Porcine Pleuropneumoniae (Actinobacillus pleuropneumoniae, APP, Haemophilus pleuropneumoniae, HPP) – Pork Industry Handbook
Michigan State University Extension Service
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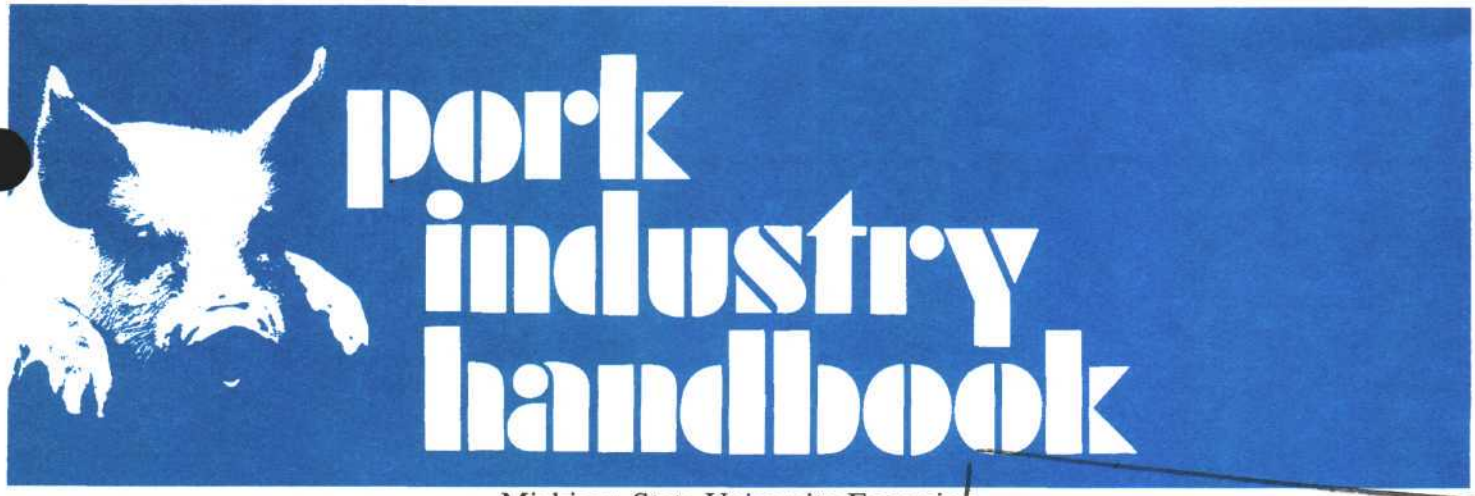

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(Actinobacillus pleuropneumoniae, APP, Haemophilus pleuropneumoniae, HPP)

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In the mid to late 1970's, porcine pleuropneumonia emerged, internationally, as a serious respiratory disease of swine. This often fatal disease, affecting primarily growing-finishing swine, is caused by a bacterium called *Actinobacillus pleuropneumoniae* (APP). The organism was formerly called *Haemophilus pleuropneumoniae*, and the disease is still referred to by many as *Haemophilus* pneumonia or Hemophilus pleuropneumonia (HPP).

APP has worldwide occurrences and causes significant economic losses, especially where hogs are raised in continuous flow operations. APP infection is common in the United States. The majority of infected pigs are asymptomatic carriers of APP. The development of clinical disease causing severe economic consequences depends on many factors such as the virulence of the APP serotype and number of APP bacteria to which the pigs are exposed.

Serotypes

There are 12 serotypes of APP in the world, and cross reaction and untypeable strains occasionally do occur. The serotype is largely determined by antigens in the capsule of the APP bacteria. In the United States, the most common are serotypes 1, 5 and 7.

Identification of APP serotype is important because protection provided by currently available vaccines is serotype specific; the serotype to be protected against must be in the vaccine. Also, differences in virulence between serotypes have been reported. Pigs that are vaccinated with one serotype might develop clinical disease if exposed to pigs infected with a different serotype. Natural infection will induce protection from all serotypes because of the antigenic differences between the APP used in vaccines and the natural, unaltered APP.

Clinical Signs

Clinical signs frequently have a sudden onset especially after a stressful situation such as moving or mixing pigs and rapid environmental temperature or ventilation changes. The first symptoms include stiffness, lameness, anorexia (loss of appetite), lethargy, coughing, a high fever between 104° F and 107° F, depression, reluctance to move, abdominal breathing (thumping) and sudden death. Bleeding from the nostrils may occur in the terminal stages and at death.

Few diseases progress faster than APP. A pig may die four to eight hours after exposure to virulent organisms. Because the organisms are spread through the air by aerosol droplets, the number of pigs affected in the group can reach 100%, and death loss can approach 20% to 40% if left untreated. Growing-finishing pigs between 40 and 250 lb are most commonly affected; however, susceptible swine of any age can become infected. The rapid course of the disease and the spread through a pen necessitate a quick, accurate diagnosis coupled with appropriate antibiotic treatment to minimize death loss.

Clinical and Bacteriologic Diagnosis

Clinical signs in combination with characteristic lung lesions usually are sufficient to make a presumptive diagnosis. The disease can be fatal by itself, or it can occur along with other bacterial diseases such as *Pasteurella multocida*, mycoplasmosis, salmonellosis, and parasitic diseases such as metastrongylosis, and viral diseases such as

pseudorabies, swine influenza and porcine reproductive and respiratory syndrome (PRRS).

APP should be cultured from the lung for a definitive diagnosis. Large blocks of affected tissue or the whole lung should be submitted on ice in a waterproof bag to a diagnostic laboratory for culture, identification of serotype and antibiotic sensitivity testing. Accurate identification of APP can be made by culture on blood agar crossed-streaked with a non-hemolytic staphylococci which furnishes the V factor necessary for APP to grow. APP produces small mucoid hemolytic colonies which grow around or satellite the staphylococcus colony. Biochemical tests are performed on the isolate to confirm that it is APP. Serotyping and antibiotic sensitivity testing for therapy determination can be conducted using these APP isolates.

Serologic Diagnosis

Serologic tests not only determine APP serotypes, but also help to identify any clinically healthy APP carriers in a herd. This knowledge is particularly important when new pigs are added to a herd or when a new herd is established.

The three serological tests most commonly used to detect APP antibodies are the complement fixation (CF) test, ELISA, and the cytotoxin neutralization (CN) test. Each of these tests has peculiar advantages and disadvantages. For example, the CF test has a high level of specificity, but a low degree of sensitivity, and it occasionally produces false negative results. The CF antibodies are relatively short lived so the sensitivity is especially low with long-term infections. The CF test has been the most commonly employed test because maximum specificity is desired when evaluating herds and low sensitivity can be overcome by a large sample size.

The ELISA has a high sensitivity, but low specificity. The ELISA test is recommended over the CF test when testing individual pigs to identify all positive animals. The ELISA occasionally produces false positive results. The CN test has a high sensitivity and specificity, and it will not give false positive results with APP vaccinated pigs as will the CF and ELISA tests. However, the CN test will not detect serotype 7, and it is relatively expensive and complicated to perform. It is important to remember that test results may vary from laboratory to laboratory regardless of which test is used.

Testing at least 30 animals and using a combination of tests gives serology good reliability on a herd basis.

Therapy

In an acute outbreak of APP, high levels of effective antibiotics in the blood stream and in the lung tissue are the most efficient treatment. Dosages of antibiotics must be at the high end of their approved range.

In the United States, penicillin, penicillin analogs, ceftiofur, and tetracycline, have given good results when injected into all animals in the same pen. The most effective antibiotic for a particular APP outbreak is determined by antibiotic sensitivity testing.

The addition of tiamulin or tetracycline to the drinking water or high levels of tetracycline in feed and water medications is ineffective during acute outbreaks of APP. Clinically affected pigs are anorexic and their water intake decreases so it is difficult to obtain therapeutic blood levels of orally ingested antibiotics. However, studies indicate feed-grade antibiotics can reduce the death loss and severity of clinical signs. Treatment costs can add substantially to the total economic impact of an outbreak of the disease.

Control and Prevention

Asymptomatic, infected pigs are almost always responsible for transmitting APP from one herd to another. Whether or not the exposed pig develops clinical disease depends on many factors including the virulence and the number of APP organisms in the environment, the immunologic status of the pig, the presence or absence of infection with other pathogens, air exchange rate in the environment, density of the pig population, and other stress factors in the environment.

Serology may be used to determine if pigs have APP antibodies and what serotype or serotypes, if any, are present in the herd. Once this information is available, pigs from different herds can be commingled based on matching immune status; that is, seronegative herds should get only seronegative pigs and positive herds should receive only pigs that are positive for the same serotypes.

Currently available vaccines do not completely block infection, death loss, lung lesions or the development of carrier pigs; however, these vaccines are a useful tool to reduce death losses and lesion development in some herds. Vaccines are the most effective when matched with the serotype of the APP causing the clinical disease.

The *A. pleuropneumoniae* organism produces at least three protein cytotoxins: hemolysin, cytolysin and pleurotoxin. Neutralizing antibodies to these toxins are an important component of protective immunity. Current vaccines fail to induce substantial toxin neutralization titers. Inclusion of these toxins in future vaccines should enhance efficacy and protection by vaccination.

Since immunizing agents fail to induce protective immunity reliably, herd management methods such as all-in, all-out movement with thorough clean-up between groups, and age segregation by group to keep young pigs from being exposed to older APP carrier animals have been applied to help control APP. Also, removing pigs from their mothers while the maternal immunity is still high can eliminate the disease from the group. Recent research shows that pigs weaned at less than 16 days of age and raised with or without medication in isolation are less likely to develop APP.

Early weaning, age segregation and all-in, all-out procedures may be the best present answer for control and eradication of APP.

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