

THE ESSENTIALS OF RODENT CONTROL

Mike Stringham, Extension Entomologist
N. C. State University, Raleigh, NC

Rodents are an on-going pest challenge for every swine producer and feed mill manager in the business. You may not see them, you may not even see any evidence that they are around, but you can count on it. Don't be too discouraged, however. It is true that some types of rodents (rats) can actually be eliminated from a facility, and mouse infestations can be effectively suppressed. That said it is also true that the need for effective rodent management is a constant. Neglect it and all your past efforts will count for nothing. Emphasize on one aspect of your rodent management program (mouse control, for example), and the rats may well sneak in the back door while you're not looking. Rely on the same old baiting routine without reassessing its effectiveness or scouting for signs of new rodent activity, and you may find hundreds of roof rats living in your attic. In short don't get lazy. One hundred percent control may not be possible, but you can sure keep rodent populations in check. Today, I'll review those practices that make up an effective rodent management program. The model I'll use is a farrowing operation, but the principles apply across the spectrum of production and feed mills as well. Many of the things I'll cover are already in place, while others could use improvement.

Rodent Particulars: Let's begin with a few facts about our adversaries. In general, rodents are very acrobatic. They can climb most surfaces, and make vertical jumps that are amazing for their size. Rats can leap straight up as much as 36 inches; mice as much as 12 inches. Rats and mice are shy, but inquisitive. They initially avoid new objects, but given enough time rodents investigate every new object that shows up in their environment. Rats and mice are nocturnal rodents, preferring to hide during the day. Mice are most active at dusk and dawn, while rats come out at dusk and head for home as the sun comes up. They don't go full bore all night, but have multiple periods of peak activity. Rats and mice have poor eyesight, relying on hearing, touch and smell to navigate in their environment. These three rodents also gnaw on just about everything. It's not a nervous habit – they must gnaw to wear down their incisors which are constantly growing. As a result, rodents damage a variety of material, including insulation, structural timbers, side curtains, cooling pads, water lines and wiring. Rats and mice have an amazing reproductive potential as well. Rats breed at 3 months of age, and produce 4 to 6 litters a year with up to 12 rats each. Mice breed at 6 to 10 weeks of age, and have 5 to 10 litters a year with up to 6 mice per litter. A quick bit of math makes it clear that just a few rats or mice can become many within a year or two.

The primary rodent pest in most situations is the common house mouse (*Mus musculus*), followed by the Norway rat (*Rattus norvegicus*), and the roof rat (*Rattus rattus*). House mice are small (only 6 to 8 inches, nose to tail tip), brown to gray in color and have prominent eyes and relatively large ears. Norway rats are the big ones, with adults ranging from 12 to 18 inches in length, nose to tail tip. They have fairly compact, heavy bodies, are gray to brown in color, and have relatively small eyes and ears. Their tails are generally no longer than half their body length. Roof rats are nearly as long as Norway rats at 14 to 16 inches nose to tail, but they are considerably more mouse-like in appearance. Their eyes and ears are relatively large, and their tail is as long as their entire body length. The roof rat has been a relatively rare rodent in hog houses, but we have seen more problems with this rodent in recent years. The roof rat has no doubt been around in low numbers

for some time, but infestations in eastern NC are on the upswing. I suspect this has happened in part because most of our attention has been focused on Norway rats. Finally, Norway rats are prodigious burrowers, often undermining foundations and feed bins, and damaging lagoon banks. Roof rats and mice are not, preferring to live in walls and overhead spaces.

Management Particulars: A complete rodent management program includes regular *monitoring*, specific *sanitation* practices, continuous *exclusion* efforts, and appropriate *control* for specific rodent problems.

Monitoring – Observation is your best tool in your battle against rodents. Monitoring for the most part is nothing more than doing just that, and should be done on a regular basis. Encourage farm managers and their workers to look for rodent activity anytime they are in a hog house. Do systematic scouting as well. Inspect 10 or more random locations throughout the house at least once a month. A good flashlight to light dark areas, and a simple schematic of the hog house to mark locations where rodent activity is heaviest will be helpful.

What should you be looking for? Let's start inside the house. Look along sills, curtain folds, and around fan housings for gnawing damage, dropping or tracks and tail marks in the dust. Check the corners in anterooms and storage rooms, and on the production floor for rodent droppings. Be on the lookout for bits of insulation on the floor, on or beneath the slats. Look overhead in open ceiling houses for dark smudges along exposed sill plates, which may indicate areas used as roof rat runways. Look up to the roof's gable for signs of insulation damage or live roof rats or mice hanging out on rafters and cross bracing. Examine the plastic sheeting of insulated overheads for holes, especially along water lines, eaves and at corners. Examine overhead spaces above the sheeting or metal ceilings for evidence of roof rat or mouse activity such as burrows in loose insulation, droppings, conspicuous piles of insulation surrounded by bare areas, and live rodents. If houses are equipped with eave vents or plenums, take some time to examine these closely for live rodents, droppings or bits of insulation.

A walk around the outside of buildings may reveal other hot beds of rodent activity. Look for large burrows along building walls, feed bins or ditch banks within 50 feet of the hog house. Note if there are well-used trails along walls or fencerows between buildings. Look for droppings, tracks or tail marks along such trails. Examine side curtains and cable housings for gnawing damage. Inspect evaporative coolers for droppings and gnaw damage to cooling pads. Even the location of rat-sized holes in cooling pads can provide a clue as to what type of rat has done the damage. Damage at the top of cool pads may indicate roof rats; damage at the bottom, Norway rats. Inspect the eaves closely for evidence that insulation is being pushed out of the overhead space of the building.

Nighttime visual estimates may prove useful where rodent activity is not apparent during the day, or when attempting to confirm particular areas of activity, entry points and rodent movement patterns. Such information is helpful when planning your control efforts.

Live trapping may be useful if mice are to be tested for *Salmonella* and other pathogens. Live, or lethal sampling with snap traps or glue boards, may be used to make quick population estimates of mice.

Lastly, here are a few words of advice about scouting for roof rats. These rodents are extremely shy. It is unlikely that you will see them out in the open during the day. Even at night, a slight movement will cause them to scurry out of sight. Their nesting preferences are for overhead areas and to a lesser extent wall voids. A great deal of patience and a little luck may be needed to get visual confirmation, but it is necessary for effective control. Because these rats seldom burrow and live in hard to access locations in the building, baiting and trap placements are often more difficult to achieve. Proper placement, however, is key to successful control.

Exclusion – Trying to keep rodents out of a hog house sounds like a joke, I know. However, elimination of entry points is not the object. Exclusion efforts are simply intended to reasonably limit access and to direct invading rodents where you have better opportunities for control. To a lesser extent it can also be used to eliminate potential harborage that the building's exterior provides.

Start by walking the building perimeter to locate problem areas that can be effectively eliminated. Nail down metal siding where it has been pulled free. Be sure that all siding seams are flush. Mice and roof rats in particular may use the rough edge of an open seam to climb all the way to the eaves. Repair holes in damaged siding or foundation walls. Close gaps around pipes, conduits and feed lines where they go through the wall. Keep in mind that roof rats in particular may gain access to buildings by running along power lines. Close gaps around fan housings as well. Cap bottom and top edges of vertical siding to close off corrugations where mice can enter. Keep all doors tight. Repair damaged housings around evaporative coolers. Sometimes rodents can be excluded by simply opening an otherwise secluded space where they might have easy access to building interiors, or easily hide from view as they gnaw a hole into the side of the building. One such area might be behind the housings for curtain ends. Keep screening under eaves in good repair. Finally, keep a bare or mowed perimeter around the facility. Clean ground discourages rodent traffic and makes it easier to spot burrowing or a well-traveled runway.

Sanitation – Outside sanitation goes along with vegetation management around a building's perimeter. It doesn't do much good to keep the weeds down if lumber and old equipment are stacked near the hog house, providing easy shelter for foraging rodents. Feed spills at outside bins are another strong lure for rodents. All such spills should be removed as quickly as possible. Be sure that all mortality is properly disposed of in a timely manner. Similarly, don't clutter up storage rooms. Boxes or flats stacked against the wall provide excellent hiding places.

Control – The tools used to control house mice and rats are nearly identical. Some rodenticides are more effective for mice than rats and bait stations may vary in size, as will traps, depending on the rodent to be controlled. Otherwise, success is largely dependent on the method of their use for particular rodents.

The most effective active ingredients are generally single-dose rodenticides. These include: brodifacoum, difethialone, bromadiolone, cholecalciferol (considered a multiple dose rodenticide by some), bromethalin, and zinc phosphide. Zinc phosphide is the only single dose active formulated both as bait and as a tracking powder. Useful multiple-dose rodenticides include diphacinone and chlorophacinone. Of these, the acute single dose rodenticides (bromethalin and zinc phosphide) are best suited for the rapid reduction of severe infestations, or where control efforts are time limited as when houses are scheduled to be empty for repairs or equipment replacement. Brodifacoum,

bromadiolone, difethialone and cholecalciferol are most useful as maintenance options, providing effective control of rodents that eat it over a course of one or two feedings. The multiple dose rodenticides diphacinone and chlorophacinone are most useful as rotational products or because they are also formulated as concentrates or liquids that are well suited to special situations.

Baits (pellets or blocks) in bait stations placed along inside and outside walls of the hog house are designed to intercept rodents where they enter the building or move inside the house. These kinds of placements spaced at a minimum of 40 feet apart will provide plenty of opportunity for rats and mice to find baits. A shorter spacing may be needed if severe mouse infestations are the main problem. Don't forget to place stations in storage rooms, offices, labs, locker and break rooms.

Block baits provide extra flexibility for placements overhead. They can be nailed to rafters, joists and sills where roof rats and mice move from nests in wall voids and attic spaces to forage for food and water on the production floor. They are also easily wired in place along water lines or conduits that rodents also use to move from place to place. Attach block baits as close as possible to obvious rodent entry points from attic or wall voids. Such entry points may be large openings, but are generally little more than small holes in plastic or insulation board. Many will be located in corners, along waterlines and conduits, at pulley attachments for cabling, near fan housings and evaporative coolers or along building eaves.

Roof rats present special challenges to achieve good control. Baiting on the production floor is often ineffective. Placements near obvious entry points from wall and enclosed overheads or along runways are useful, but frequently miss a substantial portion of the roof rat population. This is particularly true for roof rat colonies that have overrun attic spaces. Bait placements and/or the use of watering stations in attic spaces are often most effective. Often, several strategically spaced bait and watering stations in attic spaces are an effective approach to roof rat control. Obviously, success requires that each station must be easily accessible so that rodenticide-laced water and pellets or blocks can be replenished as needed until the infestation is eliminated.

Norway rats are more easily controlled because of their burrowing behavior. Often these rodents live in burrows outside the building, venturing into the hog house at night for food and water. Well-placed bait stations on the house's perimeter and interior will intercept many, but not all. Bait outside burrows to insure your Norway rat control program is complete. One or two consecutive days of baiting each active burrow with a single dose rodenticide is often sufficient eliminate the problem. Fill in baited burrows with soil after 3 or 4 days and check to see if any are reopened the following morning. If so, and if the bait continues to be taken, continue baiting for several more days.