CENTRAL NERVOUS DISEASE OF ZEBU CATTLE IN BRAZIL

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Brazil has the world’s largest commercial cattle herd (estimated 200 million animals). Most of these animals have zebu cattle (Bos indicus) ancestry. Zebus are better-adapted to tropical climate than other domestic cattle. The most important Zebu cattle breeds in Brazil include Gyr, Guzerat, Indu-Brazilian, Nellore, Ongole and Brahman.

Beef cattle production in Brazil is largely based on pasture system conditions and it is characterized as extensive production. Grasses of Brachiaria genus are largely present in Brazilian territory, representing 70% of the pasture area. It is where the majority of the beef cattle is raised.

The importance of the study of bovine central nervous diseases has increased worldwide since the appearance of the bovine spongiform encephalopathy (BSE), in the middle of the decade of 1980. The recognition of a new variant of the Creutzfeld Jacob (human disease related to the BSE) has enhanced the economy and public health importance in the world. Due to this fact, international sanitary authorities requested to the meat exporting countries, as Brazil, to present evidences that herds were BSE free. This is equivalent to say that those countries must be able to identify other diseases that affect bovine central nervous system (Galiza et al 2010).

This paper describes the main central nervous diseases of Zebu cattle diagnosed in Brazil, including rabies, malignant catarrhal fever and polioencephalomalacia.

Rabies: In 2009, 1613 cases of herbivorous rabies were diagnosed in Brazil. It is a major concern for the Ministry of Agriculture, Livestock and Food Supply, especially in those regions where hematophagous bats (Desmodus rotundus) are present. This epidemiologic situation is increasing due to the ecological disequilibrium (destruction of forests and construction of hydroelectric plants). Those actions have favored migration of hematophagous bats, as they have to search for food in distant areas.

Diseases of the central nervous system of cattle in different Brazilian regions were evaluated in a retrospective study, which concluded that rabies was the most prevalent cause of death. In 2002 the world biggest artificial lake (Serra da Mesa) and two Hydroelectric Plants, named Serra da Mesa and Cana Brava, were built in Goias State. In the first three months after they began operating 19 focuses and 21 bovine rabies cases were registered in Niquelândia, a small city near the lake, and then a significant number of notifications of this disease in neighboring regions were reported.

Although it has been extensively studied, the clinical sings of rabies in cattle can be mistaken for any other signs of neurologic diseases in the species. Seven animals infected by rabies virus were observed and exams of the cerebrospinal fluid, hemogram and blood proteins were made. The seven animals and the clinical signs were assessed daily. The most common clinic signs found were: excessive salivation, ataxia and paresis of hind legs, poor tongue tone, oral mucous congestion, decreased respiratory rate, low sensibility of the skin and flaccid tail. The average time of disease evolution was 5.3 days. The cerebrospinal fluid did not present macroscopic alterations and in four cases an increase in the number of mononuclear cells in the fluid was observed. Values of proteins, glucose, pH and density were within normal reference ranges. In one of the cases the fibrinogen was above the normal values. There was a high number of leukocytes in two animals (Moscardin 2003).

The direct fluorescent antibody technique is used as a diagnostic test to detect viral antigens of rabies cattle on nervous tissues, followed by the mouse inoculation test. The histologic lesions were diffuse non-suppurative encephalomyelitis and meningitis. Negri bodies were more frequent in the cerebellum, but they were also found in brain stem, spinal cord and cerebrum of the cattle cases histologically examined.

Malignant catarrhal fever: Many malignant catarrhal fever (MCF) reports confirm that this virus has a worldwide distribution. In Brazil the disease was described for the first time in Paraiba and later it was diagnosed in others regions, but it was not exclusively associated with Zebu cattle. Luvizotto et al (2010) reported outbreak of MCF in an extensive beef cattle herd in Mato Grosso state near northern São Paulo state, Brazil. Sheep and cattle were kept in the same area. The herd consisted of 1000 cross-bred Nelore, among which 15-month-old steers were affected. Clinical signs as ataxia, tonic-clonic spasm, disorientation, cloudy cornea and tremor of the head were observed. The diagnosis was based on typical histological lesions characterized by systemic lymphohistiocytic and fibrinoid vasculitis, confirmed by polymerase chain reaction and subsequent phylogenetic analysis of detected OvHV-2 sequences.

Polioencephalomalacia: In Brazil, Polioencephalomalacia (PEM) is caused by bovine herpesvirus type 5 (BHV-5), thiamine deficiency, diets with high sulfur, salt and lead poisoning. Although international literature mentions that PEM cases occur mainly in young cattle raised at feedlot, we noticed that it was more common in young cattle raised at pasture. It indicates that different factors play a role in the etiology and/or pathogenesis of the disease in this part of the world (Sant’Ana and Barros 2010).

The BHV-5 has been considered the second major identified cause of cattle encephalitis in Brazil. This disease has also been reported in the southeastern, midwestern and northern regions and can occur as outbreaks with several animals affected or as isolated cases. The diagnosis should be based on epidemiology, clinical signs, necropsy, histological findings, molecular techniques and virus isolation. The most common characteristic signs include anorexia, respiratory and ocular secretions, muscle trembling,
circling, opisthotonus, nystagmus, teeth grinding, ataxia, and seizures. Clinical course is usually 1-15 days. Routine diagnosis has been only performed postmortem by evaluating encephalic fragments using laboratory techniques such as histopathology, virus isolation in cell culture, and/or BoHV-5 DNA detection by polymerase chain reaction (PCR) (Lisbôa et al 2009).

Thiamine deficiency is suspected to be the cause of PEM in cattle raised on tropical pastures and in feedlot as well. Mendes et al (2007) described retrospective study of 19 cases of PEM in cattle of both sexes aging from 5 month-old to 5 year-old responsive to the treatment with thiamine. Thirteen animals were found in permanent lateral recumbency, five showed motor incoordination, 15 were exclusively fed on grass pasture, three showed partial loss of visual acuity, 14 were blindness, 16 showed presence of normal pupillary reflex, 16 decreased ruminal motility, 14 decreased sensorium (depression, semicoma or coma), and eight showed opisthotonos. It was administrated vitamin B1 in all animals and it showed a marked improvement of the clinical status within 4 to 48 hours after treatment. The treatment was very effective for a rapid response of the animal.

We observed some cases of PEM in feedlot cattle fed a diet with high carbohydrate and low in long fiber. Thiamine deficiency secondary to ruminal acidosis was possible in these cases. All cases of thiamine deficiency in cattle raised in pasture and in feedlot were not proved by laboratory determination of thiamine levels in tissues or body fluids. In both situations the diagnostic was made by good response to the treatment with thiamine at 10 mg/kg intravenously (IV) or intramuscularly (IM) every 6 hrs for the first day, followed by daily treatment.

Sulfur toxicosis has also been associated with PEM in Brazil at least in three opportunities, but not in zebu cattle. Ingestion of diets with high sulfur content can cause PEM and can produce excessive ruminal hydrogen sulfide (H2S). Cunha et al (2009) established the concentration of ruminal hydrogen sulfide using a detector tube method in Nelore bovine kept under extensive system. In four bovine ruminal hydrogen sulfide concentrations were evaluated, with 96 hours of intervals, during 40 days of experimental period. In total, there were ten evaluations per animal. Results indicated that ruminal sulfide hydrogen values were inferior to 100 ppm. According to the results, it was concluded that Nelore bovine kept in Brachiaria decumbers pasture with sulfur containing 0.15% of dry matter presented maximum concentrations of 100 ppm of H2S.

There is one outbreak of PEM associated to salt poisoning and water deprivation reported in cattle in Brazil (Lemos et al 1997) and one case of bovine PEM caused by lead poisoning was reported in cattle from the Brazilian state of Mato Grosso do Sul (Lemos et al 2004).

Although botulism is not a central nervous disease it should also be considered in the differential diagnosis of central nervous disease. It usually results in paresis of the facial muscles, the muscles of prehension and swallowing and tongue paresis. Ou et al (2007) described retrospective study of 19 cases of PEM in cattle of both sexes aging from 5 month-old to 5 year-old responsive to the treatment with thiamine. Thirteen animals were found in permanent lateral recumbency, five showed motor incoordination, 15 were exclusively fed on grass pasture, three showed partial loss of visual acuity, 14 were blindness, 16 showed presence of normal pupillary reflex, 16 decreased ruminal motility, 14 decreased sensorium (depression, semicoma or coma), and eight showed opisthotonos. It was administrated vitamin B1 in all animals and it showed a marked improvement of the clinical status within 4 to 48 hours after treatment. The treatment was very effective for a rapid response of the animal.

The central nervous diseases of zebu studies make diagnosis important for animal and public health because it has multiple etiologies and similar symptoms.

Key words: encephalopathies, Bos indicus, Brazil.

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