DOI: 10.22055/ivj.2024.442341.2690

Hematologic and electrocardiographic findings in sub-acute experimental monensin toxicosis in goats

Mahdi Deljou[1], Mohammad Reza Aslani[2*], Mehrdad Mohri[3], Ahmad Reza Movassaghi[4] and Mohammad Heidarpour[3]

[1] PhD Graduated in Large Animal Internal Medicine, Department of Clinical Sciences, School of Veterinary Medicine, Ferdowsi University of Mashhad, Mashhad, Iran
[2] Professor, Department of Clinical Sciences, Faculty of Veterinary Medicine, Shahrekord University, Shahrekord, Iran
[3] Professor, Department of Clinical Sciences, School of Veterinary Medicine, Ferdowsi University of Mashhad, Mashhad, Iran
[4] Professor, Department of Pathobiology, School of Veterinary Medicine, Ferdowsi University of Mashhad, Mashhad, Iran

Received: 07.02.2024 Accepted: 27.05.2024

Abstract

Toxic effects of monensin, a polyether antibiotic mainly used as coccidiostat, have been described in a wide range of animals. The present study aimed to investigate the hematologic and electrocardiographic features of sub-acute monensin toxicosis in goats. For this purpose, seven adult goats were administered sodium monensin, 13 mg/kg, daily for 5 consecutive days via gastric gavage. Hematologic parameters including PCV, hemoglobin (Hb), total white blood cell (WBC) and differential count, total protein of plasma (TPP) and fibrinogen, were determined in baseline and daily blood samples for 10 days. Significant elevation of Hb at day 1, WBC at day 7, neutrophils percent at days 5 and 8, lymphocytes percent at days 5, 8 and 9, monocytes percent at days 1 and 3, absolute numbers of monocytes at days 1, 3, 6 and TPP at day 1, were observed in monensin exposed goats. At electrocardiography, sinus tachycardia, sinus bradycardia, S-T segment depression, and ventricular premature complexes and ventricular tachycardia were the most prominent findings. These findings suggest that sub-acute monensin toxicosis in goats, alters some hematologic parameters and causes a numbers of electrocardiographic abnormalities related to toxic cardiomyopathy in exposed goats.

Key words: Monensin, Ionophores antibiotic, Goats, Electrocardiography, Arrhythmia

[*] **Corresponding Author**: Mohammad Reza Aslani, Professor, Department of Clinical Sciences, Faculty of Veterinary Medicine, Shahrekord University, Shahrekord, Iran
E-mail: aslani_mr@yahoo.com

Refrences

Anjos M.C., Compos L.C., Depes V.C.A., Faccin T.C., Pereire P.F.V., Bracarens A.P.F.R.L., et al. (2023) Accidental monensin poisoning in goats. *Toxicon*, 235:107314.

Agtarap A., Chamberlin J.W., Pinkerton M. and Steinrauf L. (1697) The structure of monensic acid, a new biologically active compound. *J Am Chem Soci*, 89:5737–5739.

Basaraba R.J., Oehme, F.W., Vorhies, M.W.and Stokka, G.L. (1999) Toxicosis in cattle from concurrent feeding of monensin and dried distiller's grains contaminated with macrolide antibiotics. *J Vet Diagn Invest*, 11: 79-86.

Beasley V. (1999) Organic compounds that affect the heart. In: Veterinary Toxicology, Beasley V., ed, International Veterinary Information, Ithacha, NY.

Bourque J.G., Smart M. and Wobeser G. (1986) Monensin toxicosis in lambs. *Can Vet J*, 27: 397-399.

Cha Y.M., Glen K.L., Karich K.W.and Grogan M. (2012) Premature Ventricular Contraction-Induced Cardiomyopathy A Treatable Condition. Circulation: *Arrhythmia and Electrophysiology*, 5: 229-236.

Constable P.D., Hinchcliff K.W., Done S.H. and Grunberg W. (2017) Veterinary Medicine. 11th Edn, Saunders-Elsevier, London, pp; 675-685.

Chapman H.D., Jeffers T.K. and Williams R.B. (2010) Forty years of monensin for the control of coccidiosis in poultry. *Poultry Sci*., 89:1788-1801.

Dedoussi A., Roubies N. and Tserveni-Goussi A. (2007) Monensin toxicity in ostriches on a farm in northern Greece. *Vet Rec*., 161: 628-629.

Delesalle C., van Loon G., Nollet H. and Deprez P. (2002) Tumor-induced ventricular arrhythmia in a horse. *J Vet Intern Med*, 16: 612.

Duffield T.F., Rabiee A. and Lean I.J. (2012) Overview of meta-analysis of monensin in dairy cattle. *Vet Clin North Am Food Anim Prac*t, 28: 107-119.

Franca T.N., Nogueria V.A., Yamasaki E.M., Caldas S.A., Tokarnia C.H. and Peixoto P.V. (2009) Accidental monensin poisoning in sheep in Rio de JANEIRO. *Pesquisa Veterinria Brasileria*, 29: 743-764.

García, E.N., Pistán, M.E., Lértora, W.J., Mastrantonio, G.E. and Cholich, L.A (2020) Monensin poisoning in buffalo feedlot from Argentina. *Revista Veterinaria*, 33 (1) 38-41.

Glover G.J. and Wobeser G. (1983) Monensin toxicity in a captive white-tailed deer (*Odocoileus virginianus*). J Zoo Anim Med, 14: 13-16

Gonzalez M., Barkema H.W. and Keefe G.P. (2005) Monensin toxicosis in a dairy herd. *Can Vet J* 46: 910-912.

Gy C., Leclere M., Bélanger M.C., Allano M., Beauchamp G. and e Lavoie J.P. (2020) Acute, subacute and chronic sequelae of horses accidentally exposed to monensin-contaminated feed. *Equine Veterinary Journal*, 52: 848-856.

Hall J.O. (2004) Ionophers, In: Clinical Veterinary Toxicology, ed by Plumlee P., Elsevier Co, pp: 120-127.

Hosseini R., Rajaian H., Hajimohammadi A, Nasifi S., KhalijiE. and Asmarian S. (2013) ECG alterations and changes in biochemical parameters associated with experimental salinomycin toxicosis in sheep. *Ir J Vet Res*, 14: 120-125.

Ladenson J.H. (2007) A personal history of markers of myocyte injury (myocardial infarction). *Clin Chim Acta*, 381: 3-8.

Mendes O., Mohamed F., Gull T. and Concha-Bermejillo A. (2003) Monensin poisoning in a sheep flock. *Sheep and Goat Res J*, 18: 109-113.

Miskimins D.W. and Neiger R.D. (1996) Monensin toxicosis in swine. *J Vet Diagn Invest*, 8: 396-397.

Novilla M.N. (20012) Ionophores. In: Gupta, RC, Veterinary Toxicoogy, Basic and Clinical Principles. Elsevier, Amsterdam, pp 1281-11298.

Omidi A., Aslani M.R., Movassaghi A.R., Mohri M., Dadfar M. (2010) Accidental salinomycin intoxication in calves. *Can. Vet. J*., 50: 1143-1145.

Peek S.F., Marques F.D., Morgan J., Steinberg H., Zoromski D.W. and McGuirk S. (2004) Atypical acute monensin toxicosis and delayed cardiomyopathy in Belgian draft horses. *J Vet Intern Med*, 18: 761-764.

Reef V. and McGuirk S. (2015) Diseases of the Cardiovascular System. In: Large Animal Internal Medicine. Ed by Smith B., 5th edition, Elsevier, St.Louis, pp: 427-460.

Silva A.W.O., Mendonça M.F.F., Freitas M.D., Filho A.L.R., Silva R.D.G., Leal P.V., *et al.* (2022) Accidental monensin poisoning in buffaloes in Bahia, Brazil. *Pesq. Vet. Bras*. 42: e06937.

Vitello G. and Good J. (2023) Monensin toxicosis in a dog with initial apparent recovery followed by severe relapse. *Vet Rec, Case Report*, 11 (4): e745

Smith M.C. and Sherman D.M. (2009) Goat Medicine. 2nd edn, Wiley-Blackwell, New York.

Wang J.H., Middleton D.J. and Humphreys D.J. (1990) Effects of monensin on the bioavailability and elimination of selenium from blood in lambs. *J Vet Pharmacol Therap*, 13: 378-385.

Zavala G., Anderson D.A., Davis J.F. and Dufour-Zavala L. (2011) Acute monensin toxicosis in broiler breeder chickens. *Avian Dis*, 55: 516-521.

Zhang D., Lu H., Wang E. and Zhou Y. (2018) Toxic myopathy following monensin exposure: a case report with 12 year follow-up. *Int J Clin Exp Med*, 11(5):5390-5393.