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Summary

Cases of sudden death of 9 calves a few days old have been described. The post-mortem pathological picture suggested *E. coli* infection. It was also isolated from tissue samples. The violent course indicated poisoning. The analyzed feed sample showed an increased level of monesin. After the withdrawal of forbidden pasture, the cases described above did not repeat.

Key words: sudden death, monesin, calves

Introduction

Ionophore monensin is an antibiotic widely used as a feed additive to improve the productivity of animals [9,11]. In Europe, its use in cattle has been banned since 2006 due to its high toxicity [17]. Nevertheless, accidental monensin poisoning has been reported in cattle, sheep, horses and other animal species. These poisonings are the result of errors in the mixing of fodder, overdose of monensin or its use incompatible with the indications [4]. It

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has been established that the toxic concentration of monensin depends on the species of animals and the type of diet. Adverse reactions have been reported at levels of 3 mg / kg in horses, 12 mg / kg in sheep and above 20 mg / kg in cattle [12, 16,18]. The first symptoms of acute poisoning appear between 6 and 24 hours after ingestion, usually with a fatal outcome [12]. The water buffaloes seem to be more sensitive to monensin than domestic cattle [5,18]. A similarly more rapid course and, at the same time, high mortality are recorded in calves rather than in cows [18].

A case report.

In one of the farms in the center of the country, 7 calves, about 10 days old, died suddenly overnight. Two more died after 2 and 3 days. One of them (lack of temperature) with symptoms of dyspnea was given amoxycycline and non-steroidal anti-inflammatory drugs (NSAIDs). Despite the treatment, the calves died after 2 hours. During the dissection of the calf shortly after death, focal inflammatory changes in the stomach were found. The vet performing the autopsy suggested poisoning. No other details were given.

From a local vision: On a farm of several dozen hectares, there are meat and hybrid cows of various breeds with a predominance of limousine and charolaise. They are kept on pasture in spring, indoors in winter. The mother cows are separated from the herd before birth and gathered in a small calving barn (approx. 6 / 6m). On the day of the visit, 8 mothers were in the delivery pen. The calves (there were no calves on the day of the visit) were with their mothers. The offspring had access to the silage available to the cows. The animals were kept on deep bedding, the top layer of which was constantly replenished with fresh straw.

According to the owner, the back sheet could be up to two years old. The sanitary condition of the pen was below normal (traces of distant whitewashing of the walls, the condition of the animals' soiling - significant). The condition of the cows in the calving pen was average. Their hair was matte, ruffled. Mothers, as an exception, were fed concentrated fodder - maize mix - intended for poultry, derived from unknown sources and modeled (according to the opinion of the owner) on a similar mix from de Heus, Brojler 2. De Heusse, produces two mixes.

Brojler 1 and Brojler 2. Brojler 2 forage (25 kg) contains vitamins A, D3, E, microelements, copper, iodine, manganese, zinc, iron, selenium, technological and zootechnical additives, as well as coccidiostats and histomonostats, including salinomycin in the form of sodium salt in the amount of 69 mg / kg., dried stillage, calcium carbonate and vegetable oils and fats (sunflower). Brojler 1 forage should not be used to feed horses and turkeys, Brojler 2 -

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according to the label cannot be used for feeding ruminants. However, the compound feed purchased and used had no label. Its seller advertised it as an excellent source of protein. The fodder was yellow to beige-white in colour, highly fragmented (dust) and the proportion of grains was small (about 10%). It was stored in a dry feed store.

The owner mixed 100 kg of the purchased mixture with one ton of corn silage. The period of feeding silage with the addition of concentrated fodder was a maximum of a few days. It cannot be ruled out that the concentrate mixture was sprinkled directly onto the feed table to which the calves had access. Concentrate mix for poultry was withdrawn immediately after the calves died. It is worth mentioning that similar cases have never been recorded before in the herd visited. They have also never been of a mass nature. Interestingly, no alarming disease symptoms were observed in the mother cows.

Laboratory tests of feed.

Sudden deaths of calves after using concentrated feed for poultry raised the suspicion of poisoning. Therefore, the concentrate feed samples were sent to a commercial laboratory for testing the presence of ionophoric antibiotics (monensin, salinomycin, narasin).

Results and discussion.

The presence of non-haemolytic *E. coli* strains was found in samples of internal organs. Based on the histopathological picture, it was determined that the cause of the calves' death could be colibacteriosis. Simultaneously, the presence of an increased level of monensin was confirmed in the valinil test - in an amount > 20 ppm.

Colibacteriosis is a significant cause of diarrhea in calves and a significant economic loss. Its frequency is estimated from 5.4% to 100%, while the mortality rate is 20% (3). In the discussed case, the calf mortality was 100%. It therefore seems unlikely that the direct death of calves was exclusively colibacillosis. The composition of the broiler feed used for feeding the cows as declared by the producer and the high mortality rate of the calves raised the suspicion of salinomycin poisoning. Poisoning with this antibiotic has been reported in horses, cattle, sheep, pigs, camels and other [1, 2, 8,10, 13., 15]. In Iran, accidental administration of salinomycin mixed with barley to calves 10-16 weeks of age has also been reported. The mortality rate was 58% within 10 days. High levels of AST, LDH and CK in serum, histopathological changes in the myocardium, liver and kidneys as well as symptoms related to acute congestive heart failure were found in calves [10]. The increase in ALT, ASP and CK

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activity was also observed in calves of 90-120 days old, receiving 4 and 5 mg of salinomycin per kg body weight. administered twice daily for two days [14]. Signs of toxicity in ruminant cattle are published in detail and include near complete anorexia, depression, diarrhoea, tachypnoea, ataxia, and death. The pathological and clinical pathological findings¹² in cattle reflect ruminitis and severe cardiac and skeletal muscle damage. In experimental studies the extent of pathology has largely been dose dependant.

The following report describes the occurrence of an outbreak of monensin toxicity in preruminant dairy heifers. Gabor & Downing [5] have reported monensin poisoning in four-week-old calves. They received a milk replacer with the addition of vitamins and monensin. Interestingly, as in the discussed case, no heraldic symptoms were noted in calves. Some of these animals died suddenly with no apparent prodromal signs, while others were seen to be depressed at one feeding time, only to be found dead at the next. However, myocardial and skeletal muscle degeneration and necrosis were observed [4]. These changes were not developed in the test calf. Rozza at al. [18] suggest that young ruminants which have not been in contact with monensin before are more sensitive to monensin. Such a situation took place in the observed calves that never had contact with monesin before.

An acute onset of illness was reported in a lactating dairy herd in Canada in which monensin had been incorporated in error in its ration at almost 10 times the prescribed level. All of the lactating cows became lethargic, were inappetant, developed diarrhea, and had decreased milk production from 28 kg/cow/day, the day before exposure, to 23 kg/cow/day, 3 d later. Within 9 d, all animals recovered from the incident and milk production returned to previous levels [7]. Suspected diagnosis of poisoning by ionophore antibiotics based among others on clinical and laboratory findings of animals, which included high plasma CK and LDH levels [4]. Unfortunately, the activity of enzymes was not assessed in our own research.

CONCLUSIONS.

Data from the history, direct identification of monensin in the fed fodder, high mortality in calves and no further deaths after cessation of feed containing monensin suggest that the direct cause of death was poisoning with this substance. At the same time, the characteristic pathological changes and the presence of non-haemolytic *E. coli* strains suggesting colibacillosis seem to be more of a predisposing factor than the direct cause of death.

References

1. Abu-Samara M.T., Shuaib Y.A. High mortalities among one - humped camels (*Camelus dromedarius*) due to salinomycin poisoning in the Kingdom of Saudi Arabia. *Journal Advanced Vet. and Animals Res.* 2017;4:214-221.
2. Ashrafihelan J., Eisapour H., Erfani A.M., Kalantary A.A., Amoli J.S., Mozafari M. High mortality due to accidental salinomycin intoxication in sheep. *Interdiscip Toxicol.* 2014;7:173-176.
3. Bashahun G.M., Amina A. Colibacillosis in calves: A review of literature. *Journal of Animal Science and Beterinary Medicine.* 2017;2: 62-71.
4. Brito E.S.A., Andrade T.G., Oliveira C.H.S., Moura V.M.B.D. Tainá Outbreak of monensin poisoning in cattle due to supplementation error. *Cienc. Rural* 2020;50: <https://doi.org/10.1590/0103-8478cr2019099>
5. Gabor L.J., Dowining G.M. Monesin toxicity in preruminant dairy heifers. *Aust. Vet. J.* 2003;81:456-478.
6. Geor R.J., Robinson W.F. Suspected monensin toxicosis in feedlot cattle. *Australian Veterinary Journal.* 1985;62:130-131.
7. Gonzalez M., Barkema H.W., Keefe G.P. Monensin toxicosis in a dairy herd. *Can. Vet. J.* 2005;46:910-912.
8. Holliman A., Hovuie F., Payne J., Scholes S.: Salinomycin toxicity in dairy calves. *Vet. Rec.* 2011;169:561.
9. Moore M.F., Gadberry F., Lalman D., White F., Linnene S., Beck P. A. 341 Meta-analysis of the Performance Responses of Replacement Heifers and Beef Cows to Monensin. *Journal of Naimal Science*, 2021;99:191-192.
10. Nicpoń J., Czerw J. Patogeneza, diagnostyka i terapia zatruc salinomycyna u koni. *Med. Weter.* 1995;51:659-662.
11. Neto G.B., Berndt A., Nogueira J.R., Demarchi J.J.A.A., Nogueira J.C. Monesin and protein supplements on methane production. *South African Journal of Animal Science.* 2009; 39: 280-283 (Suplemen 1).
12. Nogueira V.A., França T.N., Peixoto P.V. Ionophore poisoning in animals. *Presq. Vet. Bras.* 2009;29:191-197.
13. Omid A., Aslani M.R., Movassaghi M.R., Mohri M., Dadfar M. Accidental salinomycin intoxication in calves. *Can Vet J.* 2010;51:1143-1145.
14. Rajaini H., Nazjfi S., Fazeli M., Poorbaghi S.L., Sepehrimanesh M., Ghazelbash A. Effect of various oral doses of salinomycin on serum biochemical parameters in calves. *Comparative Clinical Pathology* 2009;18:233-237.

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15. Plumlee K.H., Johnson B., Golzy F.D. Acute salinomycin toxicosis of pigs. *J. Vet. Diagn. Invest.* 1995;7:419-420.
16. Potter E.L., VanDuyn R.L., Cooley C.O. Monensin Toxicity in Cattle *Journal of Animal Science*, 1984;58: 1499-1511, <https://doi.org/10.2527/jas1984.5861499x>
17. Przeniosła-Siwczyńska M., Kwiatek K. Why the use of antibiotic growth promoters in animal feeds was banned? *Życie wet.* 2013;88:104-108.
18. Rozza D.B., Vervuert I., Kamphues J., Farias da Cruz C.E., Driemeier D. Monensin toxicosis in water buffaloes (*Bubalus bubalis*). *J Vet Diagn Invest* 2006;18:494-496.