof materials, such as steel sheeting, 1/4 inch hardware cloth, galvanized steel and concrete. Holes may be plugged with steel wool or copper mesh prior to patching.
- Seal gaps under siding at the top of the foundation.
- Seal openings around pipes and conduits where they pass through exterior walls.
- Close outside doors tightly when not in use.
- Install tight-fitting weather stripping on the bottom of all walkways and doors.
- Cover all air vents with 1/4-inch hardware cloth.

Sanitation

Eliminating places that may provide rodents with shelter, water and food is the purpose of sanitation.

- Eliminate debris in and around buildings and grounds.
- Trim weeds and brush and keep grass short (3 inches or less) to minimize cover and food sources around the building perimeter.
- Clean up food waste and spillage daily.
- Store food 12 to 15 inches off the floor and 12 to 18 inches away from the wall for easy inspection and sanitation. Use rodent-proof containers when possible.
- Allow 24-inch aisles between stored materials and walls for improved sanitation and inspection.
- Clean up spilled grain and feed.
- Eliminate water sources available to rodents.
- Clean up windfall fruits, nuts and bird feeder spillage daily.

TOOLS

Inspection Tools

- **Flashlight** (with a strong beam) to find rodents and their signs in dark areas.
- **Black light** to identify rodent urine.
- **Knife, palette knife or spatula** to test age of droppings and to scrape droppings out from under objects for identification.
- **Specimen container** to collect unknown specimens.
- **Protective gloves** to protect yourself from diseases carried by rodents.
- **Knee pads** to protect your knees from sharp objects on floors and in crawl spaces.
- **Clipboard, graph paper and pencil** to diagram building and take extensive notes.
- **Inspection checklist** to act as a reminder to inspect critical areas. Contact your Liphatech rep for a sample checklist.
- **Binoculars** to make it easier to see what you can't get close to.
- **Respirator** with HEPA filter to prevent inhaling dust, which may be contaminated with disease organisms.
- **Hand sanitizer** (over 60% alcohol) to kill bacteria when soap and water are not available.

Trapping

In sensitive areas where rodenticide use is not permitted, traps are especially useful. Traps also prevent rodent deaths in inaccessible areas. After rodents and their patterns have been identified, follow the appropriate trapping methods.

Trapping Tips

- Store snap traps away from insecticides and chemicals that may impart a flavor. Remember, rodents have a keen sense of taste.
- Bait snap traps with food that is more attractive than other readily available feed sources. Secure bait to the snap trap trigger – a length of thread works well. For rats, fish (tuna) and meat (cat/dog food) may be used to bait traps. Glue boards can be baited, if necessary, with non-oily foods. The use of oily foods will cause the glue to lose its stickiness.
- Bait some mouse snap traps with nesting materials, such as cotton or dental floss, with a drop of vanilla. Mice constantly look for nesting material.
- Place mechanical or snap traps and glue boards in areas unsuitable for rodenticide applications.
- Position snap traps and glue boards to intercept rodents in runways. Place snap traps with the trigger toward the runway – generally along a wall, in corners, behind and under objects and near abundant tracks and droppings. Snap traps also may be attached to pipes and beams used as runways.
- More traps are better than fewer traps.
- Pre-bait traps until rodents, especially rats, overcome their fear and take bait readily. This may take several days for mature rats.
- Glue boards shouldn't be used in areas with excessive dust or wetness – both elements make glue boards ineffective.
- Check glue boards frequently to prevent rodents from escaping.
- For mice, repeating or automatic mechanical traps may be used. Watch for tracks in the dust on the top of low-profile traps, which indicate mice are running over the top of them.

Rodenticide application

When the situation permits, rodenticides usually provide the most cost-effective approach to rodent control. Select a rodenticide with an active ingredient and formulation that works well for the particular environment. Correct bait placement is key to an effective program. Proper placement insures rapid rodent control and protects non-targets from bait contact.



Rodenticide Types

Non-anticoagulants. Bromethalin and zinc phosphide based products are examples of acute baits which have no antidote. Palatability is generally lower than anticoagulant-based products.

Non-anticoagulants are considered single-feed baits because rodents typically stop feeding after one meal. If a lethal dose is ingested, rodents usually die within 24 hours. If a sub-lethal dose is eaten, rodents tend to develop bait shyness.

TRAITS

Roof Rat

Other Names:

Alexandrian rat,
black rat, fruit
rat and ship rat.

Body. Body is slender, 6½ to 8 inches (17 to 20 cm) long. Average weight is 6 to 12 ounces (170 to 340 g).

Teeth. The gnaw pattern of rats is 1/8 inch. Rats are able to gnaw through wood, lead, aluminum, copper, cinder block and uncured concrete.

Whiskers. Whiskers on the face and guard hairs on the sides and back help an animal with poor eyesight stay safely against walls, under objects, and in burrows. Whiskers are also used to detect motion and test surfaces, e.g., glue traps, before stepping on them.

Food Preferences and Consumption. Omnivores. Seeds, fruits, vegetables, eggs and grain. Rats visit fewer food sites than mice, but eat more at each site. Consumes 1/2 to 1 ounce of food daily. Drinks up to 1 ounce of water daily.

Geographic Range

Roof rats are best suited to warm climates but are often associated with marine ports. In the United States, they are found along the Pacific Coast, the lower half of the Atlantic Coast, throughout the Gulf States, along major river systems (i.e. Mississippi River) and in Hawaii. In Canada, they are found along the Pacific Coast, the southern Atlantic Coast, and occasionally in extreme southern Ontario.

Habits. Able to swing, jump and climb, roof rats usually enter and nest in upper portions of buildings. May nest outside in trees (especially palm), ivy and similar vegetation. Burrow very little. Nocturnal. Most activity and feeding takes place between a half hour after sunset and a half hour before sunrise. Strong social hierarchy.

Ears. Ears are large and cover the eyes if bent forward.

Eyes. Eyes are large and prominent. Because rats are colorblind and have poor eyesight, they primarily see light, shadow and movement.



Tail. Hairless and longer than the head and body – 7½ to 10 inches (19 to 25 cm) long. Uniform color from top to underside.

Nose. Nose and muzzle are pointed. Roof rats have an acute sense of smell.

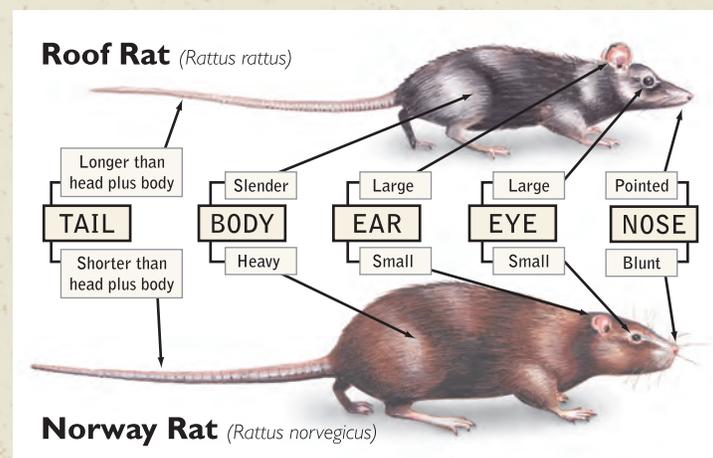
Color. Varies from black to brownish-gray. The underside varies from gray to white.

Droppings. Droppings have pointed ends and are about 1/2 inch (1 cm) or less in length. Fresh droppings are soft and dark in color. A roof rat averages 30 to 180 droppings per day.



(approximate size)

COMPARISON



TRAITS

Other Names:

brown rat, gray rat, common rat, house rat, wharf rat, sewer rat, barn rat and water rat.

Norway Rat

Ears. Ears are close to the body and won't cover the eyes if bent forward.

Eyes. Eyes are small. Rats are color-blind and have poor eyesight; primarily seeing light, shadow and movement.

Body. Body is heavy and thick, 7 to 10 inches (18 to 25 cm) long. Average weight is 10 to 17 ounces (284 to 482 g).

Teeth. The gnaw pattern of rats is 1/8 inch. Rats are able to gnaw through wood, lead, aluminum, copper, cinder block and uncured concrete.

Whiskers. Whiskers on the face and guard hairs on the sides and back help an animal with poor eyesight stay safely against walls, under objects, and in burrows. Whiskers are also used to detect motion and test surfaces, e.g., glue traps, before stepping on them.

Food Preferences and Consumption.

Omnivores. Meats, fish, flour, cereal grains, fruits and vegetables. Eats almost any human food. Rats visit fewer food sites than mice, but eat more at each site. Consumes 3/4 to 1 ounce of food each day. Requires water daily to survive – drinks 1/2 to 1 ounce of water daily.



Tail. Tail is shorter than head and body – 6 to 8½ inches (15 to 22 cm) long. Tail is dark on top with a lighter underside.

Color. Usually grayish-brown, but color may vary from a pure gray to a blackish- or reddish-brown. The underside is gray to yellow-white. Norway rats are often completely black.

Nose. Nose and muzzle are blunt. Norway rats have an acute sense of smell.

Droppings. Droppings have blunt ends and are about 3/4 inch (2 cm) or less in length. Fresh droppings are soft and dark in color. A Norway rat averages 30 to 180 droppings per day.



(approximate size)

Geographic Range

Due to their excellent adaptability, Norway rats are found throughout the United States and most of the urban and agricultural areas in Canada.

RAT FACTS

Rats explore their territory of 100 to 300 feet daily.

Rats can survive a fall from up to 25 feet onto a hard surface.

Rats can swim up to a mile.

Habits. Norway rats burrow extensively in soil and are excellent swimmers and good climbers. They often nest in basements and lower portions of buildings. Nocturnal. Most activity and feeding takes place between a half hour after sunset and a half hour before sunrise. Very strong social hierarchy – the biggest and strongest Norway rats get the best food and harborage.

LIPHA/TECH[®]

ADVANCED RODENT CONTROL TECHNOLOGY

For more information, call (888) 331-7900 or visit our Web site at www.rodent-control.com.