

# MAINTENANCE GUIDEBOOK VII TERMITE, INSECT, AND RODENT CONTROL

## CHAPTER SEVENTEEN - HOUSE MICE

### SECTION A INTRODUCTION

The house mouse (*Mus musculus*) easily adapts to living near people. It thrives in a wide range of climatic conditions in a great variety of habitats, feeding on most human food, and reproducing at a remarkable rate. House mice live throughout the United States, and are found in most areas of human habitation. They are a common problem in residences and structures. Not only do house mice destroy food and cause damage to structures and personal possessions, they also have the potential to transmit diseases and parasites to people and domestic animals.

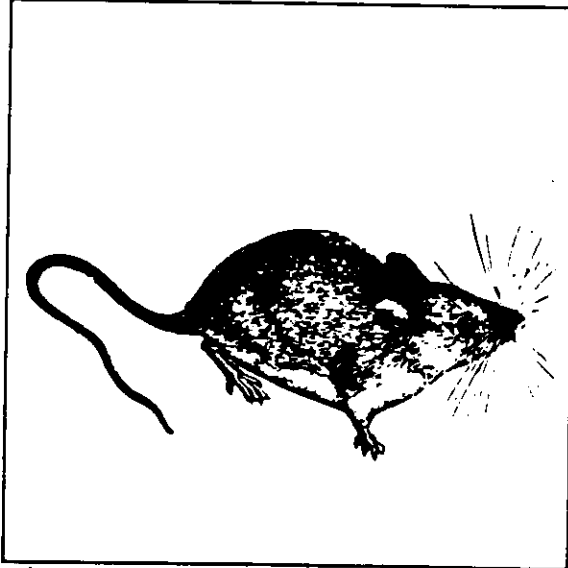


Figure 17-1

House mice are also found living in the wild. They are common inhabitants of grassy fields and cultivated grain crops. They have also been captured in open tundra in Alaska, miles away from human settlements.

Control of house mice requires understanding mouse biology and habits, and particularly the major differences between mice and rats. During the past few decades, control of Norway and roof rats has improved, while problems with house mice have increased. Baiting programs often are more successful in controlling rats than mice.

### SECTION B CHARACTERISTICS AND RECOGNITION

#### 1. APPEARANCE

The house mouse is a delicate, agile little rodent. Although adult weights vary by region and may be linked to the suitability of habitat, they usually range from half to one ounce. The color of adult house mice ranges from light brown to dark gray, but most often is a dusky gray or medium brown over most of their bodies, except the belly, which may be a lighter shade of their general color, but never white.

The mouse has moderately large ears for its body size. The tail is nearly hairless and about as long

as the body and head combined (2-1/2 to 4 inches). The feet are small in proportion to its body, and the eyes are also relatively small.

Our native deer (white-footed) mice (*Peromyscus* sp.), which often invade buildings adjacent to fields and woodlands, are about the same size as or slightly larger than house mice. Deer mice have a distinct, bicolored tail; the upper portion is brown or gray and the underside is distinctly white, with a well-defined line where the two colors meet.

Meadow mice or voles (*Microtus* sp.) sometimes invade homes; they are less agile, have larger, chunky bodies and weigh at least twice as much as house mice. They also have much shorter tails and small ears and eyes.

## **2. HABITS OF HOUSE MICE**

### **a. Life Cycle**

Under optimum conditions, house mice breed year round. Out-of-doors, house mice may tend toward seasonal breeding, peaking in the spring and fall. Environmental conditions, such as the availability and quality of food, can influence the frequency of pregnancy, litter size, and survival. Under ideal conditions, females may produce as many as ten litters of five young in a year. At very high densities, however, reproduction may nearly cease, despite the presence of excess food and cover.

New-born mice are quite undeveloped, weighing between 0.02 and 0.03 ounce, and are nearly hairless. Their eyes and ears are closed, but within two weeks the body is covered with hair and the eyes and ears are open. At about three weeks, the young begin short trips away from the nest and begin taking solid food.

### **b. Social Behavior**

While mice are active primarily at night, some day-time activity occurs. Movements of house mice are largely determined by temperature, food, and hiding places. Home ranges of mice tend to be smallest where living conditions are good. Mice tend to travel over their entire territory daily, investigating each change or new object that may be placed there. They are very aggressive. Unlike rats, they show no fear of new objects. They dart from place to place, covering the same route over and over again. This behavior can be used to advantage in control programs. Disturbing the environment at the beginning of a control program by moving boxes, shelves, pallets, and other objects can improve the effectiveness of traps, glue boards, and bait. Mice will

investigate the changed territory thoroughly.

#### **c. Senses of Mice**

Like rats, mice have relatively poor vision, and are also color blind. They rely heavily on smell, taste, touch, and hearing. Mice use their keen sense of smell to locate food and to recognize other individuals, especially those of the opposite sex. Taste perception in mice is also good. Mice use their acute hearing to detect and escape danger.

An important sensory factor for mice is touch. Like rats, mice use long, sensitive whiskers near the nose and guard hairs on the body as tactile sensors to enable them to travel in the dark, pressing against walls and boxes, scurrying through burrows.

Mice also have an excellent sense of balance. A mouse's ability to carry out actions or movements quickly is increased by constant practice of sequences of muscular movements (sometimes referred to as the kinesthetic sense): a subconscious recording of the series of movements necessary to go from point A to point B. This is the result of stimulation of sensory nerve endings in muscles, tendons, and joints, and allows mice to quickly escape danger.

#### **d. Curiosity**

As mentioned above, mice do not fear new objects as do rats, and they quickly detect and investigate new objects in their territories. They will immediately enter bait stations and sample a new food (although they may only nibble on a small amount). They will also investigate traps and glue boards. Control programs against mice often have early success, just the opposite of rat programs.

#### **e. Physical Attributes**

It is difficult to mouse-proof a building or control mice without understanding their physical capabilities:

- For their size they are excellent jumpers. Some of the more agile individuals jump twelve inches high from the floor onto an elevated flat surface.
- They can jump against a wall or other vertical surface, using it as a spring board to gain additional height.
- They can run up almost any vertical surface, from wood and brick walls to metal girders, pipes, weathered sheet metal, wire mesh, and cables without difficulty, if the surface is rough.
- They can run horizontally along insulated electrical wires, small ropes, and the like, with ease.

- They can squeeze through openings slightly more than 1/4 inch high.
- They can easily travel for some distance hanging upside down from 1/4-inch hardware mesh.
- They are capable swimmers, although they generally do not take to water as well as do rats, and tend not to dive below the surface.
- They can walk or run along ledges too narrow for rats.
- They can jump from a height of eight feet to the floor.
- They can survive at a constant 24 degrees F (-4 degrees C) temperature for ten generations.
- They have been reported 1,800 feet below the ground in a coal mine.
- They are quick to explore any physical change in their environment.

**f. Food and Water**

House mice prefer cereals over other items, although they feed on a wide variety of foods. Mice sometimes search for foods high in fat and protein, such as lard, butter, nuts, bacon, and meat. Sweets, including chocolate, are taken at times. Mice satisfy much of their water need with moisture in their food, but they drink if water is readily available.

Mice have two main feeding periods, at dusk and just before dawn, and they are nibblers, feeding twenty or more times during evening rounds. In any territory there will be one or two feeding sites, dark and protected, where mice eat more than at other places. Mice tend to hold grain kernels, such as oats or wheat, nibbling on it like corn on the cob. They often drop portions of kernels as they get smaller.

**g. Range**

Mice are territorial and seldom travel more than thirty feet from their nest. Their range is much smaller than the rats' range of 100 to 150 feet. When food is nearby, mice may restrict their activity to a few feet. Males average slightly larger ranges than do the females. This phenomenon can be related to trapping strategies. Placing traps closer together will get a higher percentage of females.

**h. Nests**

House mice may nest in any dark, sheltered location, in nests approximately four inches in diameter and constructed of fibrous, shredded materials such as paper, cloth, burlap, insulation, or cotton, which generally look like a loosely woven ball. Outdoors, house mice sometimes dig and nest in small burrows.

The small range of mice, the way they feed, and their food preferences are the characteristics that set house mice apart from rats. Keep these in mind when controlling mice.

## **SECTION C HAZARDS OF INFESTATION**

### **1. LOSSES DUE TO MICE**

When mice infest stored food, the greatest loss is not what they eat, but what is thrown out because of real or suspected contamination. In six months, one pair of mice can eat about four pounds of food and deposit about 18,000 droppings. The amount of food contaminated by the mice is estimated to be about ten times greater than what is eaten.

Losses are not limited to food. Mice also damage personal property and installations by gnawing, including electrical wiring in buildings. House mice frequently take up residence in electrical appliances and end up chewing into the power supply.

### **2. MICE AS DISEASE CARRIERS**

Excluding the spread of food poisoning, house mice are not as dangerous as rats as carriers of disease and parasites. Yet their potential cannot be neglected. House mice and their parasites are implicated in the transmission of a number of diseases.

#### **a. Salmonellosis**

Bacterial food poisoning, salmonellosis, can be spread when some foods are contaminated with infected rodent feces. Mice are probably more responsible than rats for the spread of this disease.

#### **b. Rickettsial Pox**

*Rickettsia akari* is the causal agent of rickettsial pox, a disease causing a rash of the chickenpox type. Rickettsial pox is transmitted from mouse to mouse, then to people by the bite of the house-mouse mite.

#### **c. Meningitis**

Lymphocytic choriomeningitis is a viral infection of house mice that may be transmitted to people (mainly to children) through contaminated food or dust.

**d. Leptospirosis (Weil's Disease)**

The mouse can be a major carrier of Leptospirosis (Weil's disease), although human cases are more commonly caused by rats.

**e. Rat-bite Fever, Ray Fungus, and Ringworm**

Rat-bite fever can be transmitted by house mice, as can ray fungus, *Actinomyces muris*. Certain tapeworms are spread in house-mouse droppings, and ringworm, a skin fungus disease, can be carried to human beings by mice or contracted indirectly from mice through cats. Tularemia has also been linked to house mice.

**f. Dermatitis**

Dermatitis caused by the bite of a mite has been associated with house-mouse infestation. The uncomfortable skin irritation and itching can affect both children and adults. Mites may spread through a mouse-infested house or apartment during particular times of the year; however dermatitis is frequently blamed on other causes (heat rash, allergies, fleas, and the like).

## **SECTION D INSPECTION AND MONITORING**

### **1. INSPECTION**

**a. Sounds**

Sounds are common at night where large numbers of mice are present. Listen for squeaks, scrambling, and sounds of gnawing.

**b. Droppings**

A house mouse produces about 70 droppings per day. Fresh droppings are not usually as soft in texture as rat droppings, and in a few days become quite hard. Mouse droppings are frequently the first evidence that mice are infesting. Large cockroaches, bats, and other species of mice such as deer mice (*Peromyscus* sp.) and meadow mice (*Microtus* sp.), may produce droppings similar to those of house mice. Look along runways, by food, near shelters, and in other places mice may frequent.

**c. Urine**

House mice occasionally make small mounds known as "urinating pillars." These consist of a combination of grease, urine, and dirt, and may become quite conspicuous. Look for many small drops of urine using a blacklight, since urine stains will fluoresce under ultraviolet light.

**d. Grease marks**

Like rats, mice produce greasy smears where dirt and oil from their fur mark pipes and beams. However, house mouse spots are not as easy to detect; expect markings to cover a smaller area than those made by rats.

**e. Runways**

Most house-mouse runways are indistinct trails free of dust but not readily detectable.

**f. Tracks**

Look for footprints or tail marks on dusty surfaces or on mud. Use a nontoxic tracking patch to help to determine the presence of house mice within buildings.

**g. Gnawing Damage**

Recent gnawings on wood are light in color, turning darker with age. Look for enlarged cracks beneath doors and small tooth marks. Such evidence frequently helps to distinguish between mice and rats. Look for wood chips with the consistency of coarse sawdust around baseboards, doors, basement windows and frames, and kitchen cabinets.

**h. Visual Sightings**

Since mice are often active in daylight, this may not indicate a high population as it does with rats. Use a powerful flashlight or spotlight at night in storage spaces to confirm the presence of house mice.

**i. Nest Sites**

Look in garages, attics, basements, closets, and other storage places. Be alert to fine shredded paper or other fibrous materials, which are common nest-building materials.

#### **j. Pet Excitement**

Follow up when cats and dogs paw excitedly at a kitchen-cabinet door, the floor at the base of a refrigerator, or at the base of a wall, especially if mice have invaded the premises only recently.

#### **k. Mouse Odors**

Check for the characteristic musky odor produced by mice, which is easily differentiated from that of rats.

### **2. ESTIMATING NUMBERS OF MICE**

Estimating the number of mice is more difficult to do than for rats. Unlike rats (which may travel widely within a building leaving tracks on many patches of dust), house mice do not range widely. Read natural signs such as droppings, urine stains, tracks, and damage.

Make nontoxic tracking patches of talc at twenty- to thirty-foot intervals throughout a building. The more tracks seen in each patch, and the more patches showing tracks, the larger the population. The percentage of patches showing tracks will reflect the extent of infestation. Tracking patches are also an excellent means to evaluate a control operation. Compare the number of tracks or patches with mouse tracks before and after a control program.

## **SECTION E CONTROLS**

Control and prevention of house mice is a three-part process: sanitation, mouse-proofing, and population reduction indoors with traps. The first two are useful preventive measures. When a mouse population already exists, some kind of lethal control is necessary. Otherwise, the reproductive capability of the mice, and their remarkable ability to find food in almost any habitat, will keep their populations up or increase them. House mouse control is different from rat control. Pest managers who do not take these differences into account will experience failures. The following tips may contribute to success:

- Sealing mice out of a building is difficult because they are so small.
- The range of mice movement is small. Identify each infested site in order to target control procedures appropriately.
- Mice can often produce offspring faster than control methods can work.

Nevertheless, some of the techniques to control and manage rats also apply to mice. In the sections below the differences in procedures for rats and mice are emphasized.



## 1. SANITATION

Good sanitation makes it easier to detect signs of mouse infestation since it also increases the effectiveness of baits and traps, which represent the only food supply. However, not even the best sanitation eliminates house mice, since they require very little space to get into the house and small amounts of food to flourish.

Store bulk foods in mouse-proof containers or rooms. In storage, stack packaged foods in orderly rows on pallets so that they can be inspected easily. A family of mice can live in a pallet of food without ever having to leave the immediate area.

Keep stored materials away from walls and off the floor. A twelve to eighteen-inch yellow or white band painted on the floor next to the wall in commercial storage areas permits easier detection of mouse droppings. This band and the areas around pallets should be swept often so that new droppings can be detected quickly.

## 2. MOUSE-PROOFING

It isn't easy to completely mouse-proof a building, since mice are able to squeeze through an opening as little as 1/4-inch. Seal all holes to limit the movement of mice into and through a building. Plug holes in foundation walls with steel wool or copper mesh. Caulk and fit doors and windows tightly. Seal holes around pipes, utility lines, and vents, to make it difficult for mice to move in and out of wall and ceiling voids. This confines mice to a smaller area and may make snap traps more effective.

## 3. TRAPPING

See Chapter Sixteen—Rats for illustrations of appropriate traps and glue boards.

### a. Snap Traps

If used correctly, snap traps are very effective in controlling mice. They must be set in the right places, in high numbers, and in the right position, or mice will miss them entirely. Here are some factors to keep in mind when trapping mice.

- The territory of mice rarely extends further than 30 feet from the nest, and more often is about ten feet. If mice are sighted throughout a building it means that there are numerous locations where you will have to set traps.
- Place snap traps not only wherever you see obvious signs of mice, but also in good trap locations in a three-dimensional sphere about ten feet in diameter around those signs.

- Use traps every three to six feet in prime mouse habitat.
- Mice can be living above their main food supply in suspended ceilings, attics, inside vertical pipe runs, and on top of walk-in coolers. Or they can be below, in floor voids or crawlspaces.
- The best sites are those with large numbers of droppings, since that indicates that mice are spending a lot of time there. Other good sites are along walls, behind objects, and in dark corners, particularly where runways narrow down, funneling mice into a limited area.
- Good mouse baits increase the effectiveness of traps. Peanut butter, bacon, cereal, and nuts are traditional, but one of the best baits is a cotton ball, which the female mice like to use for nest material. It should be tied securely to the trigger. Food baits should be fresh to be effective.
- Mice are attracted to sweet baits, so a gumdrop tied to the bait pan may be effective.
- Probably the biggest mistake made in mouse trapping is not using enough traps. Use enough to make the trapping campaign short and productive.

#### **b. Multiple-Catch Traps**

Multi-catch traps (for example, TIN CAT® and KETCH-ALL®) are widely used for mouse control. These mouse traps catch up to fifteen mice without requiring reset. Some brands are called "wind-up" traps; the wind-up mechanism kicks mice into the trap. Others use a treadle door. Since mice like to investigate new things, they enter the small entrance hole without hesitation. Odor plays a role too; traps that smell "mousy" catch more mice. Place a small dab of peanut butter inside the tunnel entrance to improve the catch.

Mice should be humanely killed. Check traps frequently (at least daily). Although mice are captured alive, they may die in a day or two. Some traps have a clear plastic end plate or lid so you can see if any have been captured. Place the traps directly against a wall or object with the opening parallel to the runway, or point the tunnel hole towards the wall, leaving one or two inches of space between the trap and the wall. If mice are active, place many traps six to ten feet apart. For maintenance trapping, place the traps in high-risk areas and also at potential mouse entry points such as loading docks, near utility lines, and at doorways.

#### **c. Glue Boards**

Glue boards are very effective against mice. As with traps, placement is the key. Locations that are good trap sites are also good sites for glue boards. Do not put glue boards directly above food or in food-preparation areas. Set glue boards lengthwise and flush against a wall, box, or other object that edges a runway. Move objects around; create new, narrow runways six inches wide to increase the effectiveness of glue boards. Put peanut butter or a cotton ball in the center

of the board, and place the glue boards five to ten feet apart in infested areas (closer if the population is large). If no mice are captured in three days, move the boards to new locations. If a trapped mouse is alive, kill it before disposal. Replace the boards if they fill up with insects.

#### **4. CHEMICALS**

##### **a. Rodenticides**

Toxic mouse baits may not be as effective in controlling a mouse population as toxic rat baits are for rats. Mice are nibblers and may not get a large enough dose to achieve a kill. This leads to bait shyness. Mice that are killed usually die in hidden areas that may be inaccessible. Dead mice will have a bad odor for a while, another disadvantage to toxic baits. Dead mice that are not removed immediately become attractive to blowflies and dermestid beetles which feed upon the carcass. These insects then may become the source of insect infestations in other areas of buildings. The use of toxic baits and tracking powders is discouraged in occupied dwelling units.

##### **b. Food Baits**

Observe the same safety guidelines for toxic mouse baits as discussed in Chapter Sixteen's section on rat baits. In addition, follow these guidelines:

- Children, pets, wildlife, and domestic animals should be protected by putting the bait in inaccessible locations or inside tamper-proof bait boxes. Do not use food baits for mice inside residential buildings.
- Apply many small bait placements outdoors rather than a few large placements.
- Only use baits labeled for mouse control.
- Place the baits in favorite feeding and resting sites, as determined by large numbers of droppings.
- Place the baits between hiding places and food, up against a fence or object to intercept the mice.
- Bait in three dimensions.
- Make bait placements ten feet apart or closer in infested outdoor areas.
- If bait is not taken, try switching to a different type, and replace the baits often.
- Use small bait stations, which are more attractive to mice.
- Make sure that sanitation is good so that other food is not competing with the baits.
- Place secured tamper-proof bait boxes in safe locations near doors in late summer to intercept mice before they enter structures from the wild.

**c. Liquid Baits**

Although mice get most of their water from their food, they will also drink from a water container. Liquid baits labeled for mouse control can be effective in sites that do not have a ready supply of water. As with food baits, many outdoor water stations will be necessary to put the bait into the territory of all mice infesting an area.

**d. Tracking Powders**

Toxic tracking powders are especially effective against mice, since they groom themselves more often than rats, and they investigate enclosed areas which can be dusted with tracking powder.

Outdoors, use a secured bait station, PVC tube, cardboard tube, or any small, dark shelter that a mouse could enter in cases where tracking powder can be applied. Apply the tracking powder in a layer less than 1/16-inch deep. Do not allow tracking powder to drift into nontarget areas.

**END OF CHAPTER SEVENTEEN**