





Approaches for a field diagnosis of abamectin poisoning in calves¹

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ABSTRACT.- Guizelini C.C., Pupin R.C., Möck T.B.M., Morais D.R., Arredondo J.A.C., Robalinho L.L., Gimelli A. & Lemos R.A.A. 2020. **Approaches for a field diagnosis of abamectin poisoning in calves.** *Pesquisa Veterinária Brasileira* 40(3): 155-157. Laboratório de Anatomia Patológica, Faculdade de Medicina Veterinária e Zootecnia, Universidade Federal de Mato Grosso do Sul, Avenida Senador Filinto Muller 2443, Vila Ipiranga, Campo Grande, MS 79074-460, Brazil. E-mail: ricardo.lemos@ufms.br

An approach for the diagnosis of an abamectin outbreak in calves in the field is described and discussed. In a Midwestern Brazilian property, nine out of a 52 newborn calves were affected and died, making up for morbidity, mortality, and lethality ratios of 17.3%, 17.3%, and 100%, respectively. Major clinical signs included tremors in various muscle groups, inability to stand, and difficult, wheezing breathing. Each affected calf had been treated subcutaneously with abamectin (0.4mg/kg/body weight). No lesions were found at necropsy or at histological examination. Major diseases of newborn calves were included in the differential diagnosis.

INDEX TERMS: Cattle diseases, toxic disorders, abamectin, poisoning, diagnosis approach, calf.

RESUMO.- [Abordagem para um diagnóstico a campo da intoxicação por abamectina em bezerros]. Uma abordagem para o diagnóstico de um surto de abamectina em bezerros a campo é descrita e discutida. Numa propriedade do Centro-Oeste brasileiro, nove de um lote de 52 bezerros de 3 dias de idade foram afetados e morreram, perfazendo quocientes de morbidade, mortalidade e letalidade, respectivamente, de 17,3%, 17,3% e 100%. Os principais sinais clínicos incluíam tremores em vários grupos musculares, incapacidade em se manter em pé, e respiração difícil e estertorosa. Cada bezerro afetado havia sido tratado por via subcutânea com abamectina, na dose de 0,4mg/kg/peso corporal. Não foram encontradas lesões na necropsia, nem no exame histológico. As principais doenças de bezerros recém-nascidos foram incluídas no diagnóstico diferencial.

TERMOS DE INDEXAÇÃO: Doenças de bovinos, distúrbios tóxicos, abamectina, intoxicação, abordagem diagnóstica, bezerros, bovinos.

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INTRODUCTION

Abamectin-based products are widely used, most of the times safely, as antiparasitic in cattle, but cases of poisoning occur in young calves (Seixas et al. 2006, Ferreira et al. 2011, Guerra et al. 2011). Clinical signs associated with abamectin poisoning include somnolence, ataxia, progressive paresis, mydriasis, decreased tone of tongue and lips, drooling, decubitus, and coma. The outcome is usually fatal (Seaman et al. 1987, Button et al. 1998, Seixas et al. 2006, Swor et al. 2009). As this intoxication does not cause macroscopic and microscopic changes (Button et al. 1998), the diagnosis should be supported by the history of the use of the active ingredient in calves, observation of the clinical signs and ruling out other possible causes (Seixas et al. 2006), as organophosphate poisoning (Oliveira-Filho et al. 2010, Rivero et al. 2011).

In most cases, the intoxication occurs when the drug is used to control myiasis in newborn calves, using the same dosages recommended for ivermectin or doramectin-based deworming (Riet-Correa 2007). In outbreaks of abamectin toxicity, when abamectin-based products are reportedly being used, diagnosis can be made more quickly (Button et al. 1998, Guerra et al. 2011). However, in cases of iatrogenic intoxication, when the product is misused, and yet its use is not recorded in the clinical history, the diagnosis becomes challenging and requires intense epidemiological investigation including the

collection of relevant data and reviewing comprehensively the sanitary procedures adopted for calves.

The aim of the present study is to describe an outbreak of iatrogenic intoxication by abamectin in 15-day-old calves, emphasizing the importance of proper diagnostic approach in cases where administration of the drug is not included in the initial history.

MATERIALS AND METHODS

An outbreak of neurological disease in cattle in a farm (latitude 20°08'30" South and longitude 54°23'58" West) located in Midwestern Brazil was studied. Clinical signs and epidemiological data were obtained from the animal caregiver and from the veterinary practitioner who looked over for the cattle in that farm. Also, clinical examination of affected cattle was performed by staff of the Laboratory of Anatomic Pathology of the School of Veterinary Medicine and Animal Husbandry of the "Universidade Federal de Mato Grosso do Sul" (LAP-FAMEZ). Four calves were necropsied. Tissue fragments from several organs were collected in 10% buffered formalin, processed routinely for histopathology, and stained by hematoxylin and eosin (HE). Brain and spleen impressions were performed looking for blood parasites (Tyler et al. 2002). Fresh fragments from the brain were sent to bacterial culture.

RESULTS

At the time of the outbreak, there were 52 calves with weights of 25kg at birth. The routine care with the calves was as follows: up to two days after birth the navel was treated with an antiseptic (Umbicura® - Pecuarista d'Oeste) and each calf received 1ml of a subcutaneous antiparasitic drug (Dorax® 1% - Agener).

By the morning of first day of the outbreak, the calves' caregiver found four 3-day-old calves dead. In the next day, three additional calves of the same age were found dead, and two were sick and died within 24 hours.

Clinical signs included tremors in several muscle groups, failure to stand and challenging, noisy breathing.

Due to a tentative diagnosis of tick fever and pneumonia, affected calves were treated with 44-diazoaminodibenzamidina diacetate (Diaseg® - Coopers) and oxytetracycline (Terramicina LA® - Zoetis). Calves that did not have their navel disinfected two days after birth and were still considered vulnerable of navel inflammation received prophylactic treatment with a mixture of trichlorphon (Bertac® - Eurofarm) and fention (Tiguvon® - Bayer). However, none of the calves who became sick and died was treated with neither of these two drugs.

At necropsy of three of the four necropsied calves, there were no detectable lesions. In the other one, there was subacute suppurative omphalophlebitis; the liver was swollen, with rounded edges and imprinted with rib marks on its capsular surface. No significant microscopic lesions were observed in any organ of the four necropsied calves, except for the omphalophlebitis already detected clinically. Impression smears from the brain and spleen and culture from the brain resulted negative.

Well after the efforts for investigating the cause of the disease of the calves had begun, the calves caregiver admitted that for a certain period of time, which coincided with the period that calves became sick and died, he had used abamectin at 1% (Lancer®-Valée) (1ml/calf) because the supplies of doramectin has run out.

DISCUSSION

For various reasons, finding the causes of the current outbreak was challenging and constituted an excellent field diagnostic exercise. The collected data indicated that morbidity, mortality and lethality were, respectively, 17.3%, 17.3%, and 100%. The diagnosis was initially further complicated by the lack of a history of administration of any product with abamectin to the calves, which is a fundamental criterion for establishing the diagnosis (Riet-Correa 2007).

The initial suspicion of cerebral babesiosis was predominantly based on the neurological features which were somewhat similar to cerebral babesiosis, which is commonly observed in neonatal cattle in this region (Pupin et al. 2019). However, cerebral babesiosis was ruled out due to the absence of compatible macroscopic lesions (Rodrigues et al. 2005, Antoniassi et al. 2009) and in the absence of red blood cell parasites.

Neurological disease in newborn calves can be associated with failure of passive immunity transfer due to colostrum deprivation. This can result in septicemia and suppurative leptomeningitis from an infected navel (Fecteau et al. 2009), a condition known as neonatal bacterial suppurative meningitis or NBSM (Cantile & Youssef 2016), usually produced by *Escherichia coli* or *Streptococcus* spp. (Miller & Zachary 2017). This diagnosis was also at one time considered, but then ruled out on gross, histopathological, and bacteriological grounds. Although one of the calves had omphalophlebitis, all four calves lacked suppurative leptomeningitis, polyarthrititis, choroiditis and endophthalmitis, which are hallmarks of NBSM. Furthermore, no bacterium was cultured from the brain.

The fact that all cases occurred within a short period (three days), and that all calves born on those three days were affected, led to the suspicion of a toxic condition. The clinical picture and the absence of macroscopic and microscopic lesions (Oliveira-Filho et al. 2010, Lopes et al. 2014.) led to the suspicion of organophosphate poisoning since this type of drug was used, at some time, to disinfect the newborn calves' navels.

The toxic mechanism of organophosphate and carbamates is the inhibition of acetylcholinesterase resulting in the accumulation of acetylcholine, which maintains the stimuli on its receptors, causing hyperstimulation of the parasympathetic nervous system (Kwong 2002). Therefore, one way to make a diagnosis of organophosphate and carbamates poisoning is to measure acetylcholinesterase in red cells and its activity in the plasma (Coye et al. 1987). However, these tests are not available in most laboratories. The diagnosis is then based on the history that indicates exposure to toxic substances, neurological clinical picture, and the absence of significant macroscopic and microscopic findings in necropsied cattle (Barros et al. 2006). All of these criteria were present in this outbreak. However, a closer look at the property records revealed that none of the affected calves in the outbreak had their navel treated with trichlorfon or fention.

The ruling out of all the diseases described above led us to investigate another possible cause for the neurological disease that lacked gross and histological lesions. We decided then to investigate further the possibility of the use, not reported previously by the calves' caregiver, of abamectin, due to similarity of the clinical signs with this toxicity. It was then found that a product (Lancer® - Valée) containing 1% of

abamectin had been administered (1ml/calf). If one considers the weight of calves at birth, the dose they received (0.4mg/kg/body weight - bw) was twice that recommended (0.2mg/kg/bw) by the manufacturer. Under experimental conditions, administration of abamectin, even at the manufacturer's recommended doses, in calves less than four months of age, was responsible for the development of clinical signs and death (Seixas et al. 2006).

Abamectin belongs to the group of avermectins, which includes ivermectin and doramectin. Abamectin usually does not cause toxic effects in adult cattle due to its high molecular weight, which prevents it from crossing the blood-brain barrier (Gerenutti & Spinosa 1997). In young calves (up to four-months-old), however, this barrier is immature and facilitate the entrance of the active principle into the central nervous system, resulting in severe intoxication characterized by neurological signs (Button et al. 1998).

The diagnostic approach adopted in this outbreak made possible to elaborate a clinical suspicion that led to the epidemiological investigation and the identification of the source of the intoxication. To reach the diagnosis we considered the set of signalment, history, clinical signs, necropsy and histopathological findings, and complementary microbiological and parasitic exams. This approach is considered to be ideal in the decision-making process to reach a definitive diagnosis (Maxie & Miller 2016). In this context, we evaluated the leading causes of death in calves with clinical signs compatible with those observed in this outbreak and, if necessary, ruled them out for not meeting the diagnostic criteria.

CONCLUSIONS

Abamectin (0.4mg/kg/bw) prove toxic for 3-day-old calves. The toxicosis induces an acute neurological disease with no associated gross or histological changes.

Clinical and epidemiological aspects are paramount for a field diagnosis with limited laboratory aid.

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