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Survey on thyroid hormones and their relationship with serum biomarkers of myocardial injury in cattle, sheep and lambs with FMD

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Abstract

FMD is a vesicular and acute clinical disease of angulated animals such as domestic ruminants and pig. It is one of the most prominent sanitary problems in farm animals. Although the role of FMD virus in the induction of myocarditis has been known in the farm animal newborns, due to controversy about the changes in thyroid hormones in patients with FMD and their possible association with the occurrence of myocarditis, this study was designed and conducted on 50, 15 and 15 sheep, lambs and cattle, respectively. After blood sampling, sera were analyzed for troponin I, triiodothyronine (T3) and thyroxine (T4) measurement and based on normal value of serum troponin I, each group of animals was divided into higher and lower troponin groups. The mean serum troponin I, T3 and T4 were also compared with normal levels in reliable sources. Unlike the sheep, a significant difference was found between troponin I level with the normal value in cattle and lambs. Except for a significant increase in the serum T3 level of cattle, the serum thyroid hormonal changes were not significant in the lambs and sheep. There were no significant differences for serum T3 and T4 between two groups of higher and lower troponin cattle. In comparison with the lower-troponin lambs, the higher-troponin I lambs had a significant decrease in serum thyroid hormones. In conclusion, there was evidence of serum myocardial damage in cattle and lambs with FMD. Reducing thyroid hormones in the high-troponin lambs may be attributed to thyroid glands injury from FMD virus. It seems that there is no link between myocardial damage and serum thyroid hormones level in the cattle and sheep.

Key words: Thyroid hormones, Myocardial injury, FDM, Cattle, Sheep

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Refrences

Aktas, M.S.; Ozkanlar, Y.; Oruc, E.; Sozdutmaz, I. and Kirbas, A. (2015). Myocarditis associated with foot-and-mouth disease in suckling calves. Veterinarski Arhiv 85(3): 273-282.

Alexandersen, S.; Zhang, Z.; Donaldson, A.I. and Garland, A.J.M. (2003). The Pathogenesis and Diagnosis of Foot-and-Mouth Disease. Journal of Comparative Pathology, 129(1): 1-36.

Aslani, M.R.; Mohri, M. and Movassaghi, A.R. (2013). Serum troponin I as an indicator of myocarditis in lambs affected with foot and mouth disease. Veterinary Research Forum, 4(1): 59-62.

Barkakati, J.; Sarma, S.; Kalita, D.J.; Goswami, J. and Sharma, K. (2016). Activity of different serum enzymes and hormone profile in foot and mouth disease affected cattle. Indian Journal of Animal Research, 50(5): 826-827.

Basbugan, Y.; Agaoglu, Z. and Yuksek, N. (2010). An investigation on serum troponin concentration in healthy ruminants, Kafkas Universitesi Veteriner Fakultesi Dergisi, 16(4): 641-645.

Cai, CH.; Li, H.; Edwards, J.; Hawkins, CH. and Robertson, I.D. (2014). Meta-analysis on the efficacy of routine vaccination against foot and mouth disease (FMD) in China. Preventive Veterinary Medicine, 115: 94-100.

Capen, C.C. and Martin, S.L. (2003). The Thyroid Gland. In: McDonald's Veterinary Endocrinology and Reproduction. 5th; Pineda, M.H. Blackwell Science, Pp: 35-66.

Catley, A.; Chibunda, R.T.; Ranga, E.; Makungu, S.; Magayane, F.T.; Magoma, G. et al. (2004). Participatory diagnosis of a heat -intolerance syndrome in cattle in Tanzania and association with foot and mouth disease. Preventive Veterinary Medicine, 65: 17-30.

Constable, P.D.; Hinchkliff, K.W.; Done, S.H. and Grunberg, W. (2017). Veterinary Medicine. 11th ed, Saunders Elsevier Ltd, Pp: 264-266 and 2058-2067.

Desailloud, R. and Hober, D. (2009). Viruses and thyroiditis: an update. Virology Journal, 6(5): 1-14.

Dillmann, W.H. (1990) Biochemical basis of thyroid hormone action in the heart. American Journal of Medicine, 88(6): 626-630.

Donaldson, A.I. and Sellers, R.F. (2000). Foot-and-mouth disease. In: Diseases of Sheep, 3rd ed., W. B. Martin and I. D. Aitken, Eds., Blackwell Science, Oxford, Pp: 254-258.

Fakour, Sh.; Alimohammadzadeh, P. and Vaziry, A. (2017). Evaluation of cardiac troponin I (cTnI), creatine kinase (CK), aspartate aminotransferase (AST) and electrocardiography, in diagnosis of selenium deficiency in goat kids. Iran Journal of Veterinary Medicine, 11(2): 125-133.

Gerdes, A.M. and Giorgio Iervasi, G. (2010). Thyroid Replacement Therapy and Heart Failure. Circulation, 27: 385-393.

Gulbahar, M.Y.; Davis, W.C.; Guvenc, T.; Yarim, M.; Parlak, U. and Kabak, Y.B. (2007). Myocarditis Associated with Foot-and-Mouth Disease Virus Type O in Lambs. Veterinary Pathology, 44(5): 589-599.

Hernando, V.U. and Eliana, M.S. (2015). Role of Thyroid Hormones in Different Aspects of Cardiovascular System. Endocrinology & Metabolic Syndrome, 4(2): 1-13.

Hughes, G.J.; Mioulet, V.; Kitching, R.P.; Woolhouse, M. E.; Alexandersen, S. and Donaldson, A. I. (2002). Foot-and-mouth disease virus infection of sheep: implications for diagnosis and control. Veterinary Record, 150(23): 724-727.

Huszenicza, G.Y.; Kulcsar, M. and Rudas, P. (2002). Clinical endocrinology of thyroid gland function in ruminants. Veterinary Medicine Czech, 47(7): 199-210.

Janosi, S.Z.; Huszenicza, G.y.; Kulcsar, M. and Korodi, P. (1998). Endocrine and reproductive consequences of certain endotoxin-mediated diseases in farm mammals. A review. Acta Veterinaria Hungarica, 46(1): 71-84.

Kahaly, G.J. and Dillmann, W.H. (2005). Thyroid hormone action in the heart. Endocrine Reviews, 26(5): 704-728.

Karapinar, T.; Eroksuz, Y.; Beytut, E.; Sozdutmaz, I.; Eroksuz, H. and Dabak, M. (2012). Increased plasma cardiac troponin I concentration in lambs with myocarditis. Veterinary Clinical Pathology, 41(3): 375-81.

Khosravi Bakhtiari, M.; Nouri, M.; Mohammadian, B. and Omodian, S. (2014). Some hematological, biochemical and pathological changes in cattle suffering from heat intolerance (panting) syndrome following natural foot and mouth disease. Journal of Veterinary Microbiology, 10(2): 113-121.

Kirbas, A.; Bayd, E.; Kandemir, F.M.; Dorman, E.; Kizil O. and Yildirm, B. A. (2014). Evaluation of serum cardiac troponin I concentration in sheep with acute ruminal lactic acidosis. Veterinarski Arhiv, 84(4): 355-364.

Kitching, R.P. (2002). Clinical variation in foot and mouth disease: Cattle. Revue Scientifique et Technique (International Office of Epizootics) 21(3): 499-504.

Klein, I. and Ojamaa, K. (2001). Thyroid hormone and the cardiovascular system. New England Journal of Medicine, 344(7): 501-509.

Kojima, M.; Nakamura, S.; Oyama, T.; Sugihara, S.; Sakata, N. and Masawa, N. (2002). Cellular composition of subacute thyroiditis: an immunohistochemical study of six cases. Pathololgy Research and Practice, 198(12): 833-837.

Lal, L.G.S. (1981). Relation between serum protein bound iodine (PBI) with disease stress (FMD) in Tharparkar cows. Indian Veterinary Journal, 58: 646-648.

Lamprou, V.; Varvarousis, D.; Polytarchou, K.; Varvarousi, G. and Xanthos, T. (2017). The role of thyroid hormones in acute coronary syndromes: Prognostic value of alterations in thyroid hormones. Clinical Cardiology, 40(8): 528-533.

Lee, S.J.; Kang, J.G.; Ryu, O.H.; Kim, C.S.; Ihm, S.H.; Choi, M.G. et al. (2009). The relationship of thyroid hormone status with myocardial function in stress cardiomyopathy. European Journal of Endocrinology, 160(5): 799-806.

Maclachlan, N.J. and Dubovi, E.J. (2017). Fenner's Veterinary Virology. 5th ed. Academic Press. New York, California, USA. Pp: 783-488.

Maddur, M.S.; Rao, S.; Chockalingam, A.K.; Kishore, S.; Gopalakrishna, S.; Singh, N. et al. (2011). Absence of heat intolerance (panting) syndrome in foot-and-mouth disease-affected Indian cattle (Bos indicus) is associated with intact thyroid gland function. Transboundary and Emerging Diseases, 58(3): 274-279.

Mourouzis, I.; Forini, F.; Pantos, C. and Iervasi, G. (2011). Thyroid hormone and cardiac disease: from basic concepts to clinical application. Journal of Thyroid Research, 2011: 1-13.

Olivares, E.L.; Marassi, M.P.; Fortunato, R.S.; da Silva, A.C.; Costa-e-Sousa, R.H.; Araujo, I.G. et al. (2007). Thyroid function disturbance and type 3 iodothyronine deiodinase induction after myocardial infarction in rats a time course study. Endocrinology, 148(10): 4786-4792.

Pantos, C.; Mourouzis, I. and Cokkinos, D.V. (2012). Thyroid hormone and cardiac repair/regeneration: from Prometheus myth to reality? Canadian Journal of Physiology and Pharmacology, 90(8): 977-987.

Pol, C.J.; Muller, A. and Simonides, W.S. (2010). Cardiomyocyte-specific inactivation of thyroid hormone in pathologic ventricular hypertrophy: an adaptative response or part of the problem? Heart Failure Reviews, 15(2): 133-142.

Ryan, E.; Horsington, J.; Durand, S.; Brooks, H.; Alexandersen, S.; Brownlie, J. and Zhang, Z. (2008). Foot-and-mouth disease virus infection in young lambs: Pathogenesis and tissue tropism, Veterinary Microbiology, 127(3-4): 258-74.

Taghipour-Bazargani, T.; Madadgar, O. and Vahedi, A. (2017). Blood contamination of pigeons gathering food in FMD involved farms. Journal of Veterinary Research, 72 (3): 385-389. (in Persian).

Tunca, R.; Sozmen, M.; Erdogan, H.; Citil, M.; Uzlu, E.; Ozen, H. and Gokce, E. (2008). Determination of cardiac troponin I in the blood and heart of calves with foot-and-mouth disease. Journal of Veterinary Diagnostic Investigation, 20(5): 598-605.

Zibaei, S.; Keivanfar, H.; Rabbani, M.; Hematzadeh, F.; Kianizade, M.; Fathi najafi, M. et al. (2010). Comparative study on 1D (vp1) region of foot and mouth disease virus (type astrain) among different isolate: khorasan razavi isolate and other iranian and neighboring countries isolates. Journal of Veterinary Research, 65(3): 199-202.

Zientara, S. (2016). Foot and mouth disease Situation. Foot and Agriculture Organization – Montly Report, July, 1-33.