

Ocular manifestations associated with *Rhodococcus equi* infection in a foal

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Abstract

The present case report describes the ocular manifestations in an 8 week Marwari colt, associated with *Rhodococcus equi* infection. The foal was presented with anorexia, respiratory dyspnea, swollen joints and blindness. Clinical examination of the colt revealed elevated rectal temperature, harsh lung sounds on auscultation, bilateral keratoconjunctivitis and stromal ulcer in the right eye. Radiography of chest revealed multiple soft tissue opacities in caudal lung lobe and alveolar pattern in the cranial and middle lung lobes. The findings of radiography and clinical signs were strongly suggestive of *R. equi* pneumonia in the foal. Medical treatment for pneumonia was initiated but the animal collapsed on seventh day of treatment. The case highlights the importance of extrapulmonary signs particularly the severity of ocular manifestations associated with *R. equi* infection in foals.

Keywords: Ocular; *Rhodococcus equi*; keratoconjunctivitis; stromal ulcer; foal

Rhodococcus equi is a gram-positive, rod shaped facultative intracellular bacterium that is ubiquitous in the horse environment and resistant to most disinfectants and dry conditions (Radostits 2017). The organism causes wide spectrum of clinical signs including pulmonary (granulomatous bronchopneumonia) and extrapulmonary disorders (EPDs) like abdominal (ulcerative enterotyphlocolitis, peritonitis, intra-abdominal abscesses, intra-abdominal lymphadenitis), musculoskeletal (septic arthritis and osteomyelitis) neurological (intracranial abscesses and meningitis) and ocular disorders (uveitis and blindness) (Blogg *et al.*, 1983; Patterson-Kane *et al.*, 2001; Reus *et al.*, 2009; Reus 2016; Wilkes *et al.*, 2016 and Tarancon *et al.*, 2019). Bronchopneumonia due to *R. equi* is a recognized cause of morbidity and mortality in foals between 3 weeks to 6 months of age (Hines 2014).

The Marwari horse is a rare breed of horses from the Marwar region of India, known for its inward-turning ear tips that come in all equine colours. *R. equi* infection with pulmonary signs has been reported earlier in this breed, however there are rare reports of ophthalmic signs in *R. equi* infected foals (Reus *et al.*, 2009; Reus 2016; Sharma *et al.*, 2017). We here report *R. equi* infection in Marwari horse with ophthalmic manifestations.

Case History and Clinical Observations

A 2 month old Marwari colt was presented at large animal OPD section of Guru Angad Dev Veterinary

and Animal Sciences University, Punjab, India with a history of fever (105°F), anorexia, respiratory dyspnea and blindness. The animal was treated by referring veterinarian with anti-inflammatory and anti-allergic for few days, but no remission of signs was observed.

The colt was put to thorough clinical examination on arrival and had an elevated rectal temperature (103.8 °F), tachypnoea (72 breaths/ minute), tachycardia (88 beats/minute), respiratory dyspnea (flaring of nostrils) and pale mucous membrane. Auscultation of thoracic cavity revealed adventitious sounds. Poly synovitis was observed in both knee and hock joints. Ophthalmic examination revealed bilateral keratoconjunctivitis, purulent discharge and stromal ulcer in the right eye (Fig.1). Menace reflex and pupillary light reflex was negative in both eyes. Examination of anterior uvea and fundus could not be undertaken due to severe corneal inflammation.

A complete blood cell count was performed and it revealed non-regenerative anaemia (Hb. 5.1 g/dl, Hematocrit: 14.8 %, RBC count: 4.09×10^6 /microliter), thrombocytopenia (31×10^3), absolute neutrophilic leukocytosis (14×10^3 /microliter) and lymphopenia (0.574×10^3).

Radiography of chest (lateral view) was performed and revealed multiple soft tissue opacities in caudal lung lobe. There was alveolar pattern in the cranial and middle lung lobes. There was broader effacement of cranial and caudal margins of cardiac silhouette. The findings of radiography and clinical signs were strongly

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suggestive of *R. equi* pneumonia in the foal (Fig. 2). The foal was diagnosed for *R. equi* pneumonia based on the signalment, clinical signs and radiography. Trans-tracheal wash (TTW) was not performed due to severe respiratory distress in the foal.

Treatment

The colt was initially stabilized at the hospital with intravenous fluids (Normal saline @ 15 ml/kg) and antipyretic (Vetalgin-10 ml) medication. Medical treatment for pneumonia was initiated and included oral administration of rifampin (R-Cin 600: Lupin Ltd.) @ 5 mg/kg body weight twice daily and erythromycin (Althrocin-500: Alembic pharmaceuticals Ltd.) @ 25 mg/kg body weight every eight hourly for fourteen days. The owner was advised to isolate the animal and enteral nutrition was prescribed. As per owner, initial clinical recovery was observed, however on 7th day, the animal collapsed. Post-mortem could not be done due to reluctance of the owner.

Discussion

R. equi is one of the most common cause of pneumonia in foals between 3 weeks and 5 months of age (Smith 2015). The organism has been reported to cause chronic suppurative bronchopneumonia with extensive abscessation of the lung (Wilkes *et al.*, 2016).

The clinical signs of *R. equi* in foals have been classified as pulmonary involving lungs and extra-pulmonary where lesions have been reported in other organs (Smith 2015). Among the extra pulmonary disorders associated with *R. equi* infection in foals, ocular signs have been rarely reported (Blogg *et al.*, 1983; Reuss *et al.*, 2009; Wilkes *et al.*, 2016; Tarancon *et al.*, 2019). *R. equi* infection in foals has been sporadically associated with ocular findings such as anterior uveitis, panophthalmitis and keratouveitis, anterior uveal affection being the most common ocular diagnosis (Reuss 2016).

In the present study, a 2 month old Marwari colt was presented with a history of fever (105°F), anorexia, respiratory dyspnea and blindness. Diagnosis of *R. equi* infection was done on the basis of clinical signs and radiography. Culture and PCR testing are considered as gold standard tests for the diagnosis of *R. equi* infection in foals (Guigee *et al.*, 2011; Sellon *et al.*, 2001). Due to severe respiratory distress, TTW was not performed. Instead we diagnosed the condition as *R. equi* based on criteria set by Tarancon *et al.*, (2019). He defined the

infection as *R. equi* in foal aged 3 weeks to 6 months that met at least two of the following criteria: (a) clinical signs (temperature >39.5°C, respiration rate >80/min, coughing, purulent nasal discharge and abnormal lung sounds), (b) Total leukocytic count >13.0×10⁹/L, (c) radiographic or ultrasonography evidence of bronchopneumonia (where abscesses were defined as focal hypoechoic areas of consolidation with a diameter ≥1.0 cm), and (d) cytological identification of gram-positive coccobacilli in, or isolation of *R. equi* by microbiologic culture from an abscess or tracheobronchial aspirate (TBA). Similar criteria have been set by Reuss (2016) and Venner *et al.* (2013). In this case, the foal met three out of four criteria: clinical signs, total leukocytic count and radiographic evidence of bronchopneumonia.

Ocular signs in *R. equi* infected foals could be unilateral or bilateral (Leiva *et al.*, 2011; Wilkes *et al.*, 2016; Reuss *et al.*, 2009; Patterson-Kane *et al.*, 2001; Presscott, 1994 and Blogg *et al.*, 1983). In our case, ocular signs included bilateral keratoconjunctivitis, purulent discharge and stromal ulcer in the right eye. Menace reflex and pupillary light reflex was negative in both eyes. Examination of anterior uvea and fundus could not be undertaken due to severe corneal inflammation. Our findings were in concurrence with other studies (Wilkes *et al.*, 2016; Reuss *et al.*, 2009; and Blogg *et al.*, 1983). Ocular signs are considered as uncommon complication of *R. equi* infection in foals. In a report of 161 foals affected with *R. equi* pneumonia, the most common clinical signs were cough (71%), fever (68%), lethargy (53%), and increased respiratory effort (43%) (Chaffin *et al.*, 2011). In a study on 150 foals with *R. equi* infection anterior uveitis was observed in 11 percent of animals followed by diarrhoea (33%), polysynovitis (25%), enterotyphlocolitis (21%), intra-abdominal abscesses (17) and abdominal lymphadenitis (17%) (Reuss *et al.*, 2009). Sharma *et al.* (2017) has reported four cases of *R. equi* with pulmonary signs infection in horses reared in Punjab region of India. In a retrospective study ocular signs due to *R. equi* 30 percent of the horses were found to have ocular signs (Tarancon *et al.*, 2019).

Tarancon *et al.* (2019) reported bilateral uveitis in 12 out of 39 foals with *R. equi* infection. In the same study, severe uveitis was observed in 23.1 % of foals and mild-moderate uveitis in 7% of *R. equi* infected foals. However, contrary to our report, no case of corneal ulceration and keratitic precipitates were observed in any case. The reason for this could be rapid spread of *R. equi* in the



Fig. 1. Photograph of the right eye on the day of presentation demonstrating the presence of ulceration and keratitis

blood stream (Hines 2014) and the weak equine blood-aqueous barrier (Levach 1992; Brooks 2002), and higher capacity of fibrin production in foals which if not treated can proceed to corneal manifestations and blindness (Wilkie 2010; Cullen and Webb 2013).

Analysis of synovial fluid and aqueous humour was not performed in this case. However, due to involvement of multiple joints, immune mediated etiology is strongly suspected. Deposition of immune-complex has been associated with polysynovitis in *R. equi* infected foals (Reus 2016; Reus 2009; Prescott 1994 and Giguere *et al.*, 2011). The extrapulmonary disorders are considered as immune-mediated process as *R. equi* has been rarely isolated from these organs (Reuss *et al.*, 2009). However, a recent experimental study involving intratracheal infection with virulent strain of *R. equi* has led to the isolation of pathogen from aqueous humour and synovial fluid (Huber *et al.*, 2018). More such studies are required to understand the pathophysiology of the disease.

A complete blood cell count revealed anaemia, thrombocytopenia and neutrophilic leukocytosis. Sharma *et al.* (2017) reported two cases of *R. equi* infection in foals with mild anemia. Wilkes *et al.* (2016) reported anemia, mild thrombocytopenia and neutrophilic leukocytosis in a foal with *R. equi* infection. In our case there was severe anemia, thrombocytopenia and lymphopenia. The anemia in *R. equi* infection has been mostly associated with immune mediated processes. Few cases of *R. equi* infection in foals with IMHA have been reported (Reuss *et al.*, 2009 and John *et al.*, 2011).

Radiography of the chest in this case revealed multiple soft tissue opacities in caudal lung lobe and

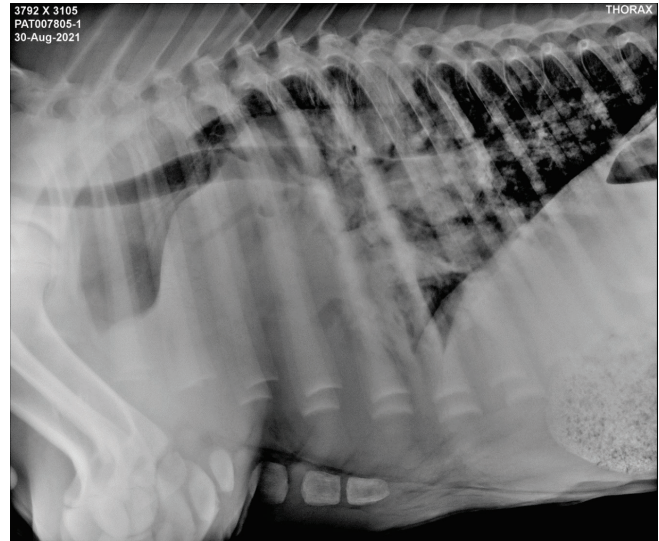


Fig. 2. Radiograph of chest (lateral view) showing multiple soft tissue opacities in caudal lung lobe and alveolar pattern in the cranial and middle lung lobes

alveolar pattern in the cranial and middle lung lobes indicative of severe bronchopneumonia. Thoracic radiography is an important tool to determine the severity of pneumonia and to evaluate the response to therapy. The prominent alveolar pattern and ill defined lung consolidation is the most commonly found abnormality in *R. equi* pneumonia of foals (Falcon *et al.*, 1985). The consolidation in lung is seen as discrete nodular and cavitory lesions consistent with pulmonary abscessation. The severity of alveolar pattern and number of cavitory lesions in a radiograph are associated low survival in foals with *R. equi* pneumonia (Giguere and Roberts, 2012).

The colt was put on standard treatment for *R. equi* pneumonia but collapsed on 7th day of treatment. The severity of intraocular inflammation has been considered as a negative prognostic indicator in *R. equi* infected foals (the more severe the inflammation, the poorer prognosis) (Leiva *et al.*, 2011; Reuss 2016).

In conclusion, the case highlights the severity of extra-pulmonary disorders particularly ophthalmic signs in *R. equi* infected foals. The case also underscores the importance of ocular signs as prognostic indicator for survival of *R. equi* infected foals. There have been very few reports about ophthalmic manifestations in *R. equi* infected foals. The findings of this case also highlight the importance of complete ocular examination in foals with *R. equi* pneumonia.

References

- Blogg, J.R., Barton, M.D., Graydon, R., Cust, R.E. 1983. Blindness caused by *Rhodococcus equi* infection in a foal. *Equine Vet J.* 2:25–26.
- Brooks, D.E. 2002. Examination of the eye of the horse. In: Brooks D.E. ed. *Ophthalmology for the Equine Practitioner*. Jackson, WY: Teton New Media; pp, 17–33.
- Chaffin, M.K., Cohen, N.D., Martens, R.J., et al. 2011. Evaluation of the efficacy of gallium maltolate for chemoprophylaxis against pneumonia caused by *Rhodococcus equi* infection in foals. *Am. J. Vet. Res.* 72: 945.
- Constable, P.D., Hinchcliff, K.W., Done, S.H., et al. 2017. Diseases of the Respiratory System. *Veterinary Medicine: A Textbook of the Diseases of Cattle, Horses, Sheep, Pigs, and Goats*, 11th edition, Volumes 1 and 2, Elsevier.
- Cullen, C.L. and Webb, A.A. 2013. Ocular manifestations of systemic disease. Part 3: the horse. In: Gelatt KN, Gilger BC, Kern TJ, eds. *Veterinary Ophthalmology*, 5th edn. Ames, IA: Blackwell Publishing.
- Falcon, J., Smith, B.P., O'Brien, T.R., et al. (1985). Clinical and radiographic findings in *Corynebacterium equi* pneumonia of foals. *J. Am. Vet. Med. Assoc.* 186: 593.
- Giguère, S. and Roberts, G.D. 2012. Association between radiographic pattern and outcome in foals with pneumonia caused by *Rhodococcus equi*. *Vet. Radiol. Ultrasound.* 53: 601.
- Guiguère, S., Cohen, N.D., Chaffin, M.K., et al. 2011. Diagnosis, treatment, control, and prevention of infections caused by *Rhodococcus equi* in a foal. *J. Vet. Intern. Med.* 25: 1209–20.
- Hines, M.T. 2014. *Rhodococcus equi*. In: Sellon DC ed. *Equine Infectious Diseases* 2nd edn. St Louis, MO: Elsevier Saunders.
- Huber, L., Giguère, S., Berghaus, L.J., Hanafi, A., Vitosh-Sillman, S. and Czerwinski, S.L. 2011. Development of septic polysynovitis and uveitis in foals experimentally infected with *Rhodococcus equi*. *PLoS One.* 13(2): e0192655.
- Johns, I.C., Desrochers, A., Wotman, K.L. and Sweeney, R.W. 2011. Presumed immune-mediated hemolytic anemia in two foals with *Rhodococcus equi* infection. *J. Vet. Emerg. Crit. Care.* 21: 273-78.
- Lavach, J.D. 1992. Ocular manifestations of systemic diseases. *Vet. Clin. North. Am. Equine. Pract.* 8: 627–36.
- Leiva, M., Peña, T., Armengou, L., Cesarini, C. and Monreal, L. 2011. Uveal inflammation in septic newborn foals. *J. Vet. Intern. Med.* 24: 391–97.
- Mair, T.S., Taylor, F.G. and Hillyer, M. H. 1990. Autoimmune haemolytic anaemia in eight horses. *Vet. Rec.* 126: 51-53.
- Patterson-Kane, J.C., Buergelt, C.D. and Brown, C.A. 2001. *Rhodococcus equi* septicaemia with pyogranulomatous hepatitis and panuveitis in an Arabian foal. *EJ-VETMED*, 7: 31–33.
- Reus, S.M., Keith, M. and Cohen, N.D. 2009. Extrapulmonary disorders associated with *Rhodococcus equi* infection in foals: 150 cases (1987–2007). *J. Am. Vet. Med. Assoc.* 7: 855–63.
- Reuss, S.M. 2016. Extrapulmonary disorders associated with *Rhodococcus equi*. *Equine Vet. Educ.* 28:193–95.
- Sellon, D.C., Besser, T.E., Vivrette, S.L. and McConnico, R.S. 2001. Comparison of nucleic acid amplification, serology, and microbiologic culture for diagnosis of *Rhodococcus equi* pneumonia in foals. *J Clin Microbiol.* 39:1289–93.
- Sharma, A.K., Randhawa, C.S., Narang, A., Sood, N.K. and Rai, T.S. 2017. Cytological and Bacteriological Evaluation of Tracheal Aspirates for the Diagnosis of Lung Affections in Horses. *J. Anim. Res.* 7(3): 459-64.
- Smith, B. P., Van Metre, D.C. and Pusterla, N. 2015. Disease of Respiratory System. *Large Animal Internal Medicine*, 5th Edition pp. 481-91.
- Tarancón, I., Leiva, M., Jose- Cunilleras, E., Ríos, J. and Peña, T. 2019. Ophthalmologic findings associated with *Rhodococcus equi* bronchopneumonia in foals. *Vet. Ophthalmol.* 00:1–6.
- Venner, M., Astheimer, K., Lämmer, M. and Ciguère, S. 2013. Efficacy of mass antimicrobial treatment of foals with subclinical pulmonary abscesses associated with *Rhodococcus equi*. *J. Vet. Intern. Med.* 27:171–76.
- Wilkes, E., Hughes, K.J., Kessekk, A.E. and Raidal, S. L. 2016. Successful management of multiple extrapulmonary complications associated with *Rhodococcus equi* pneumonia in a foal. *Equine Vet. Educ.* 28: 186–92.
- Wilkie, D.A., 2010. Equine ophthalmology. In: Reed SM, Bayly WM, Sellon DC eds. *Equine Internal Medicine* 3rd edn. St. Louis, MO: Elsevier Saunders, pp, 976–1003.

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