

Integrated Pest Management of the House Mouse in Schools

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Figure 1. The house mouse breeds rapidly and consumes a variety of food.

After humans, the house mouse (*Mus musculus*) is the second most successful mammal in the world. It breeds rapidly, consumes a broad variety of food, requires little or no water, and adapts to a wide range of habitats (Figure 1). Unfortunately, house mice are disease vectors, and the proteins found in their urine circulate in the air and can be asthma triggers for sensitive individuals. They are considered one of the most troublesome pests in the United States.

Poorly sealed school buildings are highly vulnerable to mouse invasion. Most rooms are maintained at favorable temperatures and often contain edible items. A mouse running along the outside edge of a building is drawn into the building by warm air and food odors coming from under doors and through holes in the wall.

Mice have strong senses of hearing, smell, taste, and touch. They are excellent climbers and can run up vertical walls to get to food. They can move along wires, utility cables, or ropes and can jump vertically 12 inches and survive an 8-foot fall. Adult mice can squeeze through openings slightly larger than ¼-inch wide.

Once inside, mice often establish themselves near food-storage and food-preparation areas, closets, cabinet bases, or cluttered rooms. They will also climb wall utility lines for electrical or plumbing and nest within suspended ceiling spaces.

Portable-style classroom buildings are especially vulnerable to mice: they provide attractive crawl spaces; access to dark, dirt floors that are cool in summer and warm in winter; and protection from predators. Once mice gain entry to the crawl space,

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Figure 2. One way house mice find their way into a building is through gaps created for plumbing and wiring. Gaps of ¼ inch or more should be filled with Xcluder cloth then sealed with a siliconized acrylic latex or polyurethane sealant.

they find their way up through the floor along crevices or gaps created by plumbing or other utility lines, following their nose toward food odors or warm or cool air currents. Portable classrooms also contain gaps and openings through broken vent louvers and screens.

Exclude Mice from Buildings

To reduce the threat of rodent-borne diseases, allergens, and other health threats, prevent mice from becoming established inside buildings by finding and sealing up potential access points.

1. Seal gaps of ¼ inch or more with siliconized acrylic latex or polyurethane sealant products that stretch as gaps and cracks in buildings expand and contract due to temperature changes and other factors. Steel wool, foam and other temporary materials are not recommended for larger holes and cracks. They should be filled with good quality concrete, or stuffed with Xcluder cloth then sealed with a siliconized acrylic latex or polyurethane sealant (Figure 2).
2. Seal around water, gas, electric, and other pipes and conduits going through walls.
3. Make all external doors mouse-proof using the high-quality, brush-type door sweeps that seal the gap between the threshold and the door base (Figure 3).
4. Maintain and repair all ventilation screens, louvers used in attic spaces, and furnace

closets. All gaps around the frames of screens and louvers should also be kept tightly sealed.

5. Mouse-proof the crawl-space skirt around portable classrooms. To prevent moisture damage, mold, mildew, and dry rot, the crawl-space skirt should not touch the ground. Dig a trench 1 foot deep below the skirt. Along the bottom of the skirt, attach a “barrier fence” of ¼-inch hardware cloth long enough to reach the bottom of the trench and extend horizontally 6 inches, creating a shelf. Then, fill in the trench. The buried shelf will help prevent other animals such as rats, raccoons, rock chucks, and skunks from digging underneath the barrier.
6. Assure the above pest-proofing practices are an integral part of the planning and contract process for building construction or renovation.



Figure 3. Gaps like these in external doors can be sealed with brush-type door sweeps.

Don't Attract Mice

Don't allow trash to accumulate along exterior walls; this will attract mice. Don't allow contractors to throw food or food containers into crawl spaces and wall voids during construction or renovation of buildings.

Do not place trash receptacles close to exterior doorways (Figure 4).

Keep dumpsters clean, with lids closed. Drainage holes can be screened or plugged.

Don't Harbor Mice

De-clutter storage areas and classrooms. It is best to use transparent plastic totes for storage. If cardboard boxes have not been opened in 2 years, the box and contents may be contaminated with mouse urine and feces and should be recycled or discarded. Consider having your principal mandate a 15-minute clear-out session a few times each year. Consider presenting Clutter-Free Awards for those who do the best job of removing clutter.

Mouse-Vulnerable Areas

Once inside, mice most commonly nest or forage in mouse-vulnerable areas (MVAs), including:

1. Kitchen, pantry, food-preparation areas, and food-consumption areas, including classrooms and teachers' lounges (Figure 5).
2. The crawl space beneath portable classrooms. Invading mice will often construct platform nests on structural ledges, using grass, leaves, feathers, or the building's batting insulation.



Figure 4. This dumpster is too close to the exterior door.

The mice will also carry in and store relatively large amounts of seeds, nuts, and insect carcasses in floor and wall nooks.

3. Furnace closets (if the closet ventilation louver is not in good repair).
4. Beneath kitchen and bathroom cabinets where utility lines come up through the floor.
5. Within suspended ceilings during the cold weather months.
6. Stuffed chairs and couches in staff lounges.

These MVAs are the target zones for setting out mousetraps.

Tips for Effective Mouse Snap Trapping

Snap trapping can eliminate mice populations quickly if done properly. The following are a few tips to make snap trapping more effective.

1. You have to de-clutter if you want to de-mouse. Trapping is much less effective in cluttered environments.



Figure 5. Once inside a school, mice will nest in such mouse-vulnerable areas as a food pantry or stuffed furniture in a staff lounge.

2. Remove the mice's food source before setting out traps. Unless food is scarce, mice typically do not venture more than 30 feet from their nest.
3. Plastic snap traps with a bait reservoir (such as the Kness Snap-E) can be set and reset easily, and can be cleaned with disinfectants and stored after you eliminate a mouse population (be sure to air out the traps to remove residual odors before storing). Wooden-based traps (such as the Victor M325 Pro Holdfast) can also be used if you don't need to keep traps for future use.
4. Despite common myths, there is no favorite bait for mice. The best strategy is to use a variety of baits among all the traps. Set a few traps with whatever foods the mice have been attacking; a few using nesting material (floss, string, cotton balls); a few with chocolate syrup, bacon bits, vanilla extract, or oatmeal flakes; and a few with grass seed or bird seed (Figure 6). The key to baiting these traps is to use tiny bits of food; do not over-bait.
5. Location, location, location. The most important rule for success in trapping mice is to place the traps where mice will encounter them easily and regularly. Mice travel along hidden, *shadowy* spaces such as along walls behind boxes, under equipment, around furniture, and the like. Look for places where the mice have left their droppings and install traps in those spots.



Figure 6. Traps should be baited with a variety of foods. There is no favorite bait for mice.

6. Place traps up against walls with the snap end facing the wall (Figure 7).
7. Use a sufficient number of traps (e.g., twelve traps for two or three mice is not too many).
8. Pre-bait the traps. Pre-baiting means installing the traps, but not actually setting them for the first few days. After pre-baiting for 2 to 3 days, set the traps and check them every 24 hours.
9. When installing traps and when collecting or emptying traps, always wear disposable gloves or rubber gloves that can be disinfected (see "Precautions for Handling," page 5).
10. If the mice do not show any interest, the traps are likely not in mouse-active areas and will need to be moved to better spots.
11. Remove any captured mice and re-set the traps.
12. After leaving set traps out for 2 to 3 days, shut down (remove) the traps for 2 to 3 days, then shuffle them to new positions 5 to 10 feet up, down, or sideways from the original positions and set again. Leave set traps out for another 2 to 3 days.
13. Repeat the Set-Remove-Shuffle-Reset sequence until all mice are eliminated (Figure 8).



Figure 7. The proper way to position a snap trap against the wall.



Figure 8. Follow the Set-Remove-Shuffle-Reset sequence to eliminate mice populations quickly. Twelve traps for two or three mice is not too many.

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Precautions for Handling and Removing Rodent Carcasses and Feces from Schools and Other Public Buildings

Despite good efforts, some mice inevitably gain entrance to schools and other public buildings. Most mice and the accompanying excrement are not considered to be highly hazardous to our health. Still, it makes sense to practice good safety measures when handling dead rodents in traps or cleaning up rodent excrement.

Precautions When Handling Dead Rodents

1. Wear rubber or disposable plastic gloves such as those purchased in boxes of 100 by pest management professionals and building custodians.
2. Do not reuse a wooden mousetrap that has caught a mouse. Before handling, spray the dead mouse and any trap with disinfectant until wet.
3. Any inexpensive household disinfectant will suffice, as will a weak (5 to 10 percent) solution of bleach and water.
4. Turn a re-sealable plastic bag inside out.
5. With a hand inside the bag, pick up the rodent and the trap.
6. Invert the bag over your hand and seal the bag, with the rodent and trap inside it.
7. Wrap the bag in newspaper and dispose in a dumpster or garbage can.
8. Spray the area where the trap or the dead mouse was lying with a light spray of disinfectant and let dry.
9. Dispose of the gloves in the trash, or for reuseable gloves, spray the outside of the gloves with disinfectant, then remove the gloves and wash hands with soap and water.

Precautions When Cleaning up Small Amounts of Rodent Droppings

1. Do not sweep up or vacuum feces because this can cause the excrement residues to become airborne and be inhaled.



Figure 9. Wear rubber or disposable gloves and use a disinfectant when cleaning up mouse feces.

2. Wear rubber or disposable plastic gloves such as those worn by pest management professionals and building custodians.
3. Spray the droppings and affected area with disinfectant until wet (Figure 9).
4. Use a wet paper towel to pick up the disinfected droppings.
5. Place the droppings and paper towel into a resealable plastic bag and seal the bag.
6. Place bag in a dumpster or garbage can.
7. Dispose of the gloves in the trash, or for reuseable gloves spray the outside of the gloves with disinfectant, then remove the gloves and wash hands with soap and water.

Note: Employees wishing to maximize personal protection in certain situations—such as when removing rodent feces in enclosed spaces—should wear coveralls and a respirator with a HEPA P100 filter.

Adapted from: CDC Hantavirus Preventative Recommendations (www.CDC.gov); Army Pest Management Bulletin, 2001. Vol. 22 (4); Communications from Robert Corrigan, Ph.D. RMC Pest Management Consulting.

Inspect and Monitor for Mice

When inspecting, look for fecal pellets in mouse-vulnerable areas. Also look at cardboard boxes, stuffed furniture, and similar items for signs of gnawing or nests.

In areas with past or potential mice problems, snap traps with bait reservoirs (e.g., Snap-E, Mini Rex, JAWZ, etc.) or nontoxic detection blocks (e.g., Detex or NoTox) placed inside bait stations or covers (e.g., Kness Stick-All Mouse & Insect Trap, or the Kness Snap-E cover) may be used to monitor activity (Figure 10).

Place the stations or covers in areas where they are less likely to be accidentally disturbed.

If using snap traps, place one bacon bit or something similar in the reservoirs. Check the traps once every 2 to 4 weeks. Ants will occasionally carry off the bacon bit, so it is good to carry extra bacon bits when checking traps.

Replenish block baits on an 8- to 12-week basis, or as necessary due to consumption or spoilage.

When using nontoxic detection blocks, you should put them inside tamper-resistant bait stations designed so the blocks will not fall out if the stations are picked up and shaken.

Possible locations for the bait stations:

1. Within the furnace closet, in the back area of the closet, preferably behind the furnace
2. Beneath any kitchen sink
3. In a warm area behind a kitchen stove
4. In the suspended ceiling above the kitchen stove, sink, or near the furnace closet

To monitor for mice under portable classrooms, put one or two tamper-resistant bait stations along the middle of the side of the skirts underneath the portable. To achieve this, each portable must have an access door that opens easily and closes tightly.

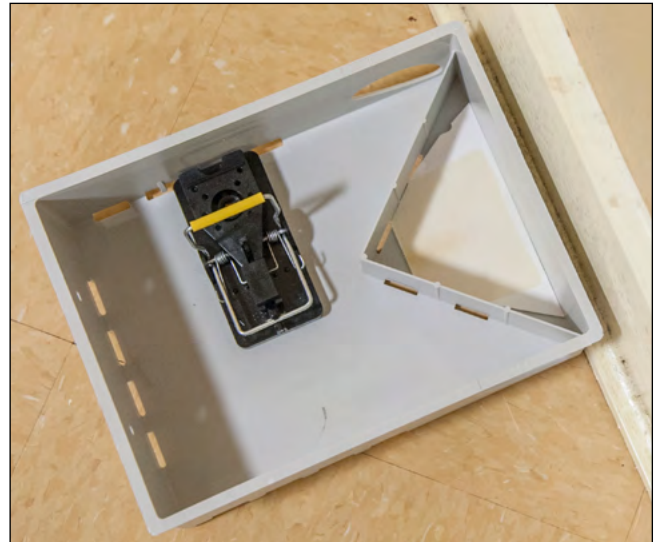


Figure 10. A Kness Stick-All with a plastic snap trap inside.

Exterior storage sheds (bike sheds, dumpster sheds, and equipment sheds) should also be monitored for mice. This can be accomplished by installing two bait stations—one on each side of the shed. The baits should be replenished on an 8- to 12-week basis, or as necessary due to consumption or spoilage. Construction and renovation projects should have active rodent monitoring programs to reduce the possibility of “building in” a rodent problem.

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