



# Swine Pneumonia

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**P**neumonia is an important disease of the lower respiratory tract that impairs animal health and lowers individual and herd performance in swine. "Pneumonia" means inflammation of the lungs. It may be minor, subsiding quickly, or develop into advanced pneumonia.

The cause of the lung inflammation and the development of complications, such as secondary bacterial infection, generally determine how severe pneumonia becomes. Coughing and "thumping" (shallow, rapid breathing) are typical symptoms of pneumonia in swine. As the pneumonia becomes more severe, appetite and growth rate decrease, feed is utilized less efficiently, hogs may become chronic poor-doers, death may occur and treatment and control costs escalate.

Possible causes of pneumonia are bacteria, viruses, parasites, extreme daily temperature fluctuations, chemicals (manure gas), dust and other respiratory tract irritants from the environment. Most of these are inhaled into the lungs. Infectious agents such as certain bacteria may reach the lungs through the blood stream. Parasites reach the lungs by larval migration through blood vessels, tissues and organs.

Atrophic rhinitis and upper respiratory system disease in swine are discussed in the Extension fact sheet L-2193, "Atrophic Rhinitis."

## Bacterial Causes

*Mycoplasma hyopneumoniae*, the pneumonia agent present in virtually all swine herds, is transmitted from sow to piglets in the farrowing house and from pig to pig in nurseries. After transmission, a variable incubation period ensues, followed by nonfatal pneumonia after the pigs are about 6 to 10 weeks old. *M. hyopneumoniae* infection weakens the lungs' normal



defenses, predisposing them to secondary infection by *Pasteurella multocida* and other bacteria. The secondary infection makes the lower respiratory disease worse than with the *M. hyopneumoniae* infection alone.

The combination of infections, first with *M. hyopneumoniae*, then with *P. multocida*, is considered the most frequent form of pneumonia, and is called "common swine pneumonia" or enzootic pneumonia. The cost in the United States for enzootic pneumonia has been estimated at \$4.08 per pig, not including the costs of drugs used to treat or reduce the effects of the disease.

*Actinobacillus pleuropneumoniae* (APP) type 1 and 5 cause a very severe form of pneumonia occurring usually between 8 to 26 weeks old. A milder form caused by APP type 7. All APP types are transmitted

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through respiratory tract secretions over short distances, such as nose-to-nose contact between adjacent pens of hogs.

Sudden death is common after unobserved symptoms or several hours of symptoms such as “thumping.” On finding a sudden death from *APP* infection, a producer usually says, “The hogs in this pen were fine yesterday, but this one was found dead this morning!” A bloody discharge from the nostrils is usual in hogs dying from *APP* infection. Recovered hogs grow slower than non-affected penmates and may suffer recurrent pneumonia episodes.

***Salmonella choleraesuis***, a post-weaning disease, initially causes a transient intestinal infection (usually without diarrhea) from oral exposure to contaminated feces, feed, water or environment. A bloodstream infection develops next. It can affect many organs, including liver, spleen, brain and lungs. Stressors such as shipment, moving and mixing with other hogs, poor sorting, overcrowding and outage of feed or water may predispose swine to salmonella disease outbreaks.

Few swine are usually affected, but of those affected, many die. Purple discoloration of the ears, snout, jowls and abdomen is typical after death, indicating that the hog died of a severe bloodstream infection as occurs with *S. choleraesuis* infection.

Lungs can be coinfecting with the enzootic pneumonia microorganisms (*M. hyopneumoniae* and *P. multocida*) and *APP* or *S. choleraesuis* or both, causing severe disease; likewise, lungs can be coinfecting with both *APP* and *S. choleraesuis* without enzootic pneumonia infection. Other bacteria such as ***streptococcal species***, ***Bordetella bronchiseptica***, ***Haemophilus parasuis***, ***Pseudomonas aeruginosa***, and ***Actinomyces pyogenes*** can cause, contribute to or be associated with pneumonia lesions in swine.

## Viral Causes

Several viruses are important causes of swine pneumonia. **Porcine Reproductive Respiratory Syndrome (PRRS)** is the most common. It is transmitted by contact with such body secretions as nasal mucus, feces and urine from infected, shedding swine. Although the PRRS virus generally does not survive for long in the environment, it may survive in chlorinated water for up to 7 days and be transmitted easily in contaminated watering systems. It is also transmitted in semen. Transmission by air over long distances is not considered important.

The PRRS virus can cause pneumonia in any age of swine, but younger pigs may be affected more severely. Because the lungs’ natural defenses are suppressed after PRRS infection, secondary pneumonia from a wide array of bacteria or viruses is common.

**Porcine Respiratory Disease Complex (PRDC)** is the term created recently in recognition that PRRS virus-induced pneumonia predisposes the lungs to a broad range of secondary bacterial or viral infections. Thumping is usually seen after PRRS virus-induced pneumonia. Affected swine may die or become chronic poor-doers and stop growing.

Pregnant swine infected with PRRS virus often suffer reproductive loss in the last trimester of gestation. Farrowing live pigs that do not survive or dead pigs 4 to 5 days before the due date are typical symptoms. Infected boars may have low fertility and intermittently shed PRRS virus in semen.

Up to 70 percent of U.S. swine herds are thought to contain PRRS virus-infected swine. It is also an important disease worldwide. PRRS is discussed in more depth in Extension fact sheet L-5137, “Porcine Reproductive and Respiratory Syndrome.”

**Swine Influenza virus** causes sudden, explosive coughing outbreaks in individual animals or herds, particularly in fall and winter. The “flu” virus spreads rapidly by air throughout all ages of swine. Coughing subsides by 10 to 11 days after onset. Few swine usually die, but deaths increase if influenza occurs as part of the PRDC syndrome. Rectal prolapses occur commonly in swine with severe coughing from “flu.”

Death, weight loss and treatment costs in hogs with rectal prolapse are part of the economic loss from an outbreak. Swine recovering from flu may take several weeks to regain condition, which increases feed costs and days to market.

**Porcine Respiratory Coronavirus (PRCV)** causes pneumonia and is a mutant of the Transmissible Gastroenteritis virus, which causes diarrhea and vomiting in swine of all ages. Transmitted by air, PRCV is important as a secondary viral infection as part of the PRDC syndrome.

**Pseudorabies virus (PRV)** is a **herpes virus infection** (totally unrelated to rabies virus!) that causes central nervous system disease in young pigs, reproductive losses from abortion and pneumonia in older swine. Transmission is through contact with virus-containing respiratory tract mucus and by PRV dispersed into the air from infected animals.

Secondary bacterial complications of PRV-induced pneumonia slow growth, worsen feed efficiency and cause some deaths. Common in feral swine, PRV infection is rare in domestic swine in Texas. U.S. domestic swine are expected to be PRV-free by the year 2000 or shortly thereafter. PRV may be a complicating viral infection in the PRDC syndrome.

## Parasitic Causes

Swine internal parasite eggs, such as from **roundworms**, survive for many years in soil or manure in lots or solid floor surfaces previously contaminated by infected hogs. Swine confined in these contaminated environments eat microscopic roundworm eggs. Larvae then emerge from the eggs, penetrate the intestinal tract lining and begin migrating through tissue. About 10 to 14 days after eggs are consumed, larvae migrate through the lungs, producing inflammation and coughing.

Secondary infection with *P. multocida* or other bacteria can occur, especially if affected swine are exposed simultaneously to adverse weather conditions or other stresses.

**Lungworm** eggs are coughed up, swallowed and passed in the feces of infected swine. Earthworms then eat the eggs and larvae emerge in this intermediate host. To be infected, a pig must eat earthworms carrying lungworm larvae. After the earthworms are digested, larvae migrate to the lungs, where they mature. Migrating larvae cause lung hemorrhages, and adults obstruct airways, predisposing the swine to infection from influenza virus, *M. hyopneumoniae*, or other bacteria. Heavy lungworm infection causes severe coughing.



## Other Causes

**Extreme daily temperature fluctuations** may irritate swine respiratory tracts, resulting in secondary bacterial infection with *P. multocida*. If levels are high enough, volatile chemicals from animal waste such as **ammonia gas** may predispose swine to respiratory tract disease. Swine may inhale fine particulate **dust (containing microorganisms)** and other environmental irritants such as **cell wall material (endotoxin)** from dead bacteria, causing inflammation of the upper or lower respiratory tract.

## Economic Losses

*APP*, *S. choleraesuis* and PRRS virus-induced (PRDC) pneumonia may cause death or chronic unthriftiness and stunting in recovered swine. Enzootic pneumonia, swine influenza, PRCV, PRV, roundworm larval migration, extreme daily temperature fluctuations, and environmental dust, gas or other irritants cause few deaths. However, they reduce appetite and growth rate, worsen feed conversion efficiency and cause unthriftiness, poor-doer syndrome and rectal prolapses

from chronic coughing. Treatment and control measures costs cause further economic loss. *APP* may result in carcass trim loss because of extensive adhesions in the thoracic cavity.

## Diagnosis at Slaughter

Swine veterinarians routinely inspect market hogs at slaughter to identify for their clients the specific disease conditions reducing production efficiency and causing carcass trim. Although often present in more than half of all marketed swine, pneumonia usually does not harm pork carcass quality (except for *APP* pneumonia, which causes extensive trim loss). Economic losses from pneumonia are predominately from death, reduced growth rate and inefficient feed conversion.

The effect of pneumonia on production efficiency may be determined by a veterinarian who combines the production records for growth rates, morbidity, mortality and percent poor-doer hogs along with findings from slaughter inspections of lungs and livers (evidence of previous roundworm larval migration through the liver to the lungs is liver “milk spots” or white scars).

The veterinarian and producer may then develop treatment and control strategies and monitor progress by follow-up slaughter inspections, coupled with production records. A veterinarian can also inspect swine that die on the farm after showing pneumonia symptoms. Samples can be submitted to a diagnostic laboratory for identification of the cause(s). Animals dead for only a short time and not treated with any medication make the best candidates for sampling. When the causative bacteria or virus is identified, the veterinarian can make specific recommendations for treatment and control.

## Live-Animal Diagnosis

Thumping and coughing are typical signs of swine pneumonia. Sickness is also demonstrated by a rectal temperature of 104 to 106 degrees F or above in an unexcited hog. Hogs sick from any disease, including pneumonia, usually lie down; therefore a sick hog in a group is the one that is lying down, while normal hogs are up and moving alertly, inspecting their surroundings.

Subclinical or a small degree of pneumonia may not be evident as a cough until an affected hog is walked. Thumping when resting undisturbed is a sign of severe, life-threatening pneumonia. Such swine may also be mouth-breathing at rest or when coaxed to rise and move. Mouth-breathing is usually a sign of impending death.

Thumping and coughing do not provide enough information to specify the cause of pneumonia. To help diagnose parasite-induced pneumonia, have a veterinarian examine fecal specimens under a microscope for roundworm and lungworm eggs. Sample older, recovered animals as well as recently coughing swine to improve chances of finding worm eggs.

Procedures to specifically diagnose bacterial or viral-caused swine pneumonia are usually impractical for live, commercially raised swine. However, information from dead swine — from laboratory analysis of samples taken from previous slaughter inspections, and from postmortem inspections of swine dying on the farm — can be very helpful in pinpointing the specific causes of pneumonia in swine on the farm and in choosing specific antibacterial drugs.

## Treatment

Swine exhibiting such pneumonia symptoms as thumping or coughing are best treated with injectable antibacterials. Tylan® 200 (Elanco) and Liquamycin® LA 200® (Pfizer) are examples of over-the-counter (OTC) antibiotics approved to treat swine pneumonia caused by *P. multocida*. Tylan® 200 has a 14-day withdrawal time and Liquamycin® LA 200® has a 28-day withdrawal time based on their use in accordance with strict label instructions.

Because sick swine may not eat or drink normally, treating them with antibacterials in feed or water is inferior to injections. Even if hogs are eating and drinking normally, feed or water treatment is generally less effective than injected antibacterials (Note that Pulmotil® is a very effective feed medication for pneumonia.). This is because approved injectable antibacterials reach affected lung tissue more effectively than the lower levels of antibacterials in approved feed or water medication.

Nevertheless, producers may need to mass-medicate groups of hogs that are coughing but still eating and drinking adequately. In such cases, a veterinarian may recommend chlortetracycline at the highest legal level of 400 grams/ton feed (zero day withdrawal at this level) until coughing subsides. Chlortetracycline (CTC 50 [Alpharma], AUREO-MYCIN® 50 [Roche]) at 400 grams/ton feed is approved to treat bacterial pneumonia caused by *P. multocida* susceptible to chlortetracycline.

For feed drugs, all extra-label use, or administration other than what is specifically listed on the label, is illegal. Drugs and their legal levels and indications for use are described in the *Feed Additive Compendium*, published by The Miller Publishing Company, 12400 Whitewater Drive, Suite 160, Minnetonka, Minnesota, 55343.

Swine respond better to treatment if the correct drug is injected soon after symptoms appear. Also, for a

better chance of recovery, move treated hogs into a sick pen to minimize the stress of being harassed by normal penmates. A veterinarian can recommend the appropriate antibacterial for treatment by injection, feed or water based on previous slaughter inspections of market swine, necropsies of and laboratory tests on swine dying with pneumonia symptoms, or examination of an individual or group of swine with pneumonia.

Some pneumonias may respond only to prescription or extra-label drugs that must be dispensed by a veterinarian to be used legally. For example, Naxcel® or Excenel® contain the same drug, ceftiofur (Upjohn), and are both approved as a prescription drug (not an OTC drug) to treat swine pneumonia caused by *APP*, *S. choleraesuis*, *P. multocida*, *Streptococcus suis* or combinations of them.

An extra-label drug is one approved for use in another animal species but not in swine; the veterinarian recommends it because no approved swine drug can reasonably be expected to treat the specific pneumonia diagnosed. A veterinarian-client-patient relationship (VCPR) should exist before such a drug is dispensed. It is illegal for a producer to use any drug (even an approved OTC swine drug) in an extra-label manner without specific recommendations from a veterinarian in the context of a VCPR.

A VCPR generally means that a local veterinarian has examined the sick animal(s) in question or, because of previous farm visits or slaughter inspections, knows of the disease problems on the farm where sick swine are located. The producer receiving instructions using the prescription or extra-label drugs must agree to:

- Use them properly;
- Identify treated swine; and
- Adhere to recommended withdrawal times.

The VCPR allows for the local veterinarian to be available for follow-up consultation if swine react adversely to the prescribed drug or if the drug is ineffective.

If internal parasites are a possible contributor to coughing and pneumonia, Atgard® C for feed (Boehringer Ingelheim), Ivomec® injection or premix (Merial), Dectomax® injection (Pfizer), levamisole (Levasole® for water, Tramisol® for feed [Mallinckrodt]), Safe-Guard® for feed (Hoechst-Roussel), Banmith® premix (Pfizer) and piperazine for water (Duravet) are effective dewormers for adult roundworms. Safe-Guard® is effective against some migrating larval stages of roundworms; Banmith® continuously in feed prevents roundworm larval migration by killing larvae as they emerge from eggs in the intestines.

Effective against lungworms are Ivomec® injection or premix, Dectomax® injection, Safe-Guard® for feed

and levamisole in water or feed. When using dewormers, read and follow label instructions carefully for withdrawal times. Safe-Guard® and Atgard® C have zero withdrawal days.

Controlling swine internal parasites is discussed in depth in Extension fact sheet L-2423, "Internal Parasite Control in Farrowing Operations."

To become better trained in preventing violative drug residues in pork, producers can participate in the ongoing **Pork Quality Assurance (PQA) program**, sponsored by the National Pork Producers Council. This program applies particularly to injected, feed or water antibacterials used to treat pneumonia and other conditions. Larger pork packers may require that producers participate in this program and be verified at PQA level III before they buy hogs from them.

For more information about this program, call the local county Extension agent, the Veterinary Extension office (409-845-4353) or the pork producers council (515-223-2600).

## Prevention and Control

Feed medications may be used to prevent pneumonia. Lincomix® 10 (lincomycin [Upjohn]) is an example of a feed antibiotic approved for swine to reduce the severity of *Mycoplasma pneumonia* caused by *M. hyopneumoniae* (at the 200gram/ton feed; 6-day withdrawal time). Pulmotil® 18 (Tilmicosin [Elanco]) is a feed antibiotic approved for controlling swine respiratory disease associated with *APP* and *P. multocida* (at 181 - 363 gram/ton feed; 7-day withdrawal time). Pulmotil® 18 can be used only after a licensed veterinarian has issued a **veterinary feed directive** for its use.

Weigh the cost-effectiveness of any preventive feed additive against other disease-prevention options such as vaccines and management techniques. Veterinarians can help producers make such decisions.

**Age-segregated rearing** is a term describing the management techniques of **All-In All-Out (AIAO) animal flow** plus weaning from 28 days down to 14 to 17 days old (early weaning). In AIAO animal flow, a producer removes all swine from a room or pen, cleans and disinfects the room and then moves a new group of similar-age swine into that room or pen. AIAO prevents disease-causing microorganisms from being transmitted from a group of older swine to younger, more susceptible animals in the same location.

**Early weaning** reduces the time of pigs on sows and thus the time that sows can transmit disease-causing organisms to pigs. **Segregated early weaning (SEW)** is a management technique in which pigs may be weaned at 14 to 17 days old. When early-weaned pigs are injected with antibiotics or sows are vaccinated pre-farrowing for specific disease-causing organ-

isms in the herd, the term **medicated early weaning (MEW)** is used.

For segregated or medicated early weaning to be effective, producers must provide early-weaned pigs an excellent nursery environment and special diets. When pigs are weaned at 28 days old or older but sows are vaccinated and pigs are medicated as in MEW, the term used is **modified medicated early weaning (MMEW)**.

Pigs grow much more rapidly in effective SEW, MEW or MMEW programs plus AIAO animal flow (age-segregated rearing) than those weaned at 28 days into continuous flow nurseries. To take full advantage of age-segregated rearing, maintain AIAO animal flow as these nursery pigs pass through the grower-finisher stage of production. In fact, later exposure of age-segregated reared pigs to groups of disease-carrying hogs can result in pneumonia, diarrheal disease and much economic loss.

Many **vaccines** prevent bacterial and viral pneumonia in swine. For example, to prevent pneumonia-caused *M. hyopneumoniae* infection, producers in virtually every farrowing operation should consider giving a killed *M. hyopneumoniae* vaccine such as Respire® (Pfizer Smith Kline Beecham, Inc.) in two doses to pigs at 1 and 3 weeks old. To prevent death loss from *App* pneumonia in show pigs, administer two doses of Pneu Pac®-ER (Schering-Plough) or Pleuroguard-4® (Pfizer Smith Kline Beecham, Inc.) at purchase and 4 weeks later.

In a herd using MEW where sow-to-pig transmission of *Actinobacillus pleuropneumoniae* needs to be minimized, sows may be vaccinated with either of these *App*-killed vaccines before farrowing. For terminal show pigs, use modified-live virus (MLV)PRRS vaccine such as RespPRRS/Repro™ (NOBL) or Prime Pac® PRRS (Schering-Plough) once in the first week after purchase or as early as 3 weeks of age. Do not expose PRRS virus-negative breeding swine to show pigs vaccinated with PRRS MLV vaccine.

Before using any vaccine, consider its cost-effectiveness. Consult a veterinarian for specific information on cost-effectiveness and instructions on using vaccines to prevent pneumonia in individual pigs and in swine herds.

Roundworm infection is best prevented by eliminating swine exposure to environments contaminated with worm eggs. To eliminate lungworm infection, separate swine from earthworms.

## Summary

Swine pneumonia can have many causes and may result in mild to severe disease symptoms and economic losses. Correctly diagnosing the specific cause(s)

of pneumonia is most important for the correct approach to treat individual animals and to treat, control and prevent pneumonia in swine herds. Veterinarians can help animal owners and producers diagnose, treat and prevent pneumonia in swine.

## For more information

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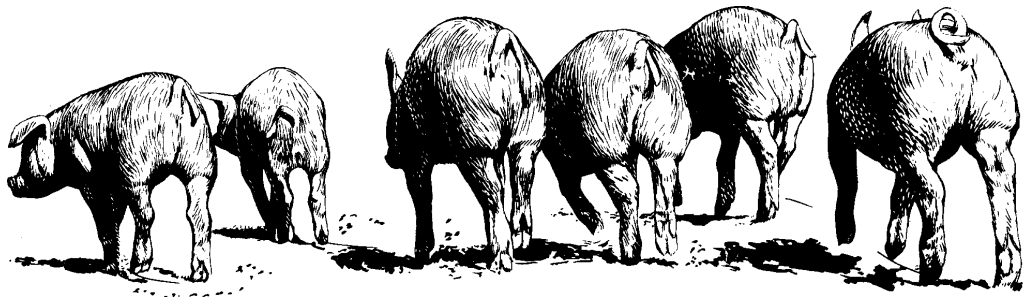
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