Clinical case

rccp Revista Colombiana de Ciencias Pecuarias

Rhodococcus equi pneumonia in a Foal – A case report¤

Neumonía por Rhodococcus equi en un potro – Un reporte de caso

Pneumonia pelo Rhodococcus equi em um potro – Relato de Caso

Olimpo J Oliver[1], MV, MSc. DVSc*; Rubiela Castañeda[2], MV, MSc.

[1]*Facultad de Medicina Veterinaria y de Zootecnia, Clínica de Grandes Animales, Carrera 30, Nº 45 – 03, Universidad Nacional de Colombia, Bogotá, Colombia.* [2]*Facultad de Ciencias - Departamento de Microbiología, Carrera 7ª, Nº 40 – 62, Pontificia Universidad Javeriana, Bogotá, Colombia.*

(Received: April 15, 2013; accepted: December 11, 2013)

Summary

Anamnesis: a 4 month-old creole filly was presented to the Universidad Nacional's Large Animal Clinic with a history of respiratory signs. **Clinical and laboratory findings:** on clinical examination, the filly presented bilateral thick muco-purulent nasal discharge and increased both laringo-tracheal sounds and coughing reflex response. On lung auscultation it showed increased bronchial sounds and crackles. The diagnostic rule outs included abscess bronchopneumonia by *R. equi,* pulmonary dyctiocaulosis and pneumonia by *Streptococcus equi subesp. zooepidemicus.* Tracheal wash culture was positive for *R. equi*. **Treatment approach:** the filly was started on IV sodium penicillin and once *R. equi* was isolated, therapy was switched to oral combination of TMS plus rifampin during 27 days. **Conclusion:** this could be the first report of *R. equi* bronchopneumonia in the scientific veterinary literature in Colombia.

Key words: *broncopneumonia, equine, R. equi.*

Resumen

Anamnesis: equino hembra de 4 meses de edad remitido a la clínica de grandes animales de la Facultad de Medicina Veterinaria y de Zootecnia de la Universidad Nacional, con historia de problemas respiratorios. **Hallazgos clínicos y de laboratorio:** al examen clínico se observó secreción nasal bilateral mucopurulenta, aumento de soplo laringotraqueal y del reflejo tusígeno, estertores y aumento de los sonidos bronquiales. Los diagnósticos diferenciales planteados fueron: neumonía bacteriana por *R. equi*, Dyctiocaulosis y Neumonía por *Streptococcus equi subesp. zooepidemicus*. El cultivo microbiológico del lavado traqueal fue positivo para *R. equi*. **Aproximación terapéutica:** el tratamiento inicial fue penicilina sódica intavenosa, una vez se aisló *R. equi*

¤ To cite this article: Oliver OJ, Castañeda R. *Rhodococcus equi* pneumonia in a Foal – A case report. Rev Colomb Cienc Pecu 2014; 27:139-144.

* Corresponding author: Olimpo Oliver Espinosa, MV, DVSc. Universidad nacional de Colombia. Carrera 30, Nº 45 – 03. Phone: (571) 3165111. Email: ojolivere@unal.edu.co

se cambió a una combinación de TMS más rifampicina vía oral durante 27 días. **Conclusión:** este podría ser el primer reporte de bronconeumonía por *R. equi* en la literatura científica medico veterinaria en Colombia.

Palabras clave: *bronconeumonía, equinos*, *R. equi.*

Resumo

Anamnese: equino fêmea de 4 meses de idade, remitido à clínica de grandes animais da Faculdade de Medicina Veterinária e Zootecnia da Universidade Nacional, com um histórico de problemas respiratórios. **Achados clínicos e laboratoriais:** o exame clínico mostrou descarga mucopurulenta nasal bilateral, aumento do ruído laringotraqueal e do reflexo da tosse, estertores e aumento dos sons bronquiais. Diagnósticos diferenciais considerados foram: pneumonia bacteriana por *R. equi*, por Dyctiocaulose e por *Streptococcus equi subsp. zooepidemicus*. A cultura microbiológica de lavagem traqueal foi positiva para *R. equi*. **Abordagem Terapêutica:** o tratamento inicial foi de penicilina sódica intravenosa, uma vez isolado *R. equi* foi mudado para uma combinação de TMS e rifampicina por via oral durante 27 dias. **Conclusão:** este pode ser o primeiro relato de broncopneumonia *R. equi* na literatura médica veterinária da Colômbia.

Palavras chave: *broncopnneumonia, equinos, R. equi.*

Introduction

Foal respiratory diseases and mainly bacterial pneumonia have been found to be one of the most important causes of death in USA (Cohen, 1994) and Ireland (Galvin and Corley, 2010). Castillo and Oliver (2006) reported that respiratory diseases in foals are prevalent in Colombia, although they are under-diagnosed.

R. equi is a soil saprophytic bacteria that multiplies within the infected alveolar macrophages and it is the commonest cause of foal bronchopneumonia (Songer and Post, 2005; Giguère *et al.,* 2011*a*). The clinical picture is a chronic pyo-granolumatouos pneumonia with abcessation in 3 to 24 weeks old foals but rarely in adult horses (Sellong *et al.,* 2001; Heidmann *et al*., 2006; Sellong and Long, 2007; Leclere *et al*., 2011; Giguère *et al.,* 2011*b;* Muscatello, 2012). It may also cause acute pneumonia, fever, respiratory distress, and produce extra pulmonary disorders (EPD) such as enterocolitis, tiphlytis, abdominal abscesses, peritonitis, septic arthritis, spondilitis, osteomyelitis, and immune-mediated synovitis (Sellong and Long, 2007; Reuss *et al*., 2009; Giguère *et al.,* 2011*b*).

R. equi pneumonia occurs endemically on some farms, but sporadically or not at all on other farms (Muscatello, 2012). It has worldwide distribution and has been reported in many countries including United States, Canada, Mexico, Australia, United Kingdom, Czech Republic, Japan, Hungary, Poland, Ireland, Japan, Slovenia, Spain, Thailand, South Korea, etc. (Ocampo-Sosa *et al.,* 2007). In South America*, R. equi* pneumonia has been reported in Argentina, Chile and Brazil (Becu *et al*., 1997; Paredes *et al*., 2000; Garcia Ribeiro *et al*., 2005). Median morbidity in Texas endemic farms has been determined to be 6.6% with 38% of the farms having more than 10% of foals affected (Chaffin *et al*., 2003). In Australia 10% of thoroughbred foals are diagnosed with *R. equi* pneumonia annually with mortalities ≤ 1% observed (Muscatello *et al*., 2007; Muscatello, 2012).

Inhalation of virulent *R. equi* is the major route of pulmonary infection in foals (Giguère *et al*., 2003; Heidmann *et al*., 2006) and foals with adequate maternal antibody titers develop protective immune responses but the susceptibility to *R. equi* infection is complex and multifactorial (Giguère *et al*., 2011b).

The definitive diagnosis of *R. equi* bronchopneumonia is based on bacteriologic culture or amplification of the *Vap* A gene using PCR from transtracheal wash (TW) fluid from a foal with one or more clinical findings: lower respiratory disease signs, evidence of septic airway inflammation and/or evidence of bronchopneumonia by either radiography or ultrasound (Sellong *et al.,* 2001; Giguère *et al*., 2003; Heidmann *et al*., 2006; Giguère *et al*., 2011a; Leclere *et al*., 2011).

R. equi has a great *in vitro* susceptibility to antimicrobials such as aminoglycosides, rifampin, vancomycin, enrofloxacin, erythromycin, azithromycin, sulfonamide-trimethoprim (TMS), and chloramphenicol. However, to treat *R. equi* bronchopneumonia, antibiotics must penetrate both infected cells and abscesses (Giguère *et al.,* 2011*a*). The treatment of choice has been the combination of erythromycin plus rifampin (Giguère *et al*., 2003; Heidmann *et al*., 2006). Recently the association between clarithromycin and rifampin offer better results (Giguère *et al*., 2004) but macrolide-resistant *R. equi* strains demand different combinations (Buckley *et al*., 2007).

The main objective of this paper is to report a case of *R. equi* bronchopneumonia in a 4-month old creole foal presented to the Large Animal Clinic at the Facultad de Medicina Veterinaria y de Zootecnia, Universidad Nacional de Colombia (FMVZ-UN).

Patient examination

Anamnesis

A 4 month-old creole filly weighing 60 kg whose dam was used as an urban draft horse was presented to the Large Animal Clinic at the FMVZ-UN with a history of 15-day duration muco-purulent nasal discharge, normal appetite, and no previous treatment.

Clinical findings

On admission the filly showed normal demeanor, congested oral and conjunctiva membranes, 38.5 ºC rectal temperature, respiratory rate was 16 breaths per minute, and heart rate was 60 beats per minute. It also presented a bilateral thick muco-purulent and mal odorous nasal discharge (Figure 1), increased coughing reflex, increased tracheal sounds, increased and coarse bronchial sounds, and crackles and dull sounds on percussion throughout both lung fields but mainly in the right lung.

Based on these findings, the main diagnostic rule outs were bacterial bronchopneumonia by *R. equi*, parasitic bronchitis by *Dyctiocaulus viviparous,* and bronchopneumonia caused by *Streptococcus equi subsp. zooepidemicus*.

Figure 1. Crusty muco-purulent nasal discharge in foal.

Diagnostic aids used

Further diagnostic evaluation included hemogram (on days 1 and 20), fecal parasitological examination, TW for cytological evaluation, and culture and lung X-rays on admission.

Hemogram and plasma total protein on admission showed a reactive leukocytosis with neutrophilia and a left-shift eosinophilia and hyperproteinemia (Table 1). On day 20th of evolution all blood parameters were within normal ranges but hyperproteinemia remained.

Table 1. Hemogram, total plasma proteins and fibrinogen Values (Jain, 1993).

Parameter	Day 1	Day 20	Reference Values
Hematocrit %	32	36	24 – 44
Hemoglobin gr/dl	10.64	12	8 – 14
RBC (cél/ul)	20,600	11,350	6,000 – 12,000
Neutrophils	12,772	5,108	2,260 – 8,500
Bands	206	-	0 – 100
Limphocytes	6,592	5675	1,500 – 7,700
Eosinophils	1,030	567	0 – 1,000
TPP gr/dl	8.9	9.2	5.8 – 8.7
Fibrinogen mg/dl	900	–	100 – 400

Fecal exam showed an infestation with *Parascaris equorum* (800 epg) and *Strongylus spp* (1200 epg).

The TW cytology showed increased mucus and an inflammatory mixed response evidenced by a differential count of 40% neutrophils (reference range: 3-21%), 40% mononuclear cells (reference range 64-91%), and 10% eosinophil (reference range:0-5%) (Pardo *et al.*, 1989). *R. equi* was isolated from the TW fluid using the protocol described by Mac Faddin (1980) and Vadillo (1997). The lung x-rays showed areas of an alveolar pattern compatible with areas of consolidation (Figure 2).

Figure 2. Presence of an alveolar pattern in the caudo-ventral area of the foal lungs (arrow).

Treatment approach

Given the diagnostic rule outs the filly was started on IV sodium penicillin at 30,000 IU/Kg QID and once *R. equi* was isolated, it was switched to oral combination of TMS (30 mg/Kg) BID plus rifampin (10 mg/Kg) BID during 27 days. The last 9 days dose was adjusted to weight. The first 4 days clembuterol was given intramuscularly at 0.8 mg/kg TID. The parasitism was treated orally with fenbendazole at 5 mg/Kg on day one.

During hospitalization, the filly showed two lameness episodes that were treated with full dose of oral phenylbutazone at a dose of 4.4 mg/Kg SID and later decreased to half the dose in both episodes.

The filly was discharged on the 35th hospitalization day fully recovered.

Discussion

Respiratory problems in 1 to 6 month-old foals are commonly caused by *R. equi* alone or in association with other respiratory pathogens such as *β hemolytic Streptococcus and Actinobacillus* (Giguère *et al*., 2003; Leclere *et al*., 2011). Usually, *R. equi* causes chronic bronchopneumonia with abscessation characterized by fever, depression, anorexia, dyspnea, mucous to purulent nasal discharge, cough, pulmonary crackles and wheezes and in some cases with EPD (Giguère *et al*., 2011b). In this case, the clinical presentation was restricted to the lungs and the lameness was considered due to trauma given the response to NSAID and no evidence of infection or joint distension.

R. equi infections cause leukocytosis with neutrophilia and hyperproteinemia, the latter due to increased fibrinogen and globulins produced during active inflammatory processes as was observed in the present case (Heidmann *et al*., 2006; Leclere *et al*., 2011); however, it was not measured on day 20 given the clinical improvement. Globulin increase is a response to active antigen-antibody reaction that takes place during active chronic inflammatory process of the lower respiratory tract as the one experienced by this filly (Jain, 1993; Meyer and Harvey, 2004). The observed eosinophilia suggested either an allergic processes or a parasitic migration; the latter is probably the cause of this increase in eosinophils given the parasite load detected and the capacity of these parasites to migrate to other organs (Jain, 1993; Meyer and Harvey, 2004).

Based on the criteria for a definitive diagnosis of *R. equi* bronchopneumonia proposed by ACVIM (American College of Veterinary Internal Medicine), this case meets all the following requirements: a positive *R. equi* isolation from TW, a septic inflammatory response evidenced in the tracheal wash fluid, signs of lower airways inflammatory disease, and radiographic evidence of bronchopneumonia (Giguère *et al*., 2011a).

Since *Streptococcus equi subsp. zooepidemicus* pneumonia was a diagnostic rule out and the

treatment needed for *R. equi* bronchopneumonia is highly expensive, it was elected to start therapy with penicillin at the highest recommended dose awaiting for the TW culture results. Once the *R. equi* isolation was determined, it was placed on a combination of TMS and rifampin instead of the treatment of choice that is the combination of erythromycin and rifampin (Giguère *et al.,* 2011*a*) due to severe economic constraints. The use of TMS in the treatment of *R. equi* infections have been somewhat effective despite the 68.3% *in vitro* susceptibility (Dowling *et al*., 2002) but in a more recent research on macrolide-resistant *R. equi* strains 75% of the isolates were susceptible to TMS (Giguère *et al*., 2010). The use of TMS in combination with rifampin was based on their high liposolubility that allows them to penetrate abscess and infected cells, along with the fact that this combination has been shown to be synergistic (Macingwana *et al*., 2012).

Conclusion

Based on the search available on several databases, this could be the first report of *R. equi* bronchopneumonia in the scientific veterinary literature in Colombia.

References

Becu T, Polledo G, Gaskin JM. Immunoprophylaxis of Rhodococcus equi pneumonia in foals. Vet Microbiol 1997; 56:193-204.

Buckley T, McManamon E, Stanbridge S. Resistance studies of erythromycin and rifampin for Rhodococcus equi over a 10-years period. Ir Vet J 2007; 60:728-731.

Castillo MC, Oliver O. Enfermedad respiratoria en potros: Reporte de 20 casos (2000-2004) Rev Med Vet Zoot 2006; 53:42-51.

Chaffin KM, Cohen ND, Matens RJ. Evaluation of equine breeding farm characteristics as risk factors for development of *Rhodococcus equi* pneumonia in foals. J Am Vet Med Assoc 2003; 222:467-474.

Cohen ND. Causes of and farm management factors associated with disease and death in foals. J Am Vet Med Assoc 1994; 204:1644-1651.

Dowling PM, Clark C, Chirino-Trejo M. Antimicrobial therapy for horses. Large animal veterinary rounds 2002; 2:1-6.

Galvin NP, Corley KTT. Causes of disease and death from birth to 12 months of age in the Thoroughbred horse in Ireland. Ir Vet J 2010; 63:37-43.

Garcia Ribeiro M, Seki I, Yasuoka K, Kakuda T, Sasaki A, Takai S. Molecular epidemiology of virulent *Rhodococcus equi* from foals in Brazil: virulence plasmids of 85-kb type I, 87-kb type I and a new variant 87-kb type III. Comp Immunol microbial infect Dis 2005; 28:53-61

Giguère S, Hernández J, Gaskin J, Prescott JF, Miller C, Bowman JL. Evaluation of white blood cell concentration, and an agar gel immunodiffusion test for early identification of foals with *Rhodococcus equi* pneumonia. JAVMA 2003; 222:775-781.

Giguère S, Jacks S, Roberts GD, Hernandez J, Long MT, Ellis C. Retrospective Comparison of Azithromycin, Clarithromycin, and Erythromycin for the Treatment of Foals with *Rhodococcus equi* Pneumonia. J Vet Intern Med 2004; 18:568-573.

Giguere S, Lee E, Williams E, Cohen ND, Chaffin MK, Halbert N. Determination of the prevalence of antimicrobial resistance to macrolides antimicrobials or rifampin in *Rhodococcus equi* isolates and treatment outcome in foals infected with antimicrobial-resistant isolates of *R. equi*. J Am Vet Med Assoc 2010; 237:74-81.

Giguère S, Cohen ND, Chaffin MK, Slovis NM, Hondalus MK, Hines SA, Prescott JF. Diagnosis, treatment, control, and prevention of infections caused by *Rhodococcus equi* in foals. J Vet Intern Med 2011a; 25:1209-1220.

Giguère S, Cohen ND, Chaffin MK, Hines SA, Hondalus MK, Prescott JF, Slovis NM. *Rhodococcus equi*: clinical manifestations, virulence and Immunity. J Vet Intern Med 2011b; 25:1221-1230.

Heidmann P, Madigan JE, Watson JL. *Rhodococcus equi* pneumonia: Clinical findings, diagnosis, treatment and prevention. Clin Tech Equine Pract 2006; 5:203-210.

Jain NC. Essentials of veterinary hematology. 1st ed. Philadelphia (USA): Lea & Febiger; 1993.

Leclere M, Magdesian KG, Kass PH, Pusterla N, Rhodes DM. Comparison of the clinical, microbiological, radiological and haematological features of foals with pneumonia caused by *Rhodococcus equi* and other bacteria. Vet J 2011; 187:109-112.

Mac-Faddin JF. Pruebas bioquímicas para la identificación de bacterias de importancia clínica. Buenos Aires: Panamericana; 1980. p.212, 222.

Macingwana L, Baker B, Ngwuane AH, Harper C, Cotton MF, Hesseling A, Diacon AH, Helden PV, Wiid I. Sulfamethoxazole enhances antimycobacterial activity of rifampicin. J antimicrob Chemother 2012; 67:2908-2911.

Meyer DJ, Harvey JW. Veterinary laboratory medicine: interpretation and diagnosis. 3rd ed. Philadelphia: Saunders; 2004.

Muscatello G, Leadon DP, Klay M, Ocampo-Sosa A, Lewis DA, Fogarty U, Buckley T, Gilkerson JR, Meijer WG, Vazquez-Boland JA. *Rhodococcus equi* infection in foals: The science of "rattles". Equine Vet J 2007; 39:470-478.

Muscatello G. *Rodococcus equi* pneumonia in the foal-Part 1: pathogenesis and epidemiology. The Vet J 2012; 192:20-26.

Ocampo-Sosa A, Lewis D, Navas J, Quigley F, Callejo R, Scortti M, Leadon D, Fogarty U, Vazquez-Voland J. Molecular epidemiology *of Rhodococcus equi* based on Tra A, VapA, VapB virulence plasmid markers. J Infect. Dis 2007; 196:763-769.

Pardo J, Ramírez R, Oliver O. Hallazgos citológicos del LTB en equinos clínicamente sanos en la sabana de Bogotá. Tesis Facultad de Medicina Veterinaria y de Zootecnia. Universidad Nacional de Colombia 1989.

Paredes E, Gallego R, Canal AM, Araya O, Chahuan, E, Thomas P, Zamora J. Primer caso descrito en Chile de neumonía y colitis por *Rhodococcus equi* en un potrillo. Archi Med Vet 2000; 32:101-106

Reuss SM, Chaffin MK, Cohen ND. Extra pulmonary disorders associated with *Rhodococcus equi* infection in foals: 150 cases (1987-2007) J Am Med Vet Assoc 2009; 235:855-863.

Sellong DC, Besser TE, Vivrette SL, McConnico RS. Comparison of nucleic acid amplification, serology, and microbiologic culture for diagnosis of *Rhodococcus equi* pneumonia in foals. J Clin Microbiol 2001; 39:1289-1293.

Sellong DC, Long MT. Equine Infectious Diseases. 1st ed. Philadelphia: Saunders; 2007.

Songer JG, Post KW. Veterinary microbiology: Bacterial and fungal agents of animal disease. St. Louis: Elsevier Saunders; 2005. p.110-112.

Vadillo S, Píriz S, Mateos EM. Manual de microbiología veterinaria. España: McGraw-Hill – Interamericana; 2002. p.519-525.