Neonatal Diarrhea

49

Abdelmalik I. Khalafalla

Newborn camel calves are highly susceptible to neonatal diarrhea or calf scours during their first 12 weeks of life and is considered a major cause of economic loss. Multiple enteric pathogens such as viruses, bacteria, and protozoa are involved in the development of this disease and coinfection is frequently observed in diarrheic camel calves these pathogens attack the lining of the calf's intestine giving rise to diarrhea that in turn decreases the absorption of essential nutrients from milk and leads to weight loss and dehydration (Fig. 49.1). However, there are many other noninfectious contributing factors that allow the development of the disease including inadequate quantity and/or quality of colostrum, overconsumption of milk, poor sanitation, or cold weather.

According to Schwartz and Dioli (1992), the morbidity and mortality rates due to camel calf diarrhea could reach up to 30% and 100%, respectively. Abbas et al. (1992) reported that camel calf diarrhea affects about 33% of the neonates causing 23% mortality in Sudan.

49.1 Etiology

The main virus that causes camel calf diarrhea is *Rotavirus A* species of the genus *Rotavirus* in the family Reoviridae. The G10 group of rotavirus was detected in dromedary camels in Egypt (Abo Hatab et al., 2008) and VP4 and VP7 genotypes of group A rotaviruses were detected in Sudanese camel calves in 2000 and 2002 (Ali et al., 2005, 2008). Phylogenetic analysis of the camel Rotavirus revealed that its genome is closely related to those of human–animal reassortant strains and shared common ancestry with some bovine rotaviruses-like strains, whereas segment 2 was closely related to a guanaco rotavirus strain suggesting that this strain potentially emerged through multiple reassortment events between several mammalian rotaviruses (Jere et al., 2014). Of note, up to date no Coronavirus was reported to be involved in outbreaks of camel neonatal diarrhea including field investigations carried out in Sudan (Ali et al., 2005, 2008) and Saudi Arabia (Al-Ruwaili et al.,

A. I. Khalafalla, M. F. Hussein, *Infectious Diseases of Dromedary Camels*,
https://doi.org/10.1007/978-3-030-79389-0_49

Fig. 49.1 Newborn camel affected with calf diarrhea, note yellow color of the feces (photo by Abdelmalik Khalafalla)

2012), except for a single case of enteric coronavirus infection in a 6-week-old dromedary calf in the USA (Wünschmann et al., 2002).

A study on the role of pathogenic bacteria and viruses in the causation of camel calf diarrhea in six different towns of North Province in Saudi Arabia revealed group A rotavirus (14.7%), *Salmonella* spp. (12%), *Brucella abortus* (8.9%), *Enterococcus* spp. (8.8%), and enterotoxogenic E. coli (7%).

Camel calf diarrheic disease results from complex infectious agents. In the present study, 33 calves presenting diarrhea were sampled for Cryptosporidium, *E. coli*, Coronavirus, and Rotavirus. The prevalence rates were 15.1%, 9%, 6%, and 6%, respectively. The prevalence of diarrhea was found to be 8.1% in calves' less than 3 months. This is the first report of Cryptosporidium and Coronavirus of Saudi camels (Mohamed & Faye, 2016).

49.2 Clinical Picture

Clinically, neonatal calf diarrhea can range from mild diarrhea without overt systemic involvement to profuse watery, acute diarrhea associated with extreme disturbance of acid-base and electrolyte balance, weight loss and dehydration (Fig. 49.1), and sometimes death.

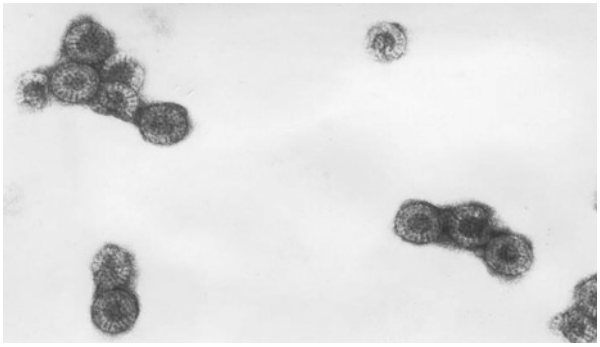

Fig. 49.2 Electron micrograph showing the camel rotavirus particles. Note, the characteristic wheel-like structure of the virus particles (source: Abdelmalik Khalafalla)

49.3 Diagnosis

Diagnosis can be made on clinical signs and epidemiology, but additional examinations are often needed. Fecal samples are examined by microscopy for *C. parvum* and Coccidia, bacterial culturing for *Salmonella* spp., *E. coli*, and *C. perfringens*, and PCR and antigen-capturing enzyme-linked immunosorbent assay (Ag-ELISA) for rotavirus. Electron microscopy is also useful particularly in detecting Rotavirus based on morphological characteristics (Fig. 49.2).

49.4 Treatment

Successful treatment of calf scours depends upon rapidly rehydrating scouring calves.

Oral rehydration products help restore fluid balance, lost electrolytes, and essential nutrients.

In bacterial scours cases, oral or injectable antibiotic therapy may be advised.

References

Abbas, B., Mohamed, G. E., Agab, H., Yagoub, S. O., & Mustafa, K. (1992). Clinical observations on field cases of some clinical diseases with emphasis on diarrhoea in camel calves. In *Proc. 5th Conf. General Federation of Arab Veterinarians*. Sudan Veterinary Association.

Abo Hatab, E. M., Hussein, H. A., El-Sabagh, I. M., & Saber, M. S. (2008). Isolation and antigenic and molecular characterization of G10 of Group A rotavirus in camel. *Egyptian Journal of Virology, 5*, 220–238.

Ali, Y. H., Khalafalla, A. I., Gaffar, M. E., Peenze, I., & Steele, A. D. (2005). Rota virus associated camel calf diarrhea in Sudan. *JAVA, 4*, 401–406.

Ali, Y. H., Khalafalla, A. I., Gaffar, M. E., Peenze, I., & Steele, A. D. (2008). Detection and isolation of group A rotavirus from camel calves in Sudan. *Veterinarski Arhiv, 78*, 477–485.

Al-Ruwaili, M. A., Khalil, O. M., & Selim, S. A. (2012). Viral and bacterial infections associated with camel (*Camelus dromedarius*) calf diarrhea in North Province, Saudi Arabia. *Saudi Journal of Biological Sciences, 1*, 35–41.

Jere, K. C., Esona, M. D., Ali, Y. H., Peenze, I., Roy, S., Bowen, M. D., Saeed, I. K., Khalafalla, A. I., Nyaga, M. M., Mphahlele, J., Steele, D., & Seheri, M. L. (2014). Novel NSP1 genotype characterized in an African camel G8P[11] rotavirus strain. *Infection, Genetics and Evolution, 21*, 58–66.

Mohamed, E., & Faye, B. (2016). Camel calf diarrhea in Riyadh region, Saudi Arabia. *Journal of Camel Practice and Research, 23*(2), 283–285.

Schwartz, H. J., & Dioli, M. (1992). *The one-humped camel in eastern Africa. A pictorial guide to diseases, health care and management* (p. 282). Josef Margraf.

Wünschmann, A., Frank, R., Pomeroy, K., & Kapil, S. (2002). Enteric coronavirus infection in a juvenile dromedary (*Camelus dromedarius*). *Journal of Veterinary Diagnostic Investigation, 14* (5), 441–444.