

## Controlling House Mice

The house mouse (*Mus musculus*) is considered one of the most troublesome and economically important rodents in the United States. House mice thrive under a variety of conditions. They are found in and around homes and farms as well as in open fields and agricultural lands. House mice consume and contaminate food meant for humans, livestock, or other animals. They cause damage to structures and property, and they transmit diseases such as salmonellosis and swine dysentery.

### Recognizing Mouse Infestations

Droppings, fresh gnaw marks, and tracks indicate areas where mice are active. Mouse nests, made from fine shredded paper or other fibrous material, are often found in sheltered locations. House mice have a characteristic musky odor that identifies their presence. Mice are active mostly at night, but can be seen occasionally during daylight hours.

### House Mouse Facts

House mice are small rodents with relatively large ears and small black eyes. They weigh about 1/2 ounce and are usually light gray in color. An adult is about 5 1/2 to 7 1/2 inches long, including the 3-to 4-inch tail. Although house mice usually feed on cereal grains, they will eat almost anything. They are sporadic feeders, nibbling bits of food here and there. Mice have keen senses of hearing, smell, taste, and touch. They are excellent climbers and can run up any rough vertical surface. They will run horizontally along wire cables or ropes and can jump up 12 inches from the floor onto a flat surface. Mice can squeeze through openings slightly larger than 1/4 inch in diameter. In a single year, a female may have five to ten litters of usually five or six young each. Young are born 19 to 21 days after mating, and they reach reproductive maturity in six to

10 weeks. The life span of a mouse is usually 9 to 12 months.

### House Mouse Control

Effective control involves three aspects: sanitation, mouse-proof construction, and population reduction. The first two are preventive measures. When a mouse infestation already exists, some form of population reduction is almost always necessary. Reduction techniques include trapping, poisoning, and fumigation. A flow chart outlining steps in house mouse control is found in *Figure 2*.

**Sanitation.** Proper sanitation is an important step in controlling house mouse populations. In particular, eliminate places where mice can find shelter. They cannot survive in large numbers if they have few places to rest, hide, or build nests and raise their young. Total elimination of mice through sanitation, however, is almost impossible. Mice can survive in small areas with limited amounts of food and shelter. Most buildings where food is handled or stored will have problems with house mice, no matter how clean they are if they have not been “mouse-proofed.”

**Rodent-proof Construction.** Mouse-proof construction is the most successful and permanent form of house mouse control. “Build them out” by eliminating all openings larger than 1/4 inch through which they can enter a structure. Steel wool makes a good temporary plug. Seal cracks in building foundations and openings for water pipes, vents, and utilities with metal or concrete. Doors, windows, and screens should fit tightly. Cover the edges of doors and windows with metal to prevent gnawing. Latex, plastic, rubber, wood, or other gnawable materials are unsuitable for plugging holes used by mice.

**Traps.** Trapping is an effective control method for controlling house mice. Although time-consuming, it is the preferred method in homes, garages,



and other structures, where only a few mice are present. Trapping has several advantages: 1) it does not rely on inherently hazardous rodenticides; 2) it permits the user to view his or her success; and 3) it allows for disposal of trapped mice, thereby eliminating dead mouse odors which may occur when poisoning is done within buildings.

Simple, inexpensive wood-based snap traps are effective and can be purchased in most hardware and grocery stores. Traps can be baited with a variety of foods—peanut butter is the most popular because it is easy to use and very attractive to mice. Set the triggers lightly so the traps will spring easily. Leave traps unset until the bait has been taken at least once to reduce the chance of mice becoming trap-shy.

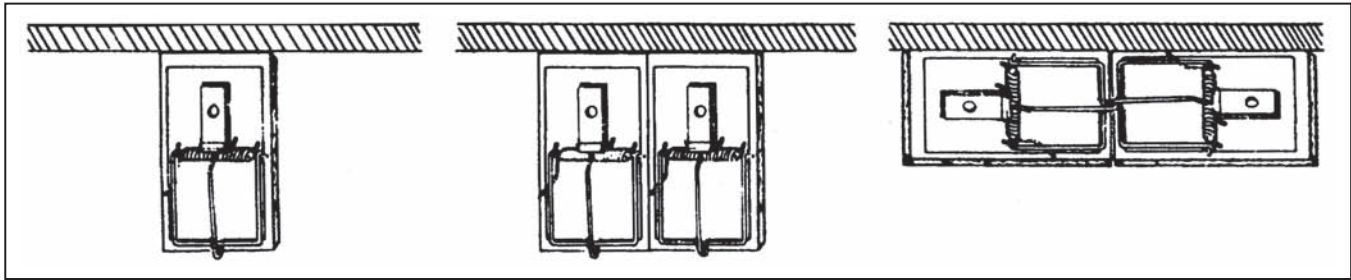
Multiple-capture live traps for mice, such as the Victor Tin Cat® and the Ketch-All®, are also available in many hardware and feed stores. They can catch several mice at a time without being reset, and therefore reduce labor requirements.

Set traps behind objects, in dark corners, and in places where evidence of mouse activity is seen. Place them close to walls so that mice will pass directly over the trigger (*Figure 1*). Traps can be set on ledges, on top of pallets of stored materials, or any other locations where mice are active.

Use enough traps to make the effort short and decisive. Mice seldom venture far from their shelter and food supply, so space traps no more than about 10 feet apart in areas where mice are active.

An alternative to traps are glue boards, which catch and hold mice that

Figure 1. Placement of snap traps.



are attempting to cross them, in much the same way flypaper catches flies. Place glue boards along walls where mice travel. Do not use them where children, livestock, pets, or desirable wildlife can contact them. Glue boards lose their effectiveness in dusty areas unless covered. Extreme temperatures may also affect the tackiness of glue boards.

**Rodenticides.** Single-dose and multiple-dose rodenticides (toxic baits) and fumigants are registered for house mouse control. A wide variety of active ingredients and formulations are available. We recommend that you use commercially-prepared materials, because they do not require that applicators handle concentrated materials that are more hazardous.

**Single-Dose Rodenticides.** Single-dose rodenticides are more hazardous than the multiple-dose (anticoagulant) rodenticides. Therefore, single dose toxicants should be used by professional pest control operators or other persons familiar with their use. Single-dose rodenticides (Table 1) will give a quick knockdown of a mouse population. They may be preferred where mice are abundant or where it is difficult to get mice to accept a bait for several days in succession because of competing food items.

Bait acceptance can be increased by “prebaiting” with unpoisoned bait for several days before the rodenticide is offered. If acceptance of prebait is poor, do not apply toxic bait, but change bait material or its placement.

“Bait shyness” can occur with some single-dose rodenticides such as zinc phosphide, so it is best to use them only once per year at any location. Remove and destroy all uneaten bait at the end of a poisoning program. Never leave single-dose baits exposed for more than three to four days.

**Multiple-Dose (Anticoagulant) Rodenticides.** Multiple-dose rodenticides (Table 2) are generally considered much safer than single-dose rodenticides. Anticoagulants cause death as a result of internal bleeding, which occurs as the animal’s blood loses the ability to clot and capillaries are damaged. The active ingredients are used at very low levels, so bait shyness does not occur when using properly formulated baits.

Figure 2. Chart of steps in house mouse control. Additional factors, such as the cost of particular control methods, must be considered when planning a control program.

Can mice's food source be removed or limited? <b>Yes</b> – Remove or limit food source.	<b>No</b>	Are the mice within a building or structure that can be safely fumigated? <b>Yes</b> – Contact a pest control agent.	<b>No</b>
Can mice's shelter be removed or limited? <b>Yes</b> – Remove or limit shelter.	<b>No</b>	Can a single-dose poison be used safely? <b>Yes</b> – Use a single-dose poison.**	<b>No</b>
Are mice numerous? <b>Yes</b>	<b>No*</b>	After using a single-dose poison, do some mice remain? <b>Yes</b>	<b>No</b>
Is a quick reduction in mice numbers needed? <b>Yes</b>	<b>No*</b>	Can an anticoagulant be used safely? <b>Yes</b> – Use anticoagulant rodenticide.	<b>No*</b>
Will the presence of dead mice cause an odor or sanitation problem? <b>Yes*</b>	<b>No</b>	After using an anticoagulant, do some mice remain? <b>Yes*</b>	<b>No</b>

continued in next column

\* Use traps: snap traps; multiple-capture traps; or glue boards if not apt to entrap children, pets or wildlife.

\*\*Assistance from a pest control agent may be required.

Mice must feed on most anticoagulant baits for several days before death will occur. Fresh bait must be made available to mice continuously for at least two weeks, or as long as feeding occurs. There are exceptions, however, such as brodifacoum and bromadiolone, that are capable of causing death after a single feeding, but the mice do not die for several days. Vitamin K is an antidote for several anticoagulant rodenticides.

**Bait Selection and Placement.**

Several types of anticoagulant baits are available. Grain baits or pelleted forms are often purchased in bulk or packaged in small plastic, cellophane, or paper packets. These “place packs” keep baits fresh and make it easy to place baits into burrows, walls, or other locations. Mice will readily gnaw into place packs and feed on baits.

Anticoagulant baits formed into paraffin blocks are useful in damp locations, such as sewers or gutters, where loose grain baits spoil quickly. Unfortunately, they are not accepted by mice as readily as other baits. A particularly good bait for house mice is whole canary grass (*Phalaris canariensis*) seed.

Anticoagulant baits are also available as sodium salts that are mixed into a water solution. Although mice require little free water to survive, water baits can be effective where moisture is scarce and mice are feeding on dry grain or livestock feed. Consider using water baits as a supplement to other control measures.

Proper placement of baits is very important for house mouse control. Place baits no more than 10 feet apart in areas where mouse activity is evi-

dent. If mice are living in wall spaces, place baits inside of the walls.

We highly recommend the use of bait stations when applying any toxic bait. They protect rodenticides from weather and provide a safeguard to people, pets, and other animals. Bait stations should have at least two openings about 1 inch in diameter and should be large enough to accommodate several mice at one time. Place bait boxes next to walls (with the openings close to the wall) or in other places where mice are active. Clearly label all bait boxes “Caution-Mouse Bait” as a safety precaution.

Establish bait stations in and around the perimeters of buildings where it is impossible to exclude rodents. Place fresh anticoagulant bait in these stations to control invading mice before breeding populations become established.

Table 1. Single-dose rodenticides and the percent of active ingredient commonly used for house mouse control.

Common name	Chemical name	Percent active ingredient used in food bait
Bromethalin (Assault®, Trounce®)	<i>N</i> -methyl-2,4-dinitro- <i>N</i> -(2,4,6-tribromophenyl)-6-trifluoromethylbenzenamine	0.005 - 0.01
Cholecalciferol, Vitamin D <sub>3</sub> (Quintox®, Rampage®)	9,10-Seocholesta-5,7,10(19)-trein-3-betaol	0.075
Zinc phosphide (ZP®)	zinc phosphide	1.0 - 2.0

Table 2. Multiple-dose (anticoagulant) rodenticides and the percent active ingredient usually found in food baits for house mouse control.

Common name	Chemical name	Percent active ingredient used in food bait
Brodifacoum (Havoc®, Talon-G®)	3-{3-[4'-bromo(1,1'-biphenyl)4-yl]1,2,3,4-tetrahydro-1-naphthalenyl}-4-hydroxy-2H-1-benzopyran-2-one	0.005
Bromadiolone (Maki®, Contrac®)	3-(3-[4'-bromo(1,1'-biphenyl)4-yl]-3-hydroxyxy-1-phenylpropyl)-4-hydroxy-2H-1-benzopyran-2-one	0.005
Chlorophacinone (RoZol®, AC90™)	2-{(p-chlorophenyl)phenylacetyl}-1,3-indandione	0.005
Diphacinone (Ramik®, Bait Blocks®)	2-diphenylacetyl-1,3-indandione	0.005
Pivalyl, Pindone (Pival®, Pivalyn®)	2-pivalyl-1,3-indandione	0.025
Warfarin (d-Con®)	3-(α-acetonylbenzyl)-4-hydroxycoumarin	0.025
Warfarin + sulfaquinoxaline (Proline®)	3-(α-acetonylbenzyl)-4-hydroxycoumarin + quinoxaliny sulfanilamide	0.025

**Fumigants.** Fumigants (poisonous gases) are occasionally used to treat structures, railway cars, or other enclosed areas. Aluminum phosphide is the most commonly used fumigant registered for house mouse control. Fumigation with other products for insect control often leads to the incidental kill of house mice. Where practical, fumigation is a very quick way to achieve 100 percent rodent control. If a building has to be completely tarped to contain the fumigant, however, the operation is expensive. **Caution** — fumigants are highly toxic to humans and other animals, and must not be used where occupants of a building could be exposed to the gases. Only licensed structural pest control operators should use fumigants in any buildings or enclosed structures.

**Safety Precautions.** Carefully follow all product label recommendations. In addition, certain general safety precautions should be followed. Consider all rodenticides dangerous enough to cause death, and place baits where only rodents can access them.

All rodenticides present some degree of hazard to humans, livestock, pets, and other nontarget animals.

Use prepared or ready-to-use baits, to reduce the risks involved in handling concentrated toxicants. Label all bait containers and bait stations clearly with appropriate warnings. Store unused bait, concentrates, and fumigants in a locked cabinet out of the reach of children or animals.

Pick up all accessible dead mice after a poisoning program. Use rubber gloves or tongs and dispose of them by burial or incineration. If only a few mice are present, place them in a plastic bag, close it tightly, and dispose of it with your household garbage.

**Electronic Devices.** Although mice are easily frightened by strange or unfamiliar noises, they quickly become accustomed to regularly repeated sounds. Ultrasonic sounds, those above the range of human hearing, have very limited use in rodent control because they are directional and do not penetrate behind objects. They also quickly lose their intensity with distance. There

is little evidence that electronic, sound, magnetic, or vibrational devices of any kind will drive established mice or rats from buildings or provide adequate control.

**Predators.** Although cats, dogs, and other predators may kill mice, they do not provide effective mouse control in most circumstances. Mice often live in very close association with dogs and cats. Mouse problems around homes are often related to the food, water, and shelter provided for the pet. To simplify information, trade names of some products have been used in the text and following tables. No endorsement of named products is intended, nor is criticism implied of similar products that are not mentioned.

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