

DIAGNOSIS AND MANAGEMENT OF POLIOENCEPHALOMALACIA IN INDIAN BUFFALO CALF

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Abstract: This case study highlights successful treatment of polioencephalomalacia in a buffalo calf with history of ataxia, inappetence, and dullness, followed by lateral recumbency and a staring position for three days. Despite the fact that the patient's rectal temperature, respiration, pulsation, and ruminal contractions were all within normal range, the clinical examination revealed the absence of the Menace reflex. Parenteral thiamine preparation TID was administered to the buffalo calf for three days based on the specific neurological signs that indicated polioencephalomalacia (PEM) and the urgency of prompt medical attention. Additionally, it helped in the clinical differential diagnosis by excluding thiamine-responsive PEM. The animal began to respond within 12 hours, and by the third day of the first treatment, it had fully recovered.

Keywords: Buffalo calf, Polioencephalomalacia, Star gazing, Thiamine deficiency.

Introduction

A laminar softening or degeneration of the grey matter of brain is referred to as polioencephalomalacia (PEM), also known as cerebrocortical necrosis (Assis et al., 2020). This disease have been reported in ruminants such as cattle, buffalo, sheep and goats (Shafi et al., 2022; Silva et al., 2024). Adults are sporadically affected, but young animals are more prone. Cortical blindness, absence of the menace reflex, opisthotonus, ataxia, circling, recumbency, dorso-medial strabismus, nystagmus, head pressing, convulsions, coma, and death are among the symptoms that affected animals exhibit suddenly (Barbosa, et al., 2023). Transketolase, the rate-limiting enzyme in the pentose phosphate pathway, is synthesized in red blood cells and requires thiamine. The pentose pathway is largely responsible for the brain's metabolism of glucose. According to Chavada & Mandalim (2016) and Radostits et al. (2017), altered glucose metabolism in the brain causes cerebral oedema and necrosis. Animals that suffer from it hence

show neurological signs. Thiamine metabolism and absorption problems in ruminants cause thiamine responsive PEM, a metabolic neurological disorder (Barbosa et al., 2023). Deficiency in thiamine resulting from high levels of thiaminases formed in the rumen, which break down thiamine that is naturally synthesized in the rumen, is the likely mechanism behind naturally occurring disease. Feeding diets high in grains or rich in carbohydrates causes ruminal acidosis, which causes a pH decline that promotes the growth of the bacteria that produce thiaminase I (*Bacillus thiaminalyticus* and *Clostridium sporogenes*) and thiaminase II (*Bacillus aneurinalyticus*) in the rumen. Many studies have reported that the administration of excess amounts of plants that contain thiaminase I, for instance prostrate pigweed and bracken fern, thiamine analogues like amprolium, and some thiaminase co-substrates, like levamasole and thiabendazole, are the etiological agents of PEM (Radostits et al., 2017).

Materials and methods

A 3 month old buffalo calf, weighing around 60 kg, was presented before me in field at Mathura district, Uttar Pradesh. The history of buffalo calf included a sudden onset of incoordination, which was followed by sternal recumbency, raising of the head, and no feed intake since 3 days. The animal was unable to stand and displayed opisthotonus, the classic stargazing posture (Figure I). Other vital signs like respiration, body temperature, pulse, and ruminal contractions were all within normal limits.

Affected buffalo calf was provided with empirical treatment regimen for the Thiamine associated PEM with neurotropic Vitamin-B1 injection @10 mg/kg intramuscularly daily for 3 days along with Dextrose 10% and Mannitol 10% intravenously OD for 2 days. Animal showed dramatic response to treatment, even at lower doses than recommended in the form of subsiding of star gazing posture, improvement in the vision. The animal started showing improvement within 24 hours of treatment. Animal was completely recovered at 3rd day of treatment (Figure II). Successful treatment of affected buffalo calf was attributed to parenteral thiamine therapy in initial stage of disease without waiting for the confirmative diagnosis. Evidence of complete and rapid recovery following specific therapy with parenteral thiamine without recurrence of signs indicates the cow was suffering from thiamine associated PEM.

Result and Discussion

PEM, a neurological metabolic disorder that affect ruminants, is most likely caused by inadequate thiamine (Barbosa et al., 2023). Thiamine therapy is frequently effective in treating PEM (Radostits et al., 2017). Clinical findings like ataxia followed by recumbency (Radostits et al., 2017), and stargazing posture (Sampaio et al., 2015) that are suggestive of the disease—

and in accordance with our case—may be used to make a conclusion regarding the presence of PEM. However, similar signs and symptoms can be observed in other diseases such as lead poisoning, nervous acetonemia, enterotoxaemia, brain abscess, hepatic encephalopathy, hemophilus meningoencephalitis, or head trauma (Radostits et al., 2017). However, in the field, thiamine therapy's spontaneous response was seen.

Conclusion

The present study proposes an easy, practical, and rapid diagnostic tool for PEM to clinicians through the spontaneous response of parental thiamine therapy, as opposed to laboratory tests, which either require confirmation over time or are unavailable in the field. We can conclude that in the early stages of these cases, intensive parenteral thiamine therapy should be started as soon as possible, within a few hours of the onset of symptoms, without waiting for the results of laboratory testing. It is possible that Animal will have improved by the time laboratory findings are obtained.

References

- [1] Assis, J. R., Assis, A. C. M., Nunes, D., & Carlos, A. B. (2020). Nutritional and food aspects related to polioencephalomalacia in ruminant. *Scientific Electronic Archives*, 13(4), 96-104.
- [2] Barbosa, J. D., Martins, F. M. S., Ferreira Filho, C. E. D. S., Barbosa, C. C., Vieira, E. V., Silva, R. P. D. L., Lopes, C.T.D.A., Silveira, N.D.S.E.S., Oliveira, C.M.C., Brito, M.F.& Salvarani, F. M. (2023). Polioencephalomalacia in Buffaloes in the Amazon Biome. *Animals*, 13(19), 3131.
- [3] Chavda, P. K. And Mandali, G.C. (2016). Study on Clinico-Haematobiochemical Alterations in Goats with Polio-Encephalomalacia of Anand District, Gujarat. *Lifesciences leaflets Peer-Reviewed*: 59-64.
- [4] Radostits, O.M., Gay, C.C., Blood, D.C. and Hinchcliff, K.W. (2017). *Veterinary Medicine: A textbook of the Diseases of Cattle, Sheep, Pigs, Goats and Horses*. Edi. X: 598,602,1188-1190.
- [5] Sampaio, P.H.; Fidelis Junior, O.L.; Marques, L.C.; Cadiolli, F.A. Polioencefalomalácia in ruminantes. *Rev. Inv. Med. Vet.* 2015, 14, 96–103
- [6] Shafi, T. A., Siddiqui, M., Sakhre, M. P., Syed, A. M., Borikar, S. T., & Digaskar, S. U. (2020). Successful treatment of Lantana camara poisoning in sheep. *EC Veterinary Science*, 5(2), 1-5.

[7] Silva, V. A. N., Moura, M. A. O., Souza, A. E. C. D., Oliveira, A. S. D., Cerqueira, V. D., Rivero, G. R. C., & Bezerra, P. S. (2023). Polioencephalomalacia in buffaloes (*Bubalus bubalis*) in a feedlot. *Ciência Rural*, 54(7), e20230220.

[8] Withoeft, J. A., Bonatto, G. R., Melo, I. C., Hemckmeier, D., Costa, L. S., Cristo, T. G., ... & Casagrande, R. A. (2019). Polioencephalomalacia (PEM) in calves associated with excess sulfur intake. *Pesquisa Veterinária Brasileira*, 39, 376-381.



Figure 1: Buffalo calf affected with PEM showing typical star gazing posture, nystagmus and recumbency at 1st day.



Figure 2: Buffalo calf is in standing position with normal positioning of head after the thiamine therapy at 3rd day of treatment.