

Rhodococcus equi

R. equi is a bacterium that lives in the soil and can cause severe pneumonia and other problems in foals

Overview

Rhodococcus equi is well known for its ability to cause severe pneumonia in young foals. In addition, *R. equi* can cause septic arthritis (infection of joints), osteomyelitis (infection of bones), neonatal diarrhea (enterocolitis), abdominal lymphadenitis (inflammation of the lymph nodes), spinal cord abscesses, and immune-mediated disease such as polysynovitis. It can also cause sudden death in foals that appear to be healthy.

R. equi is a ubiquitous gram-positive bacterium that lives in the soil and feces of herbivores. In North America, pneumonia caused by *R. equi* tends to occur only sporadically except on some farms where pneumonia caused by *R. equi* is endemic (i.e., occurs more frequently). On farms where *R. equi* is endemic, approximately 10-20% of foals develop clinical signs of pneumonia. In moist environments, *R. equi* can live in the soil for approximately one year.

Foals are thought to become infected when they ingest or breathe in the bacteria in soil, dust, and fecal particles. The bacteria then multiply inside macrophages (a type of white blood cell that normally kill bacteria) and, in some cases, cause pneumonia.

While most foals are exposed to *R. equi* at some point, not all foals develop disease. It remains unclear why some foals develop pneumonia caused by the pathogenic strains of *R. equi* while other foals do not. It is likely that a combination of the foal's immune status, environmental factors, and farm management practices all play a role.

R. equi is a particular problematic bacterium in the equine industry because of its high prevalence and mortality rate (approximately 28%), associated economic losses to the breeding industry, and potential negative impact on future athletic performance in foals that recover.



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Clinical Signs

It is currently hypothesized that foals become infected with *R. equi* before two weeks of age; however, clinical signs of infection are not obvious until the foal is 30 to 90 days old. In general, it is accepted that *R. equi* can cause pneumonia in foals as young as one month and as old as six months.

Common clinical signs include cough, a mucopurulent (thick, greenish-white) nasal discharge, fever, lethargy, an increased respiratory rate, and progressive respiratory distress. On auscultation of the lungs, crackles and wheezes are easily noted in both lungs. These clinical signs tend to develop rapidly.

Pneumonia is a common medical condition in foals and is a major cause of illness and death in this age group. *R. equi* must be differentiated from other causes of pneumonia, including respiratory tract infection due to other bacteria or infection with other microorganisms such as fungi. In many cases the causative organism(s) of undifferentiated respiratory tract infections is/are not identified.

Diagnosis

Diagnosis of *R. equi* is challenging, particularly during the early stages of disease. A positive diagnosis of *R. equi* is achieved in young foals with clinical signs consistent with *R. equi* that have evidence of pulmonary abscesses on radiographs (X rays) and ultrasound and a positive *R. equi* culture from a sample obtained by a transtracheal aspirate. This is a procedure that involves passing a thin, sterile tube down the trachea to the lungs to obtain a sample of cells and bacteria.

Routine blood work is usually non-specific and simply reveals a high fibrinogen level (a marker of inflammation) and a high white blood cell count. A DNA test (polymerase chain reaction, PCR) for *R. equi* exists, but it has not been widely adopted. Bacterial isolation from the transtracheal aspirate is more helpful in achieving a positive diagnosis.

Treatment

Foals diagnosed with *R. equi* are prescribed a variety of antibiotics, including a

combination of erythromycin estolate and rifampin. This combination of antibiotics allows the drugs to penetrate the lung abscesses and the macrophages where the bacteria are multiplying.

Treatment should continue for at least 30 days, and prolonged treatment of six to eight weeks or more is often required. Fibrinogen levels and radiographs are used to help determine when to stop treatment. Foals are administered the antibiotics until there is no longer any evidence of pneumonia on repeat radiographs.

Antibiotic-associated side effects for the foal include hyperthermia and a mild diarrhea that is usually self-limiting. In some cases the foal might require a short interruption in erythromycin administration until the diarrhea subsides.

Dams of affected foals can develop a potentially fatal diarrhea that is thought to be caused by ingestion of the active erythromycin metabolite either by drinking water contaminated with erythromycin by the foal or by ingesting the foal's feces.

Prevention

Because *R. equi* is widespread, it is a

difficult bacterium to control. Good farm management and sanitation strategies can help minimize infection. For example, mares and foals can be kept on grassy pastures rather than dry, dusty paddocks. Frequent removal of feces to minimize bacterial exposure is recommended. Any foal with clinical signs of respiratory disease should be seen by a veterinarian.

At present, no vaccine is available against *R. equi*. The only proven preventative medical strategy is the intravenous administration of *R. equi* hyperimmune plasma (HIP), which contains high levels of antibodies (immunoglobulins) against *R. equi*. HIP provides passive immunity to treated foals against *R. equi* and reduces the incidence of pneumonia caused by this bacterium. Nonetheless, HIP is expensive, labor-intensive to administer, and not universally effective.

Note that *R. equi* is a zoonotic disease, which are diseases transmissible between animals and people, but tends to only cause disease in immunocompromised humans, such as those with human immunodeficiency virus (HIV) or acquired immunodeficiency syndrome (AIDS). ♣

FAST FACTS

- ***R. equi*** is best known for the severe and devastating pneumonia it causes in young foals between one and six months of age.
- **Most foals** are exposed to this ubiquitous, soil-dwelling bacterium, yet not all foals develop disease.
- **Ingesting or inhaling** the bacteria from soil, dirt, or fecal particles is the primary route of entry in foals. *R. equi* then invades macrophages in the lung, which are a special type of white blood cell that normally kill bacteria.
- **Affected foals** rapidly develop fever, lethargy, a mucopurulent nasal discharge, an increased respiratory rate, and respiratory distress.
- **Diagnosis** is challenging and is dependant on clinical signs, evidence of lung abscesses on radiographs, and isolation of *R. equi* from a transtracheal wash.
- **Treatment** consists of a variety of antibiotics, including a combination of rifampin and erythromycin.
- **No vaccine** for *R. equi* is available. Prevention is aimed at management of sanitation strategies and administration of hyperimmune serum to foals shortly after birth.

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