

race, and that year over 250 students and faculty members competed. Dr. Pearson's legs were swift enough that day to capture first place in the Master's division.

This year his work commitments have reduced Dr. Pearson's running to 30-40 miles per week. He says he'd like to break three hours at the Drake Relays Marathon this year!

Running is pretty much a family affair for Dr. Pearson. His son, Bryan, is a junior in high school and a member of the Ames High School track team. They find time for some long runs during the year and have a favorite 16-17 mile course around West Lake Okoboji that they like to run during family vacations

in the summer. But other members of the family run too. His son, Todd, who is 12 runs up to 4 miles with him and his daughter, Julie, who is 9 runs up to 1½ miles. And when nobody else is available their dog, Penny, will run up to 5 miles.

Those of us who are more armchair-bound might regard his running schedule as a grueling test of courage, but like most avid runners Dr. Pearson runs for the pleasure of it. He says, "I run to relax. A long run is the best way I've found yet to get away from my problems."

Good Luck at the Drake Relays this spring, Dr. Pearson.

# Pseudorabies: Control and Prevention

by Larry Klarren\*

## *Control and Eradication of the Pseudorabies Problem*

This paper will discuss the problem of pseudorabies (PrV) and the measures which a veterinarian or producer may take to control the disease, as well as what the federal government is currently planning to do to help control the disease.

### *The Pseudorabies Problem*

Pseudorabies has become a concern to the pork industry in the last few years. At this time there is much confusion among producers and veterinarians concerning the nature of the disease and how it should be handled. Laws vary greatly from state to state and often change.

Some people claim there is not a great financial loss due to PrV. This may be true in terms of the entire United States, but in the areas where PrV is a problem, many herd owners are suffering devastating losses. For example, in Hardin County, Iowa; where one

of the earliest outbreaks of PrV occurred, \$467,000 were lost on just sixteen farms.<sup>1</sup> Of this amount \$109,007 was actual loss to the producer as money already used to bring the pigs to the point at which they were lost and \$353,580 was lost as potential profit on those pigs which died.<sup>2</sup> One producer claimed that it was impossible to control the disease on his farm and he lost 25% of the pigs he farrowed to PrV alone.<sup>3</sup> Other farmers have had to go through the expense of depopulating and buying new breeding stock or go to much expense in testing and retesting pigs for titer to the disease.

Total losses to PrV in 1976 were estimated at \$13,006,000.<sup>4</sup>

Other losses are less direct. Producers are hesitant to buy breeding stock from a farm which has had PrV, even if it has been tested negative. In fact, some are even wary of buying from the same area. The progress of the industry has been slowed because many animals have been withheld from type shows or tests because of slim possibilities of contracting the disease, thus some superior animals are never recognized.

Pseudorabies is caused by a heat and ether

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sensitive Herpesvirus. In terms of survival and sensitivities, it is very similar to the TGE virus. It was not a concern to most U.S. producers until 1962 when the incidence began to increase in Indiana. It is thought that the virus may have undergone some change in virulence which increased its pathogenicity. The disease has now spread to several areas in the U.S. and incidence is increasing.

Pigs infected while less than 10 days old and especially less than 36 hours old or born from clinically infected sows show clinical signs of vomition and diarrhea which are followed by evidence of CNS signs; circling, paddling, shaking, incoordination and coma. Temperatures increase to 105.5° F and then steadily fall, usually resulting in the death of the pig. Blood work does not show any consistent changes except for a slight neutrophilia.

Pigs three to four weeks old show similar clinical signs, although they may be constipated rather than have a diarrhea. In older feeder pigs there may be a mild cough followed by a slight temperature increase, constipation and anorexia. About the fourth day CNS signs may be evident, including convulsions accompanied by excessive salivation. The course of the disease in these pigs is four to eight days. When other pigs come in contact with a pig shedding the virus they may show clinical signs in three to four days. In a group of feeder pigs there will be a continual exposure and infection which will cause a herd course of approximately 12 days.

In gilts and sows, an upper respiratory disease is often noted, accompanied by anorexia and depression. Bloodwork again shows only a neutrophilia. After about four days the sow or gilt will either improve clinically or will start to show CNS signs and die.

If pregnant animals are exposed and infected, about 50% will abort. If the pig is in the first month of pregnancy, it is more likely to abort. In later pregnancy there is less probability of abortion, but fetal retention is likely. She will probably deliver a macerated fetus.

Atypical forms of the disease do occur. These may occur by natural inoculation or by a rather unusual method such as being inoculated subcutaneously or intramuscularly by a barb of wire. Flaccid paralysis has been rarely observed in these situations.

Pseudorabies is known as "Mad Itch" in other species but on rare occasion pruritis has been observed with intranasal exposure in pigs.

The disease is considered endemic in three areas of the U.S. These are Northwest Iowa; Pike County, Illinois; and Carroll County, Indiana. In the state of Iowa about .5% of all swine slaughtered test positive<sup>5</sup> but in certain small foci the incidence has been as high as 50 or 80%.<sup>6</sup>

A typical case history usually begins with introduction of new animals into the herd, unusual exposure to a wild animal (usually a raccoon or skunk) or a dog or cat being sick and dying on the farm. Usually a nonspecific respiratory syndrome is seen in the market pigs or breeding herd shortly after this incident. At the next farrowing several syndromes are seen such as shaker pigs, neonatal deaths, paddling weak pigs, stillbirth, fetal resorption, mummies and macerated fetuses. Often this is misdiagnosed and attributed to the SMEDI syndrome.

After these events, the course on a farm will vary with management, especially the amount of exposure of different groups of hogs to each other on the farm. Especially dangerous are common water sources.

If no control is attempted, the disease may be one of insidious losses. Sometimes the producer decides he can't live with it and gets out of the swine business.

### ***Tools We Have To Use in Pseudorabies Problems***

At this time there is only one test that a practitioner can use to confirm the diagnosis of PrV in a live animal, the serum neutralization test. Serum, or clotted blood, is sent to the state diagnostic lab, or a commercial laboratory, where the test is performed. The serum is placed in a tissue culture to see if growth of the virus is inhibited. If the virus is inhibited, or neutralized, it is due to previous exposure to the PrV virus. A positive test indicates exposure and immunity to the disease but does not rule out the possibility that the animal is a carrier. Three percent of sero positives tested have been found to be carrying the virus.<sup>7</sup> Usually the virus is found in tonsillar tissue.

A fluorescent antibody test is being developed in the U.S. This test is thought to be less sensitive than the serum neutralization

test.<sup>8</sup> It can be used for a quick diagnosis of the presence of the virus in dead animals. Brain or tonsil tissue must be sent to the laboratory on ice. If the transit time would be greater than 24 hours then the tissues should be frozen in dry ice. Antibodies labeled with a flourescent dye are added to the tissue in a slide section and observed for the presence of a grouping of the antibody around the virus.

A skin reaction test is also being investigated here in the U.S. It appears that results correlate well with the serum neutralization test. This test is used in Hungary and a positive result there is considered to diagnose an animal positive for PrV. U.S. authorities do not agree at this time.<sup>9</sup> If the test is released in the U.S., it may be administered by the producers themselves. The technique is not difficult. Antigens are injected intradermally or into the lower eyelid and the area is observed for the inflammatory action.

In Hungary where the skin test is used extensively antibodies have developed to the PrV antigen in about three weeks.<sup>10</sup> However, in the U.S. research at the Ames NADC lab, formation of antibodies has not been seen.<sup>11</sup> This would be a good test to be used on new animals before bringing them onto the farm.

This summer Norden laboratories introduced a tissue-culture modified live virus vaccine to the U.S. market, which is known as Pr-VAC. This vaccine may be administered to any age swine except those which have a passive antibody due to maternal antibody or the use of hyperimmune serus. It provides immunity to clinical signs of PrV, and the resulting economic loss. But it does not prevent establishment of the virus in tonsilar tissue or the resulting carrier state. For this reason there was much debate prior to release of the vaccine whether the USDA should approve the vaccine, as resultant carriers may increase the spread of the virus around the country. A similar vaccine has been widely used in Europe and has not helped to control the spread of the virus. The federal government has decided to allow each state to implement its own laws. Presently in Iowa a producer must get a permit from his state veterinarian and have the pigs vaccinated by a practitioner. These permits are issued only for infected herds, herds adjacent to infected herds, and in endemic areas. Unvaccinated animals from these herds should be tested

before moving into other herds.

This is a summary of vaccinations in 52 of Iowa's counties during the month of September 1977.<sup>12</sup>

Swine	68,462
Sows	3,751
Gilts	784
Feeder pigs	684
Baby pigs	247
Boars	133
	<hr/> 74,061

There is much potential for the veterinarian to provide a service by vaccination for this disease.

Current federal recommendations are to vaccinate only infected herds and to control movement from these herds. A new federal regulation on movement of hogs will be discussed later.

Often wildlife is blamed for the introduction of PrV virus into a herd. Usually this would be a raccoon, but sometimes even dogs or cats are suspect, and occasionally skunks. Research has supported the possibility of a direct transmission from a raccoon, but not from a dog or cat.<sup>13</sup> Exposures from a dog or cat to a pig or vice versa has only been shown to occur by exposure to the carcass of animals that have died of the disease.<sup>14</sup> For example, a pig may die of PrV and be thrown outside the building, or into a manure spreader and spread onto a field. Another farmer's dog, while roaming, may carry the carcass home with him and leave it in the feedlot where the pigs would have direct exposure to the virus; or the dog might contract the disease at that time and happen to die in a lot where the pigs are confined. It should be noted that many dogs choose to sleep in a warm hoghouse, especially in the winter when cold temperatures allow the PrV virus to survive until the dog takes the carcass. No PrV virus has been isolated from skunks or rats.<sup>15</sup>

In the past it has been said that all cattle infected with the virus would die from the "Mad Itch" syndrome. Since the recent increase in incidence in swine, several cattle herds have been noted to be "not right," or off feed, or have other non-specific signs. Two cattle have even been shown to respond positively to the serum neutralization test.<sup>16</sup> It is known that cattle may get PrV directly from pigs such as through a bite or sharing a common water source, but it is not known if

the reverse is true.

### *Approaching the Pseudorabies Problem*

Of course the most desirable problem from a producer's point of view is keeping PrV out of his herd. A herd can be considered negative only if a serum neutralization test of all animals in the herds shows no titer to the disease. Absence of clinical signs cannot establish the herd free of PrV. All of the animals may be immune and thus not show clinical signs and even be capable of carrying the virus. It is in their own interest for most seedstock producers to test their herd and find out where they stand.

If the testing established that a producer's farm is negative, he should endeavor to keep PrV out of his herd. This may be accomplished by sensible management. No new animals should be brought to any farm unless the animals have been tested negative for PrV within the prior thirty days. These animals should then be isolated thirty to sixty days and then retested. If still negative, they may be considered acceptable to add to the herd. This is the same procedure that should be followed for adding pigs to the herd to decrease the danger of introducing other diseases. Some producers and veterinarians prefer to place market hogs or cull sows in the isolation pen and watch for signs of sickness. This has the advantage of helping the new animals to develop an immunity to endemic disease in the herd. Sometimes a sheep is used because of the obvious symptoms. If a person would want to do this they should wait thirty days and draw blood for PrV, and whatever other diseases they wish to check for possible carrier status. At this time they could then add the sentinel animal. As a matter of practice, no animals from the farm should be placed in isolation pens with the intent of readmitting them into the herd later. If management is at a level that AI breeding may be utilized, it may be possible to never introduce a new animal into the herd.

Vaccination is not necessary in a herd which is negative for PrV if these controls are followed.

In the herd which is PrV positive there are several courses of action which may be taken. The best of these probably varies with each herd. At times a combination will be most effective.

One plan often advocated is depopulation, followed by an idle period in the facilities during which the buildings are thoroughly cleaned before repopulation with animals that have tested negative. Some herds which used this approach have become reinfected soon after repopulation. These farmers may not have adequately sanitized the buildings, or they may not have investigated the original source of the virus adequately.

Another plan is to vaccinate all pigs at six to eight weeks, after maternal immunity has worn off, and saving replacement gilts from these pigs. An active vaccination program must be followed if this is done. This should include the boosting of immunity in sows by revaccination prior to farrowing to increase the amount of maternal immunity. New boars must also be vaccinated because the vaccinated sows may be carriers of the disease. Hungarian farmers have credited the vaccination approach with decreasing losses to two pigs per litter.<sup>17</sup>

Some farms have reestablished negative herds without complete depopulation by removing all positive animals and retesting every thirty days. At least two consecutive negative tests for the entire herd are needed to indicate control. This is very expensive and can be a very long procedure.

Some producers have chosen gilts from a litter which have shown no clinical signs, and weaned them at four weeks of age while they still have a maternal immunity. These gilts were then isolated; using them to establish a negative herd.<sup>18</sup> Apparently this has worked very well.

In the face of an outbreak where baby pigs are being lost, some veterinarians have been prescribing hyperimmune serum. Five to ten ml. is given subcutaneously to susceptible pigs. This provides a 48 hour immunity. In several herds which were suffering an average loss of 49.8% of baby pigs, ranging from 30.2 to 80.4%, this method was used. Losses were reduced to an average of 22%, ranging from 3.6% to 53.6%.<sup>19</sup> It is not known if all of the decreases can be attributed to the disease, as sows which farrow later in the outbreak may have developed a titer and some colostral antibody. The death rate in pigs from immune sows is 25% less than in sows that are not immune.<sup>20</sup>

Unfortunately, there is no source of hyperimmune serum. Some veterinarians

have used up old stocks of hog cholera vaccine with varying success, which may indicate that PrV, at least in a milder form, was around in the 1950's. Some veterinarians have also produced their own serum but no drug company is expected to enter this market, as they have with erysipelas, because of the relatively small scope of the problem.

### **USDA Plans**

In March of 1977, a USDA-industry group issued a resolution calling for a national plan to control and eventually eradicate PrV.<sup>21</sup> This plan is to be a three stage procedure:

- 1) The preparation stage would be a time of information gathering, standardizing tests and requirements of various states.
- 2) The control stage would be one in which we tried to control the movement of the virus and perhaps concentrate it in a few herds. This would include the testing of breeding animals moving interstate and intrastate, mandatory reporting of outbreaks, tracebacks to herd of origin, quarantines, extermination of wildlife which are infected, restrictions of movement, testing and culling procedures, and vaccination.
- 3) The eradication phase would include depopulating infected herds and the paying of indemnity, prohibiting vaccination, and controlling movement of infected swine.

This summer the USDA began to set up the regulations for the control phase by issuing a resolution with a comment period which expired last July 26. After a few modifications depending on the comments, the plan will be published in federal lawbooks and take effect early next year. The plan was published with the following purposes:

1. Determining the extent and location of PrV infection in the U.S. This may include testing all boars moved in the nation, tracing reactors to the herd of origin, and establishing a uniform system for reporting positives.
2. Vaccination of infected herds along guidelines established as needed by the states.
3. Establish uniform procedures for clearing infected herds. This would include testing and isolation of negative animals with a

retesting of negative status before shipment.

4. Establish uniform methods for maintaining negative herds. The current proposal would require 25% of the herd to be retested each three months.
5. Establish the epidemiology of the disease.
6. Adapt uniform state and federal shipping regulations.
7. Establish a national information center.
8. Fund and conduct more research of vaccines, wildlife and handling of the virus.

This plan will only slow the spread of the virus and help the buyer and the producer to know where the herd situation is at.

Currently in the state of Iowa a herd may be "certified" on the basis of a negative test of all breeding stock greater than six months old, plus retesting 25% of all breeding stock every 90 days.

The federal government has already set up the control stage by adopting several terms to use in describing the status of a herd and has set up a plan controlling movement of all hogs with respect to their herd status.<sup>22</sup> This plan will also take affect in early 1978.

A *Qualified Herd* is one in which all animals test negative and 25% are retested every 90 days. Under plans currently being considered, unvaccinated animals from these herds would be able to move anywhere in the U.S. as long as they aren't mingled with other classes. Vaccinated animals from a qualified herd will be allowed to move only by approval of the state to a quarantined herd or feedlot. By definition a quarantined herd is one in which all animals are destined for slaughter or another quarantined herd. Feeder pig lots qualify as a quarantined herd, but groups of replacement gilts, or boars, do not. A ½ inch hole must be punched in the ear of vaccinated animals moving from qualified herds.

A *Qualified Vaccinated herd* is one in which all breeding stock test negative and then are vaccinated. Twenty five percent of all pigs farrowed from these stock must be tested and found negative at 3-4 months and a different 25% tested every 6-8 months. Unvaccinated pigs may be moved without restriction but must be tested if they haven't been already, unless they are going to a quarantined herd or feedlot. Pigs which have been vaccinated may move only to a quarantined herd or feedlot.

*Herds of Unknown Pseudorabies Status* will not be able to move pigs except to quarantined herds, unless a veterinarian signs a health certificate and they are tested negative within thirty days prior to shipment. If pigs of unknown status are vaccinated then they may move to other herds only when accompanied by a health certificate, prior approval of the state veterinarian in the state of destination, and a ½ inch hole is punched in the left ear.

*Infected Herds* are those in which clinical signs are evident or there is a positive test. There herds remain in the infected category until the animals are all tested negative or the herd is depopulated and entirely restocked with negative animals. Pigs from these herds must be vaccinated to be eligible for interstate movement. If pigs are vaccinated, interstate movement is possible if the owner and a veterinarian sign a certificate stating that the herd of origin is known to be infected with PrV, and that no clinical signs have been evident in the herd for two weeks. The state veterinarian in the state of destination must then send a statement acknowledging the herd of origin has the status of a herd infected with PrV. Even then these pigs may go only to a quarantined herd and a hole must be punched in the left ear.

The PrV problem will not end as quickly as it developed, and it will not end by itself. Hopefully, this paper will help the reader to understand what may be done by the producer, the veterinarian and the USDA to keep this problem at a minimum.

## Footnotes

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The following awards were presented at the Fall Banquet, October 6, 1977.

The *Merril B. Anderson Award* to Tom M. Chaillie.

*Allen Product Co. Scholarships* (Alpo Awards)

Vm I—Karen H. Stuedemann

VM II—Mark J. Engle

VM III—Robert D. James, Jr.

Vm IV—Elizabeth J. Rapien

Doctor Dennis M. McCurnin, Associate Professor of Veterinary Clinical Sciences and Assistant Dean, was presented with an *Auto-Tutorial Excellence Award* from the National SAVMA.