



Pneumonia's Fatal Grip

by: Heather Smith Thomas

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Pneumonia is, simply put, inflammation of the lungs. It can be mild or life-threatening (and quickly fatal) depending on its cause and the age of the foal. Pneumonia can be caused by viruses, bacteria, or fungi. Many foals are susceptible to developing pneumonia because of a lack of adequate maternal antibodies contained in colostrum. Very ill foals often will show few signs, so it is up to owners to know when a young foal "isn't right" and call the veterinarian immediately.

Lais Costa, MV, MS, PhD, Dipl. ACVIM, assistant professor in large animal medicine at Tufts University's Cummings School of Veterinary Medicine in North Grafton, Mass., says pneumonia is considered the main cause of morbidity and mortality in foals less than six months of age.

What Causes It?

In most cases, pneumonia occurring in foals one to six months of age is caused when the foal inhales the causative airborne organisms--viruses, bacteria, or fungi. Maternal antibodies start to wane when the foal is three to six months of age, so the youngster becomes more vulnerable to these agents.

"Newborn foals that for whatever reason don't get the antibody package in colostrum from the mare are at risk for developing infectious disease, but the lung is especially--and commonly--problematic," says Philip Johnson, BVSc, MRCVS, MS, Dipl. ACVIM, professor of equine medicine and surgery at the University of Missouri-Columbia. "Pneumonia, secondary to failure of passive transfer, is common at that age."

Pneumonia can start as a herpesvirus or influenza infection. The foal's lungs are weakened and his defenses are reduced, leaving the lungs open for bacterial invasion.

"Several types of bacteria are involved in pneumonia in foals, but most bacterial infections of the lung are secondary to an initial insult," notes Costa.

In newborn foals, notes Bonnie Barr, VMD, Dipl. ACVIM, of Rood and Riddle Equine Hospital in Lexington, Ky., the main causes of pneumonia are *Streptococcus* bacteria or gram-negative bacterial organisms such as *Klebsiella*.

Costa says many of the bacteria that cause pneumonia are found normally in the environment and only cause trouble when a foal's resistance is lowered by stress, viral infection, or some other problem.

"Many of these bacteria are part of the intestinal flora of horses," says Costa. "Virulent strains of *Rhodococcus equi* cause severe pneumonia in foals and may become endemic to a farm (see sidebar on page 58). Other bacterial agents such as *Streptococcus equi* (which causes strangles) may occasionally result in pneumonia, but strangles is usually just an upper respiratory infection."

Parasite migration, especially larval migration of ascarids (a common intestinal parasite of foals), can damage lungs and lead to a secondary bacterial infection.

There are many events in a foal's life that can stress him and hamper his immune system--anything from a long trailer trip to bad weather at weaning time, and from extreme heat or cold to poor air quality in a stall (dust from bedding or hay, or ammonia fumes from urine and manure).

If a foal less than one month of age develops pneumonia, you should look for other sites in the foal where the bacteria have caused infection. "The route of infection in neonatal foals is generally hematogenous (spread via the bloodstream)," says Costa. Thus, it could also settle in the joints or affect other organs of the body.

Diagnosing the Disease

Signs of pneumonia might be very different in the newborn foal than in an older foal. The newborn is more prone to lung infection originating from the bloodstream (introduced by bacteria gaining access through the digestive tract or umbilical stump). This type of infection doesn't create as many respiratory signs as infection originating from inhaled airborne pathogens. If pneumonia is due to septicemia caused by *Salmonella*, the foal might have diarrhea and possibly joint infection.

"The hematogenous infection stays compartmented between the layers of tissue in the lungs, rather than affecting the air passages, so it's more likely to remain at the alveolar level (within the tiny air sacs, where gas exchange occurs in breathing) or interstitial level (between the layers of tissue in the lung lining)," explains Costa.

With this type of infection, you don't hear the wheezing or crackling sounds of bronchopneumonia if you are listening to the lungs with a stethoscope.

"Thus, a newborn foal may have very severe pulmonary illness without having abnormal lung sounds or a cough," explains Costa. "People may think that since they don't hear wheezing or abnormal breath sounds, it must not be pneumonia. That makes newborn foals a lot trickier in terms of diagnosis."

Some of these foals have fevers, others have subnormal temperatures.

"The only clue may be that the breathing rate is increased and the breathing pattern abnormal or labored," says Costa. "Newborn foals do not have much glycogen storage, and when they are not nursing well (due to feeling sick), they become easily fatigued if breathing takes too much effort. This exhaustion may result in the respiration rate not being very increased; the muscles are not able to keep up."

Thus, a foal might give few clues to being ill. He might merely be too quiet, easier than normal to handle, or lacking energy. She tells clients that if a foal is too easy to catch, there is something wrong, and they should have a veterinarian look at the foal.

"Sometimes the foal will be panting, like a dog," says Costa. This might be due to hot weather, since foals rely on air exchange and lung dissipation of heat (more than adults do) as well as sweating, but panting can also be a sign of pneumonia. If a foal is putting a lot of effort into breathing, he might be reluctant

to lie down because it's easier to breathe (less pressure on the lungs) while standing.

In the older foal, fever and respiratory signs are more typical of pneumonia. "The foal might not want to nurse or eat, and this would be a clue to take his temperature," says Barr. "He may or may not have nasal discharge. You're more apt to notice depression and the foal being off feed."

One of the earliest signs might be that the mare has a full udder.

"If you notice anything unusual, have your vet look at the foal as soon as possible to listen to the lungs and do bloodwork," says Barr. "The veterinarian might also do an ultrasound or a transtracheal wash to get fluid for a culture."

"To obtain fluid to culture, we put a plastic tube down the trachea, put in some saline solution, and then aspirate it back out to get the sample," explains Barr. "We also look at the fluid under the microscope."

A veterinarian can look at this sample right after the fluid is aspirated from the foal, whereas a culture takes a couple days to grow--and you don't want to wait that long to start treatment.

"Sometimes you don't see anything on the slide, but it never hurts to look (for evidence of pneumonia)," says Barr. "Based on the size or shape of bacteria seen on the slide, we can recommend a certain type of antibiotic." This decision would be confirmed or changed later, depending on results of the culture.

Pneumonia can progress very rapidly in a young foal--resulting in death within a few hours. The "wait and see" approach (as is often taken with adult horses) often leads to treatment being given too late, says Johnson.

Treatment

"Most often we start with a broad-spectrum antibiotic such as penicillin and Gentocin (gentamicin)," explains Barr. "We also use chloramphenicol, given orally, especially if it's a strep or gram-negative organism. If we suspect a *Rhodococcus*, we usually use azithromycin and rifampin, which are both given orally. Penicillin and Gentocin are injectable."

Oral preparations come in pills or paste. If Barr prescribes a pill, she tells clients to grind it up and mix it with a little water so it can be squirted into the back of the foal's mouth. A little corn syrup (such as Karo) can be added to make it better tasting.

"If the foal is having trouble breathing, I may administer a bronchodilator (such as Ventipulmin) to open the airways," says Barr. Sometimes she keeps these foals on a little Banamine (flunixin meglumine) to reduce fever and inflammation. This will also make the foal feel better and thus encourage him to nurse.

If the foal is not nursing, he should be given fluid and nourishment. "This is usually done by IV (intravenously)," says Barr. "If he's that sick, I don't like to tube him because you don't want to create more stress. The foal is usually put into an air-conditioned stall to keep him cooler, and fluid is administered intravenously."

Johnson adds, "You also need to make sure the calorie balance is positive." The foal can be fed by stomach tube (milking the mare and administering the milk via tube) or IV feedings.

A newborn with serious pneumonia might need oxygen, with clinics setting up a ventilator and endotracheal tube to breathe for him, says Johnson.

If the foal did not get enough antibodies at birth and has developed infection because of that lack, Johnson recommends a plasma transfusion, along with antibiotics.

Prevention

Any kind of stress can make a foal vulnerable to respiratory infections. To help prevent pneumonia, minimize stress and make sure foals have a clean environment, free of dust and ammonia.

"Even dust in the paddock, such as around a gate or waterer--wherever horses are always moving--can irritate the lungs, says Barr. "Putting too many foals outside in a small lot can cause stress as well as stirring up dust."

Foals are vulnerable at three to six months of age when they are losing their maternal antibodies from colostrum and trying to build their own immune systems. Other risky times are when foals come into contact with strange horses.

"If horses are always moving in and out of the barn or farm, foals may be exposed to viruses that might set them up for pneumonia," says Barr. "If you have horses going and coming, in and out to shows, and so on, try to keep the foals in a different area or at one end of the barn and the other horses at the other end. Also, try to have just one person take care of the mares and foals who doesn't have much involvement with the horses that are going in and out.

"The other important thing is to vaccinate each mare prior to foaling, so she has strong maternal antibodies, and keep the mare and foal on a good deworming program," says Barr. "Anything you can do to add to the total health picture is important. Foals should be dewormed with a mild dewormer like fenbendazole starting at about four to six weeks of age."

Checking immunoglobulin levels in the newborn foal within 24 hours of birth is also important. "If these levels are unsatisfactory, consider giving a plasma transfusion and putting the foal on antibiotics," advises Johnson.

Take-Home Message

There are many things that can trigger an episode of pneumonia in foals, and you might not notice overt clinical signs until the foal is very sick. Because of that, take precautions to help the foal stay healthy.

Have the mare vaccinated properly throughout pregnancy, make sure the foal receives adequate colostrum in the first 24 hours of life, and avoid stress and exposure to "new" horses traveling on and off the farm. Also, deworm the foal appropriately, and most of all, keep an observant eye on him for any signs that he "just isn't right."

These management precautions will help you avoid pneumonia's sometimes fatal grip.

RHODOCOCCLUS PNEUMONIA

Even though this type of pneumonia is more common in older foals (up to six months of age), there is now evidence that the infection is picked up in the first few days of life, says Philip Johnson, BVSc, MRCVS, MS, Dipl. ACVIM, professor of equine medicine and surgery at the University of Missouri-Columbia.

Rhodococcus equi can become endemic on a farm, living in the soil for at least 12 months, to infect next year's crop of foals.

A foal might pick the bacteria up by inhalation (via dust from soil mixed with manure) or by ingesting his dam's manure (coprophagia, which foals instinctively do to obtain the microbes necessary for the hindgut to ferment and digest forage).

"The bacteria multiply in the digestive tract of adult horses and foals, resulting in large numbers of *R. equi* being deposited in the environment in manure," says Lais Costa, MV, MS, PhD, Dipl. ACVIM, assistant professor in large animal medicine at Tufts University's Cummings School of Veterinary Medicine.

"Bacteria in fecal piles multiply more effectively than in the gut, greatly amplifying environmental contamination. Warm temperatures increase bacterial multiplication, and foals may inhale organic dust (that includes manure), seeding the lungs with infection. Or the foal may swallow the organisms."

Up to 40% of foals with lung lesions will also have abdominal lesions, with bacteria found in mesenteric lymph nodes and abscesses in the abdomen. However, you usually don't see clinical signs of a problem until the foal is three to four months old.

"With *Rhodococcus*, you'll see respiratory signs, but because this is a disease that's been going for several weeks before you notice respiratory signs, the foal may be undergrown or have poor body condition," says Johnson. The foal may also have diarrhea or colic, joint enlargement, or inflammation inside the eyes. This type of pneumonia is often readily detectable with a stethoscope and is associated with abnormal breath sounds and fever."

Ultrasound exams and X rays can also show the changes in the lungs--the abscesses and cavities where there are pus-filled holes in the tissue.

R. equi is an intracellular bacterium that evades the immune system by hiding within the macrophages, which are the cells that are supposed to clean up the lungs, explains Costa. Since the bacteria are in the cells, antibiotics don't get to them very well, and the immune system can't effectively eliminate them.

"*R. equi* is a cousin to tuberculosis," she notes. "It hides in the lung the same way, and by the time you see clinical signs, there's a whopping infection. By the time the foal is coughing, there is severe lung damage."

An infected foal will amplify and shed bacteria, putting other young horses at risk. "The bacteria are shed through coughing, but also in the foal's manure," notes Costa. "The foal coughs, swallows bacteria that come up from the lungs, and the bacteria multiply in the intestine and come out in the manure."

Adult horses are also exposed, but rarely get sick unless they are immune-compromised --*Heather Smith Thomas*

ASPIRATION PNEUMONIA

Newborn foals are at risk for aspiration pneumonia if they have trouble swallowing. Milk gets into the windpipe and down into the lungs. A common problem in foals brought to the veterinary hospital at University of Missouri is milk pneumonia.

"Maybe the mare died or there is some problem with the foal and it wasn't nursing so the owner tried to force-feed it," says Philip Johnson, BVSc, MRCVS, MS, Dipl. ACVIM, professor of equine medicine and surgery at the University of Missouri-Columbia.

"Other reasons a foal might get milk in its lungs include structural abnormalities (such as a cleft palate) or a neurological dysfunction of the throat that makes swallowing inefficient," he adds.

Foals that survive difficult birth and reduced oxygen supply during or before birth might have nerve damage that makes it hard for them to swallow, he explains.

"If the foal can't swallow effectively and this is contributing to pneumonia, we put a muzzle on the foal, milk out the mare, and give the milk to the foal via stomach tube and see if time will resolve the swallowing problem," he says.

In an older foal (not newborn), botulism can compromise the muscular function of the throat, notes Johnson.

"Another problem is hyperkalemic periodic paralysis (HYPP), which is common in some lines of Quarter Horses," he says. "Those foals sometimes have dysfunctional throats and tend to aspirate milk. With these kinds of pneumonia cases, we're looking at infection by bacteria that are normally present in the environment; the pathogens get into the lungs by accident due to milk getting into the windpipe." --*Heather Smith Thomas*



Readers are cautioned to seek the advice of a qualified veterinarian before proceeding with any diagnosis, treatment, or therapy.

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