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Practical Detection of Bordetella Rhinitis in Swine Herds

Lauritz Larson*

In an interview with Dr. W. P. Switzer, the following information was obtained concerning Bordetella rhinitis:

History

The first reports of turbinate atrophy in swine were from Germany in 1831. Since then many articles have been written about the subject to prove or disprove the cause as being infectious, heritable, or nutritional. Attempts to demonstrate that it was transmissible were not conclusive until recently, although herd history indicated it to be transmissible. No causative agent was established until *Bordetella bronchiseptica* was isolated. After finding in 1956 that this organism produced turbinate atrophy, work progressed rapidly.

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Economic Significance

The economic effects of turbinate atrophy are difficult to evaluate. In older literature, turbinate atrophy was considered to have severe economic effects, but upon more research, it was found that uncomplicated atrophy had minor significance. However, when associated with other conditions, such as mycoplasma pneumonia, great economic loss results. This intensifies the primary condition causing a loss of certain defense mechanisms such as filtration and warming of air.

Cause-Isolation of Organism

The major cause of turbinate atrophy is infection of young pigs with a virulent strain of *Bordetella bronchiseptica*. This
is the only primary organism known to be the cause of turbinate atrophy.

This condition is primarily a surface infection of the nasal and respiratory mucosa. The nasal cavity is the major site of proliferation of the organism. Since it does not invade to any appreciable extent, nasal swabs are highly effective in demonstrating this organism. The collection of swabs from pigs and sows is complicated by the problem of restraint. A hog catcher is a necessity. The swabs are cultured on selective media and the *Bordetella bronchiseptica* is identified by simple bacterial means.

No adequate serological test is currently available for diagnosis of Bordetella rhinitis, because it is probably a surface infection. The lesions are produced by an unknown substance which has the property of being diffusible.

To produce turbinate atrophy, the infection has to become established early in the pig's life, and the infecting organism has to be of a virulent strain. Not all pigs from which it is recovered have turbinate atrophy, but most all with atrophy have had a Bordetella infection.

In clinical cases, there is a two-phase transmission:

1. A generation to generation transmission as a result of infected sows transmitting the organism by aerosol exposure to their offspring.
2. Infected pigs serving as aerosol transmitters to cause spread from litter to litter.

A third minor phase is that *Bordetella bronchiseptica* is not just a swine organism. It will infect many species of animals including dogs, cats, and even man. Some of the cultures from other species can cause turbinate atrophy.

Cultural detection can be used to break the generation to generation cycle. This involves the culture of the nasal cavity of breeding animals with the elimination of positive reactors. The efficiency of the cultural detection is approximately 96%.

It is advisable to have three cultures made one to two weeks apart. The reason for this is that if three tests are superimposed, the chances of missing a positive reactor are very slim. This method is a very accurate test. The best time to take nasal swab cultures is when there is the least number of hogs on the premise, such as, when just the breeding herd is present and farrowing has not started. This is often impossible in a continuous farrowing setup. A break in the cycle or a segregated breeding herd is the next best alternative.

**In An Outbreak**

Older animals are somewhat resistant to infection so they do not have to be moved to a new location. In outbreaks in pigs, the majority will be positive to the organism. Therefore, to use the culture test as a herd diagnosis, it is best to sample pigs from four to twelve weeks old.

**Procedure**

To collect the swabs, use sterile cotton-tipped applicator sticks. The selective media used is MacConkey's agar with 1% dextrose added. The dextrose is not essential but it is helpful for determination of dextrose fermentation. This agar preparation can be purchased at any one of several culture media supply houses. This media inhibits about 90% of the unwanted nasal organisms and the lactose and dextrose ferment the media red. Bordetella will appear as clear, medium-sized, smokey-tan, translucent colonies on the plate after 48 hours incubation. Transfer the colony into tryptose broth, grow overnight, then seed into lactose, dextrose, litmus milk, urea, and Simmon's citrate agar. The following results will be proof of *Bordetella bronchiseptica*:

1. No fermentation of lactose or dextrose.
2. Litmus milk after 24 hours of incubation will show a characteristic deep blue ring as time progresses, the blue ring will go deeper in the tube. No digestion of the litmus milk will take place, however.
3. Urea—this bacterial organism will split urea within 24 hours, being a very fast urease producer.
4. Simmon's citrate—*Bordetella bronchiseptica* will be able to utilize citrate as its sole source of carbon.
Discussion

The diagnosis of atrophic rhinitis in swine can be made by a practical cultural technique. Although the procedure in a large number of swine can be quite tedious, accurate results can be attained. Nasal swabs streaked onto MacConkey's agar and incubated at 37°C will produce colonies in 48 hours if the animal is positive. In an additional 24 hours positive proof can be attained by results of various reagents, namely Simmon's citrate, urea, litmus milk, lactose and dextrose. Three cultures taken one to two weeks apart are recommended to avoid the miss of an affected animal. Positive reactors then can be eliminated or segregated from the rest of the herd.

REFERENCES


DEAN'S REPORT

These are difficult times for all in higher education due to concerns about the Vietnam war, relevancy, finances, faculty salaries, funding of building programs, equipment and supply budgets.

At times like these I am truly thankful that I am a member of the Veterinary Medical Profession; thankful for our outstanding students, faculty, alumni; thankful for the support of the Iowa Veterinary Medical Association and the American Veterinary Medical Association.

Iowa State University Veterinarian