RESEARCH REPORT

PORK SAFETY

Title: North Carolina Trichinae Study - **NPB #99-240**

Investigator: Mike Stringham

Institution: North Carolina State University

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I. Abstract

A rodent control program was established on a four house finishing facility in eastern North Carolina that had a previous history of low incidence trichinae parasitism. A pre-treatment index of thirteen mice was established by trapping for all four houses in January. Rodent control practices, primarily vegetative control and routine baiting, were initiated and maintained for the next six months (February to July). Monthly trap counts were compared with the pre-treatment index. The greatest reduction (79%) occurred inside the finishing houses. Mouse numbers on the outside of the buildings rose above the pre-treatment index early in the study, but declined to dramatically during the last four months. Nevertheless, the reduction in mouse catches for building exteriors was 42% for the entire study period. Overall, mouse indexes were reduced by 62%. One group of mice and two rats were submitted for trichinae examination. Status of those samples is unknown at present.

II. Introduction

Rodent control is an important part of modern swine production practices. Rats and mice may harbor and transmit diseases or parasites of swine, cause considerable structural damage, and contaminate feed. Trichinosis, a parasitic infection caused by *Trichinella spiralis*, is a minor but troublesome parasitic infection that can be transmitted to hogs by rats. The trichinae-free status of a swine herd is at risk where rodent control practices are neglected.

I. Objectives

1) Establish and maintain monthly rodent monitoring at a four building finishing facility on which trichinae infection had been previously identified.
2) Submit rodent specimens for diagnostic examination to determine the presence of trichinae during the study period.
3) Establish a rodent management program to substantially reduce or eliminate rodent populations present on the study farm.

IV. Procedures

The site consisted of four finishing houses and an associated single stage waste lagoon. Each curtain-sided house was approximately 180 feet by 40 feet (7,400 ft^2 of floor area), with slatted floors over a flush/recharge pit area. Rodent control efforts were concentrated inside the buildings where the risk of contact between hogs and rodents was the greatest. Baiting density on building exteriors was much lower, but other rodent management practices (primarily vegetative control and the removal of waste feed) were used to discourage rodent activity.

Eighty bait stations were constructed from three-inch PVC pipe or corrugated plastic drain tile. Stations constructed entirely form PVC pipe (Figure 1) consisted of a single PVC T-joint, two sections of three inch diameter PVC pipe (5 2 inches long), a single eight inch section of 1 2-inch diameter PVC pipe, and one three inch inspection cap. The inspection cap was halved and each half glued to one end of each of the short sections of PVC using standard PVC cement. These assemblies were then inserted into the wide diameter openings of the T-joint. The section of 1 2-inch PVC pipe was inserted in the smaller opening of the T-joint and served as a vertical Astand-pipe@ by which bait was placed in the station. All pipe was dry seated in the T-joint with a rubber mallet. Bait stations constructed with corrugated plastic drain tile were of a similar design.

Fifty six and twenty four of these stations were placed on the interior and exterior of buildings, respectively. Interior placements (fourteen stations per house) were made at approximate intervals of twenty five feet along the side walls. Bait stations were placed on the sills of curtain openings behind existing hog panels. Stations were secured with a single zip tie attached to the side wall screening to prevent pigs from dislodging the bait placed within. Exterior placements were made along side and end walls. Station intervals were much greater (approximately sixty feet) than for building interiors. Provisions were made for supplemental baiting on building exteriors (primarily for rats) if it became necessary. Two tablespoons of pelleted rodenticide (bromodialone, .005%) was added to bait stations at weekly intervals for the first month of the study. Bait consumption fell off dramatically at this point and the baiting interval was increased to once per month. Twenty four bait blocks (bromodialone, .005%) were placed at fifteen foot intervals inside overhead ventilation plenums along the side walls of each building as well. These were inspected at monthly intervals and replaced as necessary. Placement density of both bait stations and blocks was approximately one per 190 square feet based on an estimated floor area of 7,200 square feet.

Monitoring devices (Catchmaster 4R8 glue boards) were placed in and around the finishing buildings at monthly intervals. A total of sixteen glue boards were used in each building. Fourteen were placed on the sills along both side wall openings between the hog panels and screening material. The remaining two glue boards were placed in the aisle at each end of the building. Four glue boards were placed on the ground along foundation walls of each building. Exterior glue board placements were protected from the elements with an eighteen-inch section of corrugated drain tile that had been halved along its long axis. A ten-inch long gutter spike was used to secure the glue board to the ground and another to hold the cover in place. Glue boards were left in place for 1 week, inspected twice during that time interval, and removed until new boards were again placed. An initial round of monitoring was carried out in mid-January to establish a rodent population baseline for the farm. Subsequent monthly trap results were compared with the pretreatment value to determine the impact of the rodent control program. Rodent samples were submitted to Dr. Ray Gamble (USDA/ARS, Beltsville, Maryland) for trichinae examination in March (mice) and again in August (rats).

V. Results

Monthly monitoring measured reductions in mouse populations on the farm. An initial population index of thirteen (seven interior, six exterior) mice was established during the month of

January, 2000. Subsequent monitoring showed a steady decline of the mouse population and/or distribution in and around the buildings. Rats were noticeably absent around the farm for much of the study. However, Norway rats (*Rattus norvegicus*) attempted to colonize the site in late July. There presence was first detected by a small amount of burrowing activity beneath the buildings= entry ramps and droppings along building perimeters. Monitoring was extended into August in an effort to trap specimens for tissue examination.

The predominant rodent present on this farm for much of the study was the house mouse, *Mus musculus*. This rodent is not considered to be part of the transmission cycle for trichinae. Nevertheless, a sample of mice was submitted for analysis in March. As noted, efforts were made to specifically catch Norway rats late in the study. Two rats were trapped during the first half of August and submitted for examination. Trichinae status of both the mouse and rat samples is unknown at present. An unsuccessful effort was made to trap large vertebrates (raccoons and opossums) around the hog buildings. It was hoped that in the absence of rats at the site, wildlife might confirm the presence of *Trichinella spiralis* and suggest a method of transmission to the hogs.

An effective rodent management program was established at this site as evidenced by the decline of the farm's mouse population (Table 1). The initial population index of thirteen mice had dropped by slightly more than half by the end of April. The combination of routine baiting and other rodent management practices had produced a mean reduction in the mouse index of 62% by the end of the study. The picture is complicated somewhat by the relatively high number of mice trapped during February and March. These numbers probably resulted in part from the less intense control efforts in place outside the buildings. It is reasonable to assume that the overall reduction in mice at this site would have been greater had control efforts been equally concentrated.

The distribution of mice around the buildings is also informative. Mouse numbers on the outside of the buildings dropped substantially, but was less pronounced than for building interiors. Mouse indices outside of the buildings declined from six in January to one at the end of July. However, mouse catches were higher than the pre-treatment in February and March. These increases were 83% and 33%, respectively. Because of the high numbers early in the study, the mean percent reduction in the mouse index outside the buildings was only 42% for the entire period. It is worth noting, however, that the decrease in the exterior mouse index from April to July ranged from 83% to 100%.

Mouse numbers declined most rapidly inside the buildings, dropping from a high of seven mice in January to zero (100%) in May. No further mouse activity was detected inside the buildings through the end of July. There was a jump in mouse numbers for building interiors in April when monitoring coincided with removal of the hogs. Cleanup and maintenance between groups of hogs caused mice to move from their home territories, and increased the expected trap catch in other areas of the buildings. Despite the somewhat artificial increase in mouse numbers in April, the overall mean percent reduction inside the hog houses averaged 79% by the end of the study.

This study demonstrated that it is possible to achieve good reductions in rodent populations by using a combination of monitoring, simple cultural practices and baiting. However, rodent control programs must be both thorough and continuous. Large mouse and rat populations can be hidden away in walls and attics, beneath foundations and in heavy vegetation around buildings. Haphazard or infrequent control efforts simply will not reduce established and thriving rodent populations.

Rodent monitoring does not provide an absolute measure of rodent density, but it does provide a way to document the impact of a rodent control program. It is also a useful indicator of where and when control efforts may need to be intensified. Monitoring can be as simple as regular inspections for signs of rodent activities. Alternatively, disposable glue boards or reusable traps offer a way to count and remove rodents from the facility.

Cultural practices, most notably good vegetative control around buildings and lagoons, has two

advantages. First, it will make the surrounding habitat less attractive to rodents. Secondly, rodent activity is much easier to spot when the grass is mowed. Good sanitation practices and timely building maintenance reduce rodent pressure even more.

Some form of direct rodent control is essential for a good rodent management program. Rodenticides are the tool of choice on most farms. A variety of active ingredients and formulations are available. Homemade or commercial bait stations provide a relatively safe and effective way to use rodent baits around livestock. Bait stations are not necessary where bar baits and bait packets are placed in areas accessible only to rodents (e.g., attics, air plenums and beneath secured feeders).

Table 1: Effects of rodent control practices on mouse counts at a North Carolina hog finishing facility.

Month	*Interior*	*% Change*	*Exterior*	*% Change*	*Int+Ext*	*% Change*
Pre-Trtmnt (Jan)	7	—	6	—	13	—
February	0	– 100	11	+ 83.3	11	– 15.4
March	3	– 57.1	8	+ 33.3	11	– 15.4
April	6	– 14.3	0	– 100	6	– 53.9
May	0	– 100	0	– 100	0	– 100
June	0	– 100	1	– 83.3	1	– 92.3
July	0	– 100	1	– 83.3	1	– 92.3
Mean	1.5	– 78.6	3.5	– 41.7	5.0	– 61.5

Figure 1: An example of a homemade rodent bait station used to bait for rats and mice.