CONGENITAL MUSCULAR DYSTONIA 1 (CMD1) AND PSEUDOMYOTONIA (PMT) IN CATTLE - TWO NAMES FOR THE SAME DISEASE?

Walter Gruenberg1, Roberta Sacchetto2, Inge Wijnberg3, Francesco Mascarello2, Ernesto Damiani4, Cord Drogemuller5

1Dept. Farm Animal Health, Utrecht University, Utrecht, The Netherlands, 2Department of Experimental Veterinary Sciences, University of Padova, Padova, Italy, 3Dept. Equine Sciences, Utrecht University, Utrecht, The Netherlands, 4Experimental Biomedical Sciences, University of Padova, Adova, Italy, 5Institute of Genetics, Vetsuisse Faculty, University of Berne, Bern, Switzerland

Congenital Muscular Dystonia 1 (CMD1) and Pseudomyotonia (PMT) are two rare congenital conditions recently described in Belgian Blue and Chianina cattle respectively. Both conditions that have been related to different missense mutations of the ATP2A1 gene encoding the Ca-channel protein SERCA1 are characterized by congenital exercise induced muscle spasms. Whereas CMD1 was reported to also result in impaired swallowing, decreased growth rates and early death at a few weeks of age, calves affected by PMT appear to develop normally and can reach adult age.

We present the case of a normally developed, 3-months old Dutch Improved Red and White cross-breed heifer calf that was evaluated for a muscular disorder resulting in exercise induced muscle stiffness. Physical examination revealed generalized exercise induced muscle spasms with normal response to muscle percussion but without obvious neurologic abnormalities. Cell counts and biochemical analysis of blood or plasma as well as of cerebrospinal fluid only revealed elevated enzyme activity of AST, CK and LDH in plasma. Electromyography did not show myotonic discharges thus ruling out myotonia. Whereas histological examination of muscle biopsies from the M. semimembranosus was unremarkable, Ca2+-ATPase activity of sarcoplasmatic reticulum membranes (SERCA1) in the biopsied muscle was markedly decreased compared to control animals. Mutation analysis revealed the presence of a missense mutation in the ATP2A1 gene encoding the SERCA1 protein (p.Arg559Cys). These findings make the mutation in the ATP2A1 gene resulting in decreased activity of Ca2+-ATPase that is responsible for the removal of Ca2+ from the cytosol of muscle fibers at the end of the contraction phase a likely cause for the clinical presentation observed.

The clinical presentation of the case presented here showed striking similarities to abnormalities reported in Chianina cattle with PMT but differed markedly from the presentation reported in Belgian Blue calves with CMD1. In contrast the missense mutation on the exon 14 of the ATP2A1 gene identified in THE CALF presented here was identical to the mutation recently identified in Belgian Blue cattle affected by CMD1 but different from the mutation described in Chianina cattle with PMT. These findings suggest that PMT and CMD1 refer to the same congenital condition that may present with differing phenotype possibly dependent on the affected breed.