1987

G87-848 Control and Eradication of Pseudorabies in Swine

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G87-848-A

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This NebGuide discusses various plans to control and eradicate an increasingly important disease of swine--Pseudorabies.

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Introduction and History

Pseudorabies (Aujeszky's Disease) is an acute, frequently fatal disease affecting most species of domestic and wild animals. The disease is caused by a virus of the Herpesvirus group, and is characterized by a variety of clinical signs--those involving the nervous and respiratory systems being particularly prominent. Pseudorabies is a persistent cause of loss in both cattle and sheep in many countries throughout the world.

Year	% Positive	
1974	0.56%	(mkt. & Breeding)
1977-78	4.58%	(Breeding only)
1981	9.7%	(Breeding only)
1983-84	18.8%	(Breeding only)
1983-84	8.18%	(Market only)

Pseudorabies is an increasingly important disease of swine in the U.S. This increase in importance has paralleled the swine industry's move to larger confinement type pork production units.

National serological surveys indicate the increasing prevalence of pseudorabies as follows:

The last survey was three years ago. It appears that the spread of pseudorabies virus (PRV) to new herds

has leveled off and we now have 11-12% of herds in the U.S. swine belt infected.

Pork producers, at a 1977 National Pseudorabies Meeting in Ames, Iowa, expressed a need for vaccine and were of the opinion that we could live with pseudorabies.

In 1986, the feeling of a majority of pork producers was that pseudorabies is a costly disease and that we should work toward control and eventual eradication.

The Livestock Conservation Institute (LCI) assembled a PRV Task Force in 1986. This PRV Task Force drafted a PRV Control/Eradication Plan to be considered by industry groups during the winter of 1986-87.

LCI plans are described as Plans A, B, and C.

Plan A - Test and Removal (3 options)

Option 1. Test and removal without vaccination. Use this option when less than 20% of the breeding herd is PRV positive.

Option 2. Test and removal with vaccination. Use this option when a high percentage of the breeding herd is PRV positive and/or there is evidence of infection in growing or finishing pens. Vaccinate the entire breeding herd with a killed PRV vaccine three times at six-month intervals. Six months after the last vaccination, test all breeding animals and a representative sample of offspring over 16 weeks of age. If the offspring test negative, remove all positive sows and boars and retest as in option 1.

Option 3. Phased test and removal with vaccination. To minimize the interruption to pig flow, use a phased test and removal plan. Inherent in this plan is increased risk of failure to clear the herd of PRV. However, in many herds the risk may be more than offset by the reduced cost. All sows and boars are tested negative and then vaccinated with killed vaccine to enhance their immunity and lessen the risk of virus spread until all the originally positive sows are removed from the herd at their next weaning. Remove all positive boars immediately from the herd. Replace positive sows with unvaccinated gilts. Four months after vaccination, test all sows and remove any remaining positives immediately from the herd. Retest herd in 30 days and continue to monitor as in option 1.

Plan B - Offspring Segregation

Vaccinate all sows with killed vaccine 3-4 weeks pre-farrowing to insure that all piglets receive adequate colostral antibodies.

1. Immediate offspring segregation. Wean pigs from selected females at 3-4 weeks of age (or as early as possible), select gilts which will become the foundation of a new herd and move them to new facilities.

Pens should ideally contain pigs from only one litter. If they contain pigs from more than one litter, more gilts will be lost if there is a positive in one litter, since the whole pen must then be considered positive.

Test all of these isolated, weaned gilts at 16 weeks of age. Maternal antibodies should be gone, resulting in negative serological findings. All seropositive gilts must be considered potential sources of infection and removed. Retest the entire pen 30 days later.

If any pigs in a pen test positive on the 30-day retest drop the entire pen from the program.

As entire pens test negative combine them into larger units to eventually establish the new herd. Delay combining groups as long as possible. If possible, breed these gilts to new, clean boars and hold in segregation through gestation.

Depopulate the original herd, cleaning up as outlined in Plan C. This is usually carried out in phases, first the farrowing facilities on an all out-all in basis with thorough disinfection and at least 30 days downtime. Then retest the entire new gilt herd before replacing in old facilities. By the time the litters from the new, clean gilts are ready to be weaned, the nursery/grower should have been emptied, cleaned, disinfected, and kept empty at least 30 days. The nursery/grower must be completely segregated from the finisher. If this cannot be done the finishing pigs must be sold or moved to a quarantined feedlot. If the finishing pigs can be kept segregated, they may be kept on the farm until the finishing facilities have been emptied, cleaned, disinfected, and maintained empty at least 30 days.

2. Delayed offspring segregation. An alternative is to keep all offspring on the original premises until the young pigs become seronegative. Wean pigs at the regular age and place in a nursery, separated from sow contact, in pen groups (one litter per pen if possible). Move pigs to a growing barn at the appropriate age and at 12 weeks of age test potential replacement gilts. Move all negative gilts at that age to a separate, segregated growing facility. Retest remaining gilts at 14 and 16 weeks of age. At each test, move negative gilts to the segregated facility. Depopulate gilts positive at 16 weeks of age with the original herd. Retest all gilts in the new herd 30 days after the last addition. Depopulate the original herd, cleaning up as outlined for Plan C, and replace with the newly established herd.

Plan C - Depopulation - Repopulation

This option is recommended for, and is the plan most likely to succeed, in a confinement operation with a high level of infection.

Consider this choice if:

1. A high percentage of seropositives (over 80% of breeding animals) indicates an actively progressing disease, especially if there is an increasing seropositive rate, or appearance of new seropositive pigs in repeated tests.
2. Genetic strains have little value.
3. There are multiple disease problems.
4. The herd is housed in confinement with a common air source or where separation is difficult to maintain.

A significant advantage of this choice is the opportunity to repopulate with healthier, genetically superior swine. Other diseases may be causing as much or more loss as PRV.

- **Timing.** Choose warm, dry months, when possible. Sunlight and drying very quickly inactivate the virus.

- **Depopulation.** The most common and economical plan is depopulation over a period of months as hogs reach market weight. In a commercial herd, don't be in too big a hurry to depopulate lightweight hogs. Sell hogs as they reach market weight, but don't retain slow growing pigs. Other options include:

1. Sell for slaughter all breeding swine and market weight hogs, and sell to a quarantined feedlot all other pigs. A quarantined feedlot is a unit which has no breeding stock and sells only to slaughter. With proper planning, this option could result in minimal downtime, if bred gilts are available.

   With adequate approval and safeguards to neighboring herds, growing-finishing hogs kept during cleaning and disinfection could be moved to a neighboring farm, or a separate, isolated feeding lot. Precautions must be taken to prevent recontamination of cleaned buildings by human, animal, or mechanical means.

2. Sell sows as soon as pigs are weaned. Remove weaned pigs and/or market animals in the finishing house to another location as soon as possible. Move pigs to a quarantined feedlot for finishing.

- **Disinfection.** Recommended disinfectants are: orthophenolphenate compounds, phenolic compounds, 2% sodium hydroxide, trisodium phosphate and chlorhexidine. All disinfectants are less effective in the presence of organic matter.

- **Rodents.** Exterminate rodents. Prevent wildlife and domestic animal exposure to swine and feed source.

- **Repopulation.** Wait 30 days after disinfection before repopulating. Wait longer if there is any question about effectiveness of cleanup and disinfection procedures. The period between cleanup-disinfection and repopulation can vary, depending on weather and individual farm conditions. Consider, along with the testing and retesting of animals used to repopulate, in the planning stage and make decisions after consultation with your veterinarian.

  Repopulate from a PRV qualified negative herd, isolate on premises, and retest 30 days later.

Other Plans

Two other plans of eliminating PRV from a herd, not LCI plans, are Plans D and E.

Plan D - Vaccinate with Killed Vaccine Without Depopulation

1. Vaccinate the entire breeding herd, gilts, sows, and boars with killed vaccine on a calendar basis every 6 months.

2. Rotate out of the herd all animals that have ever had MLV vaccines.

3. After all MLV vaccinates have been rotated out of the herd, test 25-30 animals at random to monitor the herd. Do this test 5 1/2 months after the last killed vaccine was used (two weeks before the next scheduled killed vaccination is due).

4. If there are only a few low titers (1:4 or 1:2), test the rest of the breeding herd. Cull all animals with titers. Repeat the test of the entire breeding herd. If all animals are negative, consider the herd to be free of PRV.

5. If there are still animals with titers of 1:16 or greater on the initial sampling (25-30 tests), continue to vaccinate with killed vaccine for 1 year. Attempt to speed up the culling rate, meanwhile, and

repeat the sampling test of 25-30 animals as in 3 and 4 above.

Meanwhile, if the growing pigs are not being vaccinated, test 10 finishing pigs (150 lb). The finishing house could be the source of circulating field virus. If that is the case as evidenced by high titers in the finishing pigs, start vaccinating the growing pigs with killed vaccine to help stop field PRV from circulating in the finishing pigs.

Plan E - Test and Removal With Vaccination with Sub-unit Vaccine Without Depopulation

Summary of Marshall County Iowa Pilot Pseudorabies Eradication Project.

The following data and conclusions generated by the Iowa pilot project may be helpful as other states or areas start PRV control and eradication projects:

Sponsors:

- U.S. Department of Agriculture
- Iowa Cooperative Extension Service
- Iowa Department of Agriculture

Time Span: July 1983 to September 1986

No. Swine Farms: 224

Total Swine: 75,000

Herds Under Quarantine: 11 (5%)

Twenty-five to 29 blood samples were collected from each farm to identify infected herds. Twenty herds not quarantined were found to be infected and 8 of the quarantined herds were positive for a total of 28 of the 224 herds in the county (12.5%).

Each previously negative farm was blood sampled (25-29 samples per farm) every 6 to 9 months to detect new infections during the 39 month project period. This resampling plus clinical outbreaks identified 12 new infections in previously negative herds and 2 reinfections in herds that apparently had eliminated PRV.

It is important to note the sources of these new infections:

Swine Movement:

*Feeder pigs = 5
*Bred gilts = 1
*Boars = 1

*Herds of unknown status

Other species or fomites:

Cat = 1
Straw = 1

Other:

Unknown source = 1
*Area spread = 4

*from outside the county

Infections by type of operation are given in *Table I*.

Table I. Infections by type of operation.

Type of operation	*Herds enrolled*		*Infected herds*		*Percent infected by type of operat.*
	Total	%	Total	%	
Farrow to finish	177	79	36	80	20.3
Seed stock producer	8	4	0	-	0
Feeder pig finisher	31	14	4	9	12.9
Farrow to finish & feeder pig finisher	7	3	5	11	71.4
Total, all farms	223	-	45	-	20.2

Clean up plans used in the Iowa Project. On each infected farm, a herd clean up plan was worked out to suit the management practices on the farm, providing greatest likelihood of success at lowest cost to the operator. The achievements in herd cleanup are shown in *Table II*.

Table II. Herd cleanup.

Cleanup plan	*Total herds Infected/cleaned*	
Off. segrega.	28	21
Test & remove	4	4
Depop. repop.	10	9
Depop. norepop.	3	3
Totals, all plans	45	37 (82%)

Most of the herds used the offspring segregation plan which was the least disruptive of pig flow and therefore the most economical. The success of this plan is more graphic when the data are divided into herds infected before December 1984 and those infected after January 1985 (*Table III*).

Table III. Herds infected before December 1984 and those infected after January 1985.

	Infected herds	

	Before 12-84/cleaned		*After 1-85/cleaned*	
Off seg.	21	20	7	1
Test/rent	3	3	1	1
Depop/repop	8	8	2	1
Depop/no repop	3	3	-	-
Totals/all	35	34	10	3
Efficiency	(97%)		(30%)	

Area control of pseudorabies was both practical and effective in Marshall County. Excellent voluntary cooperation of producers was obtained. The prevalence of infected herds was found to be 2.8 fold higher than initially identified on the basis of quarantined herds in the county. Area testing on premises was effective in identifying infected herds. Statistical sampling gave sufficient sensitivity with lowest case finding costs. Monitoring tests of herds every 6-9 months showed that all new infections were indeed new and that no old infections had been missed.

Other significant data from the Iowa PRV pilot project:

Herds infected-start of project = 14%

Far/finish operations infected = 20%

Feeder pig finishers infected = 13%

Breakdown of infected farrow/finish operations:

-- Infections in breeders and finishers = 45%

-- Infection in breeders only = 47%

-- Finishers only = 8%

This is strong evidence to justify focusing sampling procedures in the breeding herd.

Swine movement introduced pseudorabies into half of the newly infected herds; this could not be adequately regulated in a voluntary program. Area spread within a 1 mile radius of clinical herd outbreaks could not be prevented; the mechanisms of area spread could not be determined, but did not include swine movement.

Clean up of infected herds was best undertaken when the infection had stabilized in a herd. If it had stabilized at a low seroprevalence level, in the project at below 20% of breeding stock, test and removal of seropositive swine worked effectively. At higher seroprevalence levels, offspring segregation and phased turnover of the herd worked well. It was attempted in 62% of the infected herds and 57% of all successful cleanups followed this plan. The average time from identification of an infected herd to successful cleanup demonstrated by 2 clean quarterly tests was 15.4 months.

Before the program, 34% of farms not under quarantine were vaccinating; during the program, the use of vaccine in clean herds increased to 48%. Vaccination of breeding stock at program expense stimulated participation in the program but was not shown to prevent acquisition of infection. Among the 14 new infections which occurred during the program, 8 were in vaccinated herds. Vaccination was effectively

used in halting the advance of clinical outbreaks and in cleanup programs by offspring segregation. Serological detection of infected swine was possible in herds using killed vaccine but not in herds using the modified live virus vaccine available at the time of the program.

Additional Comments

1. Since swine do become infected with PRV after a monitoring or qualifying test whether vaccinated or not, it is prudent for all pork producers to strictly isolate all newly arriving animals and retest them after 21-30 days of isolation before contact with the main herd.

2. The goal of the swine industry in the U.S. is to control and eventually eradicate pseudorabies. Good evidence of this support is the 87% favorable vote by delegates to the National Pork Producers Council at the 1987 American Pork Congress. This creates an opportunity for practitioners to provide consultation and service to their pork producer clients. Practitioners who want to take advantage of this opportunity should take the lead and contact all their swine clients and help those free of pseudorabies (85%) to stay that way and those that have pseudorabies infection, or simply vaccination titers, to clean up their herds.

File G848 under: ANIMAL DISEASES
B-8, Swine
Issued July 1987; 10,000 printed.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Elbert C. Dickey, Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.